-----Original Message-----
From: John Isaacson [mailto:isaacson@lanl.gov]
Sent: Wednesday, June 08, 2005 1:21 PM
To: Owens, Kirk W.
Subject: RE: Biosciences NEPA Determination Document Revisions

Yes, I will attach and resend. The attached revisions are one of two
I received. I am having the two revisions compared and consolidated
and will send a newly revised one if it changes from this comparison.

Thanks, JI

>John,
>
>This email did not have an attachment, but you sent an email with
attachment
>yesterday. Your email yesterday said,
>
>Kirk, attached is the Bioscience Key Facility NEPA Determination
>Updates. I received this on Friday, June 3, but somehow overlooked it
>until today. You will notice that this is revisions to the capability
>table from the 1999 SWEIS NEPA Determination Document for HRL.
>
>Was there something else since then?
>
>Kirk Owens
>SAIC
>(301) 601-5611 (voice)
>(301) 428-0145 (fax)
>
>-----Original Message-----
>From: John Isaacson [mailto:isaacson@lanl.gov]
>Sent: Wednesday, June 08, 2005 11:02 AM
>To: KIRK.W.OWENS@saic.com
>Cc: ewithers@doeal.gov; torig@lanl.gov; sradz@lanl.gov; janecky@lanl.gov
>Subject: Biosciences NEPA Determination Document Revisions
>
>Kirk , attached is the text revisions for the HRL, now called
>"Biosciences", Key Facilities NEPA Determination Document.
>
>JI
>--
>
>John Isaacson
>S-SWEIS Project Leader
>ENV Division M887
>(505) 667-2276 (phone)
>(505) 667-0731 (fax)

LA-UR-01-3040

Title: ENV-ECO NEPA Determination Document 12
Health Research Laboratory

Los Alamos
NATIONAL LABORATORY

Table of Contents

Tables

Figure

1.0 Introduction

This document describes the *National Environmental Policy Act of 1969* (NEPA) operational envelope for operations, capabilities, and parameters analyzed for biological research at Los Alamos National Laboratory , including the former Health Research Laboratory and associated buildings, a key facility in the *Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory* (SWEIS; DOE 1999a), and other facilities used for biological research. The principal buildings and structures for this research are shown in Table 1. The purpose of this document is to determine whether proposed projects for these facilities have NEPA coverage in the SWEIS as implemented by the Department of Energy (DOE) in the Record of Decision (ROD) for the SWEIS. As long as these facilities operate within the bounds of the impacts projected by the SWEIS, the facilities are in compliance with NEPA. If there is potential to exceed projected impacts, further NEPA review would be required.

Table 1. Principal Buildings and Structures for biological research

Technical Area	Principal Buildings and Structures
TA-43	Offices, Laboratories: 43-1, -20,-24, -37 Sewage Lift Station: 43-10 Storage: 43-12, -28, -36, -46 Cooling Tower: 43-44 Computer/Instrument Assembly Building: 43-45 Chemical Storage Sheds: 43-47, -49, -61
TA-46	Offices, Laboratories: 46-24 Other buildings?
TA-35	Offices, Laboratories: 35-85 Other buildings?
TA-XX	Offices, Laboratories: XX Other Buildings?

Under the Laboratory Implementation Requirement (LIR) entitled "NEPA, Cultural Resources, and Biological Resources (NCB) Process," (LANL 2000) proposed projects are screened by the authorized facility NCB reviewer as part of the NCB assessment. The screening requires the facility NCB reviewer to decide

- if the project is new or modified from a previous determination and
- if DOE has already made a determination that covers the proposed project.

The Facility NCB Reviewer uses the Facility NEPA Determination Document (LANL 2000b) for screening. Table 2 summarizes the capabilities, and the operations examples for the capabilities, that were published in the SWEIS to estimate the impacts. If the facility NCB reviewer finds that the proposed activity is one of the capabilities in the SWEIS and is within one of the operations examples for that capability as shown by Table 2, the reviewer could determine that the proposed activity is covered by the SWEIS and does not require further NEPA analysis.

Table 2. TA-43

Capability	Operational Examples
1. Genomic Studies	1.1 Conduct research utilizing molecular and biochemical techniques to analyze the genes of animals, particularly humans.

	1.2 Develop strategies at current levels to analyze the nucleotide sequence of individual genes, especially those associated with genetic disorders, and to map genes and/or genetic diseases to locations on individual chromosomes. Part of this work is to map each nucleotide, in sequence, of each gene in all 46 chromosomes of the human genome.

Table 2. Continued

Capability	Operational Examples
2. Cell Biology	2.1 Conduct research at current levels utilizing whole cells and cellular systems, both in-vivo and in-vitro, to investigate the effects of natural and catastrophic cellular events like response to aging, harmful chemical and physical agents, and cancer.
3. Cytometry	3.1 Conduct research utilizing laser-imaging systems to analyze the structures and functions of subcellular systems.
4. DNA Damage and Repair	4.1 Research using isolated cells to investigate DNA repair mechanisms.
5. Environmental Effects	5.1 Research identifies specific changes that occur in DNA and proteins in certain microorganisms after events in the environment.
6. Structural Cell Biology	6.1 Conduct research utilizing chemical and crystallographic techniques to isolate and characterize the properties and three-dimensional shapes of DNA and protein molecules.
7. Neurobiology	7.1 Conduct research using magnetic fields produced in active areas of the brain to map human brain locations associated with certain sensory and cognitive functions. Instrumentation is sensitive magnetic detection devices.
8. In-Vivo Monitoring	8.1 Perform 3000 whole-body scans/year as a service as part of the LANL personnel monitoring program, which supports operations with radioactive materials conducted elsewhere at LANL.

a Source: Modified from SWEIS 1998 Yearbook (LANL 1999).

However, a proposal that does not match a capability description in Table 2 or that is not included with one of the operations examples for that capability in Table 2 could still be covered by the SWEIS. The SWEIS analysis is based on information in background documents prepared for each of the key facilities; these background documents provide more detailed descriptions of the ongoing and potential operations for each key facility. In addition, the levels of activity called the "operations examples" for each of the capabilities reflects scenarios that were developed for each capability to provide an estimate for calculating potential impacts. The SWEIS was not intended to set stringent limits on the level of activity for a particular capability. In most facilities the operations examples for every capability would not be reached at one time because of the ebb-and-flow-like nature of the work at LANL. Thus it would be possible to exceed the operations examples for one capability and still be within the parameter limits for the facility or the LANL operations limit. If the proposal reviewer can demonstrate this, the proposal would still have NEPA coverage through the SWEIS. This document presents the procedure for a more detailed review and supporting information from the SWEIS and background documents.

2.0 Procedure

A proposed project can be screened by the Facility NCB reviewer or ENV-ECO reviewer to determine if it is included in the descriptions in Table 2. Under that procedure, if a proposal does not clearly fit those descriptions of capabilities and associated operations examples, it will be

referred to ENV-ECO for review under this procedure, which requires more familiarity with SWEIS supporting documentation and projected additive impacts of other proposed work at LANL. The ENV-ECO reviewer will use the data on Health Research Laboratory facilities and capabilities from the SWEIS document and the background documentation. The supporting documentation on the Health Research Laboratory facilities and capabilities is presented in Sections 3 and 4 below.

A flow chart that summarizes the procedure for the ENV-ECO reviewer to use in screening a proposal is presented in Attachment 1. Upon receiving a proposal, the reviewer should answer the following:

1. Is this a new capability? Review the detailed descriptions of the biological research facilities and capabilities from the SWEIS (Section 3 of this document) and from the background documents (Section 4 of this document).
   a. If this is a new capability, go to 4.
   b. If this is not a new capability, go to 2.
2. Does the proposal fit within one of the operations levels for that capability in the SWEIS? Compare description to second column of Table 2.
   a. If the proposal is within the operations levels for that capability, go to 5.
   b. If the proposal is not within the operations examples, go to 3.
3. Is the proposal within the facility operations data envelope? Work with the facility manager and other Environment, Safety, and Health subject matter experts (SMEs) to calculate if the proposal is within the envelope of facility operations data (Table 3).
   a. If the proposal is within the facility operations data envelope, go to 5.
   b. If the proposal is not within the facility operations data envelope, go to 4.
4. ENV-ECO will prepare a NERF to complete the NEPA process.
5. Proposal is covered by the SWEIS. Attach explanation/calculations to NCB Screening Checklist (Attachment 2) to complete the NEPA process.

Table 3. Health Research Laboratory Operations Data

Parameter	Units [a]	SWEIS ROD
Radioactive Air Emissions:	Ci/yr	Not estimated
NPDES Discharge:[b]		
• 03A-040	MGY	2.5 [c]
Wastes:		
• Chemical	kg/yr	13,000
• Biomedical Waste	kg/yr	280
• Low-level waste	m^3/yr	34
• Mixed low-level waste	m^3/yr	3.4
• TRU waste/Mixed transuranic waste	m^3/yr	0

a: Ci/yr = curies per year; MGY = million gallons per year.
b: NPDES is National Pollutant Discharge Elimination System.
c: Outfall 03A-040 consisted of one process outfall and nine storm drains.

3.0 SWEIS Data for Biological Research

This section provides information directly from the SWEIS. Section 3.1 is a description of Health Research Laboratory facilities from Chapter 2 of the SWEIS. Section 3.2 is a description of the capabilities at the time the SWEIS was written, while Section 3.3 is a description of the capabilities under the preferred alternative as selected under the Record of Decision.

3.1 SWEIS Description of Biological Research Facilities

3.1.1 TA-43

The Health Research Laboratory (HRL) complex within TA-43 includes the main HRL and 13 support buildings and facilities (Figure 1). The Biosciences Division is the primary occupant of TA–43 and is responsible for management, and safety measures, procedures, and most of the research and experimental science activities at HRL. Three of the support buildings and structures have low hazard classifications. HRL is designated a low hazard as a radioactive material source and low hazard as a chemical source facility. One transportable building houses lasers and is designated low hazard as an energy source, and a safety storage shed where chemical waste is stored is assigned a low hazard as a chemical source. The other buildings have no hazard classification.

Research areas in HRL focus on trying to understand the relationships between energy and health by studying the effects of different types of radiation and chemicals on cells and subcellular components. This research is important to DOE because of its work in nuclear fission and fossil fuels, both of which generate byproducts that can affect human health by damaging deoxyribonucleic acid (DNA) and can lead to carcinogenesis.

Small quantities of many toxic and hazardous chemicals are transported to and used in research projects at HRL. They include solvents, flammable materials, dilute suspect carcinogens, certain recombinant biological preparations, and compressed gasses. There are four low-level radioactive sources used for the irradiation of samples: two cesium-137 sources, one cobalt-60 source, and one plutonium-238 source. In addition, several sealed sources of depleted uranium (uranium-238) are used to check personnel monitoring equipment. Radioisotope-labeled compounds are also used in small volume operations and include phosphorus-32, phosphorus-33, and sulfur-35. All are short-lived (half-lives in days) beta emitting radionuclides. Radioactive wastes are typically allowed to decay before being discarded. Operations at HRL may involve samples that contain radionuclides as well as dilute suspect carcinogens and other hazardous chemicals.

Chemical and radiological wastes produced at HRL are disposed of through LANL's waste management system. All biohazardous material (bacteria, viruses, fungi, and associated laboratory waste), cells, subcellular materials, and culture media are sterilized and then disposed of along with solid wastes at the Los Alamos County Landfill. All of the research activities at TA-43 produce low volumes of waste.

There is one outfall associated with TA-43, and it discharges cooling water from lasers into Los Alamos Canyon. The Biosciences Division is considering the elimination of this outfall and

discharging cooling water instead to the Los Alamos County Sewage Treatment Facility. Further NEPA review would be prepared for any such proposal. Because of its location, utilities (gas,

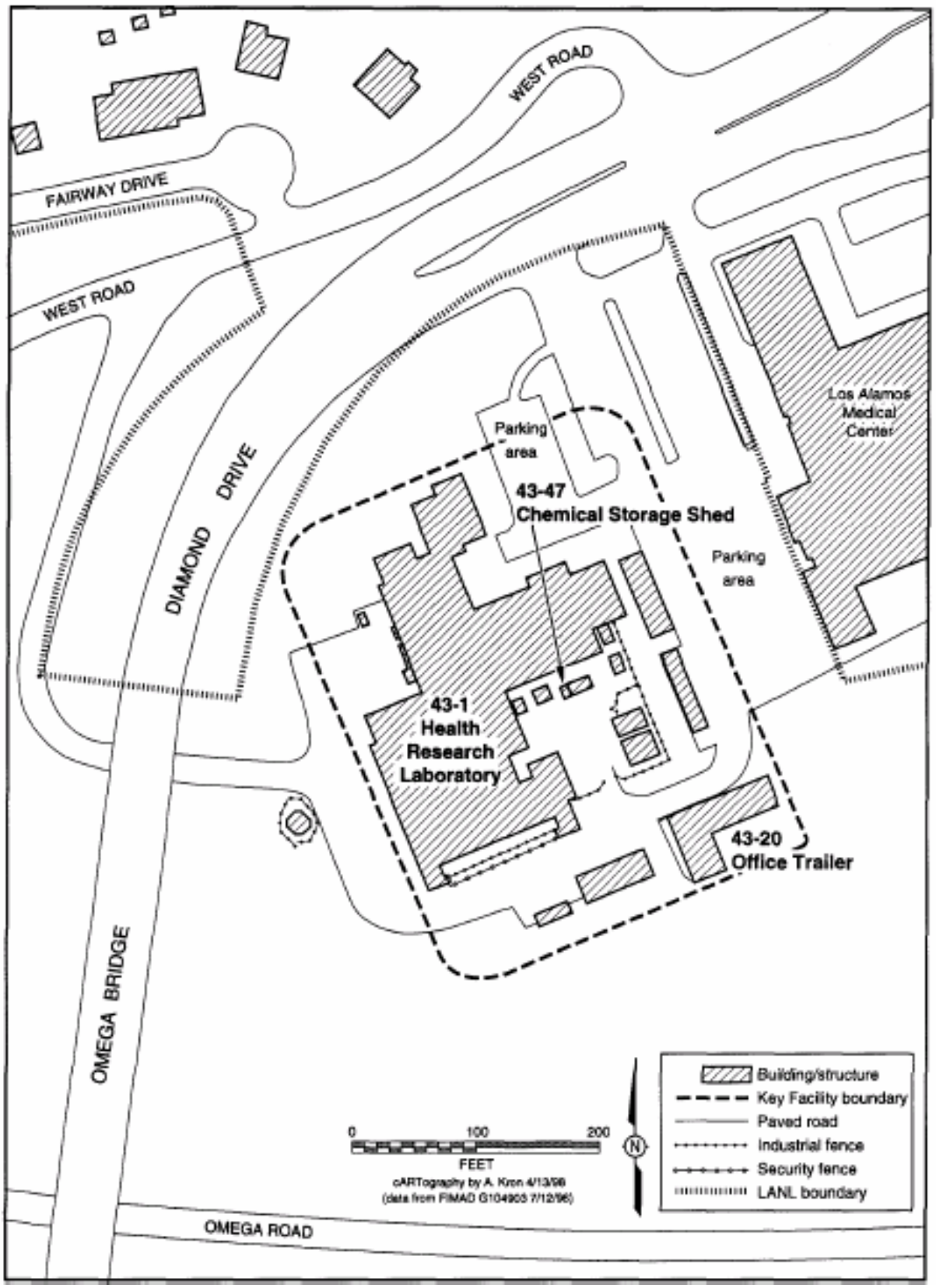


Figure 1. TA-43 Health Research Laboratory.

water, and electricity) are delivered to HRL from Los Alamos County distribution systems. These delivery systems are metered, unlike most of the other facilities at LANL.

3.1.2 TA-46

INSERT DESCRIPTION OF WORK

3.1.3 TA-35

INSERT DESCRIPTION OF WORK

3.1.4 TA XX

INSERT DESCRIPTION OF WORK

3.2 Description of Biological Research Capabilities (Baseline)

The capabilities for biological research at LANL are described below.

3.2.1. Genomic Studies

These studies are directed at understanding the organization, replication, and regulation of complex genomes.

3.2.2 Cell Biology

Activities are directed at understanding how whole cells respond to insults from the environment, including ionizing radiation and oxidants.

3.2.3 Cytometry

Activities focus on developing, refining, and applying laser-based techniques for imaging and analyzing biological materials such as whole cells and subcellular organelles.

3.2.4 DNA Damage and Repair

Studies involve how DNA is damaged and how it is repaired.

3.2.5 Environmental Effects

Studies involve the ecology of microbes and how the DNA and protein components in microbes are changed as a result of changes that humans introduce into the environment.

3.2.6 Structural Cell Biology

These are activities to understand the structure, functions, and interactions of subcellular structures and biological macromolecules.

3.2.7 Neurobiology

These activities include studies of the functions of the human brain, using magnetic waves generated by the brain to map the areas that become active as the brain receives certain sensory stimuli and goes through thinking/reasoning activities.

3.2.8 In-Vivo Monitoring

This activity provides a service to other LANL operations. Extremely sensitive detection equipment measures photons emitted by the bodies of workers to determine whether they have inhaled any radioactive material.

3.3 SWEIS Description of Health Research Laboratory Capabilities – Expanded Operations Alternative

Under the Expanded Operations Alternative, the following activities would occur at this facility.

3.3.1 Genomic Studies

Under the No Action Alternative, LANL would continue to conduct research at current levels using molecular and biochemical techniques to analyze the genes of animals, particularly humans. Specifically, personnel are developing strategies to analyze the nucleotide sequence of individual genes, especially those associated with genetic disorders, and to identify their map genes and/or genetic diseases to locations on individual chromosomes. Part of this work is to map each nucleotide, in sequence, of each gene in all 46 chromosomes of the human genome. Under the Expanded Operations Alternative, LANL would increase genomic studies at HRL by approximately 25 percent over the No Action Alternative level.

3.3.2 Cell Biology

Under the No Action Alternative, LANL would continue to conduct research at current levels using whole cells and cellular systems, both in-vivo and in-vitro, to investigate the effects of natural and catastrophic cellular events such as response to aging, harmful chemical and physical agents, and cancer. Under the Expanded Operations Alternative, LANL would increase its research activities by approximately 40 percent above the No Action Alternative level.

3.3.3 Cytometry

Under the No Action Alternative, LANL would also conduct research utilizing laser-imaging systems to analyze the structures and functions of subcellular systems. Under the Expanded Operations Alternative, LANL's research utilizing laser-imaging systems to analyze the structures and functions of subcellular systems would increase by approximately 33 percent.

3.3.4 DNA Damage and Repair

Under the No Action Alternative, LANL would conduct research using isolated cells to investigate deoxyribonucleic acid (DNA) repair mechanisms. Under the Expanded Operations Alternative, Research using isolated cells to investigate DNA repair mechanisms would increase by approximately 40 percent above the No Action Alternative levels.

3.3.5 Environmental Effects

Under the No Action Alternative, LANL would conduct research that identifies specific changes in DNA and proteins in certain microorganisms that occur after events in the environment. Under the Expanded Operations Alternative, LANL would conduct research that identifies specific changes in DNA and proteins in certain microorganisms that occur after events in the environment at a level approximately 25 percent higher than the No Action Alternative.

3.3.6 Structural Cell Biology

Under the No Action Alternative, LANL would conduct research utilizing chemical and crystallographic techniques to isolate and characterize the three dimensional shapes and properties of DNA and protein molecules. Under the Expanded Operations Alternative, LANL would conduct research utilizing chemical and crystallographic techniques to isolate and characterize the three-dimensional shapes and properties of DNA and protein molecules at a level approximately 50 percent higher than the No Action Alternative.

3.3.7 Neurobiology

Under the No Action Alternative, LANL would conduct research using magnetic fields produced in active areas of the brain to map human brain locations associated with certain sensory and cognitive functions. Under the Expanded Operations Alternative, LANL's activities in neurobiology, conducting research using magnetic fields produced in active areas of the brain to map human brain locations associated with certain sensory and cognitive functions, would be increased to three times that of the No Action Alternative.

3.3.8 In-Vivo Monitoring

Under the No Action Alternative, LANL would also continue to conduct 1,500 whole-body scans annually as a service that supports operations with radioactive materials conducted elsewhere at LANL. Under the Expanded Operations Alternative, LANL would conduct 3,000 whole-body scans annually as a service that supports operations with radioactive materials conducted elsewhere at LANL.

3.4 SWEIS Description of Health Research Laboratory Activities – Preferred Alternative

The following is the description of Health Research Laboratory activities under the expanded operations (preferred) alternative, which was adopted in the ROD for the SWEIS (DOE1999b).

4.0 Background Document Information for Health Research Laboratory

This section presents information from the "Background Information Health Research Laboratory Facilities for the Site-Wide Environmental Impact Statement for Los Alamos National Laboratory" (LANL 1996).

4.1 Background Document Description of Facilities

The Health Research Laboratory (HRL) complex at TA-43 is the focal point of LANL's core competency in bioscience and biotechnology. Originally, the Atomic Energy Commission sponsored research at the Laboratory on how radionuclides associated with the Manhattan Project are taken up, transported, deposited, and eliminated by the human body. This research was needed to protect workers. Studies were also begun on the ways the different types of radiation affect living systems. Later, the Center for Human Genome Studies was established at the Laboratory to take advantage of the massive computer capability needed in mapping the human genome. These early research initiatives have evolved into the present research programs carried out in HRL, mostly by the Biosciences Division.

The Biosciences Division (B Division) seeks to understand the relationships between energy and health through research on the effects on cells and subcellular components of different types of radiation and chemicals. This research is important to DOE because of DOE's work in nuclear fission and fossil fuels, both of which can generate byproducts that can affect human health by damaging DNA, leading to carcinogenesis. B research areas address the molecular basis of mutagenesis, DNA repair, and regulation of gene expression. B also supports DOE's national security needs. One research area addresses the mechanisms by which the pulmonary system protects itself, can be damaged by foreign materials including toxic inhalants, and then repairs itself. Finally, research in microbial ecology and plant genetics seeks to identify and understand responses of microorganism communities and plants to environmental stressors including drought and the aftermath of national defense-related activities.

Human subjects are involved as research subjects in two operations currently conducted at HRL, neurobiology and in-vivo monitoring. Both procedures are non-invasive. Although LANL personnel participated in human radiation experiments in the past, this is no longer the case. Neurobiology research measures magnetic waves emanating from the brain. In-vivo monitoring is a procedure to detect possible incorporation of radioactive material into personnel, typically via accidental inhalation. This is part of the LANL personnel protection and monitoring program.

Most of the set of HRL structures at TA-43 is occupied by B personnel. Other tenants include the Advanced Chemical Diagnostics Group (C-1), Health Physics Measurement Group (HSR-4), Center for Human Genome Studies, and Biophysics Group (P-6). The work focuses on basic research in cellular and molecular biology, biochemistry, and biophysics. The HRL Complex includes offices and laboratories (buildings 1, 20, 24, and 37); a sewage lift station (building 10); storage buildings (buildings 12, 28, 36, and 46); a cooling tower (building 44); a computer and instrument building (building 45); and chemical storage structures (buildings 47, 49, and 61. The HRL Complex is located on a 2-acre site adjacent to the west side of the Los Alamos Medical Center, south of Diamond Drive. The site has no perimeter fence, but the dock/service area has a

security fence and gate. Access to the facility is controlled by badge reader, and the main lobby and business office area are accessible to the public during working hours. Two parking lots serve the site.

The main building, HRL-1, is located about 100 ft west of the closest part of the Los Alamos Medical Center, where doctors' offices are established. The east wing of HRL-1 contains administrative offices rather than laboratories.

All utilities at HRL are metered. Because of its location, utilities are delivered directly to HRL from Los Alamos County distribution systems. Natural gas use was about 600 therms in 1994 and 500 therms in 1995. Water usage was 11 million gallons in 1993 and 10 million gallons in 1994. Electrical usage was 4.4 million kWh in 1994 and 4.5 million kWh in 1995.

All sink drains are plumbed to a sump that delivers drain discharges to a lift station and subsequently to the Los Alamos County Sewage Treatment Facility. Discharge of chemical and radiological materials into these drains is prohibited. Chemical and radiological wastes are disposed of through the Laboratory's waste management system. All biohazardous material (bacteria, viruses, fungi, and associated laboratory waste), cells, subcellular materials, and culture media are sterilized by autoclaving and then disposed of along with solid wastes from administrative activities are collected by JCI janitorial staff and are disposed at the Los Alamos County Landfill. Research operations also generate chemical waste, low-level radioactive waste (LLW), and mixed low-level waste (MLLW). These wastes are collected by LANL waste management personnel and managed with other, similar LANL wastes.

There is one outfall, designated 03A 040, which discharges once-through cooling water from lasers into Omega Canyon. At present, the flow is about 5 gallons per minute (gpm) for each laser operating. Flow in the last 1-2 years has not exceeded 1,000 gallons per day (gpd), 200,000 gallons per year. B has decided to eliminate this outfall as soon as feasible and to discharge cooling water to the Los Alamos County Sewage Treatment Facility. This is expected to occur in late 1996, following NEPA review of potential impact on wetlands augmented by the outfall.

4.1.1 HRL-1

The main building consists of three stories with offices and laboratories, an equipment penthouse, and a subbasement that houses equipment, shops and HSR-4' s in-vivo monitoring operation. It has a total area of ~93,000 ft2, of which ~5 3 ,000 ft2 are devoted to offices and research laboratories, including wet chemistry, dry chemistry, and Biosafety Level (BSL) 1 and BSL-2 laboratories. The original building, constructed in 1953, of reinforced concrete, has five additions of concrete block and/or reinforced concrete construction.

The roofs are all tar and gravel. Most exterior labs and offices have glass windows. The building has several HVAC systems that heat or cool air drawn in from outside. The conditioned air is distributed to individual rooms within the complex. Exhaust air is drawn from individual rooms and corridors and is channeled out of the building through several stacks. These stacks are not monitored for toxic or radiological materials, nor do they contain filters. Chemical fume hoods throughout the building serve simple, laboratory-scale, organic and inorganic chemistry operations. Biological research is limited to that which can be performed in a BSL-1 or BSL-2

laboratory. Radiological operations are restricted to five labs located on the first floor of the northeast wing. These operations are not conducted in hoods or gloveboxes and do not require special air-handling equipment. The building is classed as low hazard from energy sources (x-ray generating equipment, experimental and diagnostic x-ray machines, and lasers) and low hazard for chemicals.

4.1.2 HRL-20

HRL-0 is a single-story, ~2,000ft^2 transportable, wooden-frame building on a block foundation. The building, which is used for offices and laboratories, is located south of HRL-l on the rim of Omega Canyon adjacent to Los Alamos Medical Center and is accessed only by a service road. It is supplied with utilities and has a self-contained HVAC system that exhausts directly to the environment. The exhaust is not filtered or monitored. Discharges into sinks and sanitary sewer drains go to a lift station, then on to the Los Alamos County Sewage Treatment Facility. Operations involving chemical and biological agents are conducted in this building; however, no radiological work is conducted here. Biological research is limited to that which can be performed in a BSL-1 or BSL-2 laboratory.

4.1.3 HRL-45 and-37

These two buildings, located to the east of HRL- l, are of wooden frame construction and are secured to a block foundation. They have self-contained HVAC and electrical service but no plumbing, sinks, restrooms, or drains. They are used for meeting space, computing, and instrument assembly operations.

4.1.4 HRL-12, -28, -36, and -46

These buildings are typically used for short-term storage of equipment. They are all of metal construction, have entry doors and/or roll-up access doors, and rest on cement pads. All but Building 46 have electrical service. Building 12 contains a large walk-in refrigerator unit. None of the buildings has outfalls or exhausts.

4.1.5 HRL-47. -49, and –61

Safety storage sheds are used as chemical storage and a satellite accumulation point for chemical waste. Building 47 is designated as low hazard for chemicals.

4.1.6 Addition to HRL-1

A new 5,300 ft^2, two-floor addition will be constructed beginning in mid-1996 and completed by late 1997. It will stand off the northwest corner of the existing structure. The flow cytometry research and instrument development program and the structural biology program will move into the addition. This addition will provide five instrument laboratories, three computer rooms, six offices, and a computer graphics room. The addition will contain rest rooms, mechanical and electrical service rooms, and other necessary support closets. The laboratories will be on the ground floor where equipment including lasers will be isolated from vibration and the flooring will support heavy loads. Existing plant utilities will be extended from the main building into the addition except that the addition will have its own heating, ventilation, and air-conditioning

(HVAC) unit and a new water chiller system will be installed; the chilled water will cool instruments, mainly lasers.

4.2 Description of the Research Areas at Health Research Laboratory

The facilities at HRL and the research performed there includes research that can be performed at BSL-1, and BSL-2. Undergraduate, graduate and post-doctoral students, university faculty collaborators, and industrial colleagues join LANL personnel in conducting research projects which are funded by National Institutes of Health and other organizations in addition to DOE and Department of Defense (DoD).

The research areas being pursued at the HRL complex are briefly described below. All biological research involving bacteria, viruses, fungi, human cell lines, and other cell lines is limited to that which can be performed in a BSL-1 or BSL-2 laboratory. All research must comply with applicable biological regulations, LANL Work Smart Standards, and applicable DOE orders. All research conducted at BSL-2 must be approved by the LANL Institutional Biosafety Committee (IBC)/Biological Safety Officer (BSO). All BSL-1 work is reviewed and approved by the LANL BSO.

LANL requirements for BSL-1 and BSL-2 are found in "Biosafety in Microbiological and Biomedical Laboratories:, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention and National Institues of Health, 4th edition, May 1999. LANL also follows requirements contained in U.S. Department of Health and Human Services "Guidelines for Research Involving Recombinant DNA Molecules", latest edition.

4.2.1 Genomics

Genomics studies, conducted by B-? and the Center for Human Genome Studies (CHGS), are directed at understanding the organization, replication, and regulation of complex genomes, with emphasis on the human genome. The research utilizes standard molecular and biochemical methods including hybridization, sequence analysis, and electrophoretic and chromatographic separations. Radioactive tracers (beta-emitters with half lives less than 85 days, such as phosphorus-32 and sulfur-35) are used. Sequencing studies contribute to computer models. The current focus is on sequence-based strategies for mapping specific chromosomes and developing theories about the molecular basis for heritable biological effects. New areas of research include developing novel strategies to expand genomic information databases and unique libraries of genomic DNA.

The National Laboratory Gene Library Project and the Human Genome Project conduct research and serve as resources for internal and external collaborations, including international interests. The work is principally funded through DOE but includes minor projects funded by NIH.

4.2.2 Cell Biology

Studies in cell biology, conducted by B-? personnel, are directed at understanding cellular responses to environmental insults, particularly effects resulting from ionizing radiations and reactive oxygen species. Focal areas of study include cell cycle regulation, apoptosis (programmed cell death), reproductive inactivation, senescence, DNA repair, genomic

instability, cell immortalization, and tumorigenesis. In addition, B-4 has undertaken a cancer risk assessment initiative that involves identifying cancer susceptibility gene candidates and the development of biomarkers to assess cancer risk in individuals before and after exposure to carcinogens. A new area of interest for this group is identification of cell-derived mediators of genetic change.

As with genomics, standard molecular and biochemical methods including hybridization, sequence analysis, and electrophoretic and chromatographic separations are used in this research. Sealed radioactive sources are used to irradiate test material and cause damage. Radioactive tracers (beta-emitters with half lives less than 85 days, such as phosphorus-32 and sulfur-35) are used to study damage and repair mechanisms at the molecular level. These studies have numerous internal and external collaborations that provide flexibility in direction and scope. These collaborations are internal to B, with other Divisions of LANL - C, MST and external through visiting scientists and collaborators (Eleanor Roosevelt Cancer Center). This work is conducted principally for DOE, but future initiatives could attract sponsorship from National Institute of Environmental Health and Safety (NIEHS), National Aeronautics and Space Administration (NASA), DoD, and Environmental Protection Agency (EPA).

4.2.3 Cytometry

Cytometry focuses on developing, refining, and applying laser-based techniques for analyzing and imaging biological materials. This program, supported by the National Institutes of Health (NIH,) through the National Flow Cytometry Resource. This effort supports diverse health and national security projects. The Cytometry Group (B-?) and National Flow Cytometry Resource present an annual course on flow cytometry available to an international community of users. LANL personnel use flow cytometers in chromosome sorting and analysis, extremely high speed sorting and isolation of materials of interest from mixed samples. Radioactive tracers (beta-emitters with half-life less than 85 days, such as phosphorus-32 and sulfur-35) are used occasionally to identify biological materials. Sealed radioactive sources are used to irradiate test material. Currently, several cooperative research and development agreements (CRADAs) are associated with this work. B-5 is currently pursuing opportunities to expand its research efforts on behalf of DOE, the military and industrial sectors. LANL personnel expect to continue research on the applications of cytometry as well as developing instruments for specific applications.

4.2.4 DNA Damage and Repair

The study of DNA damage and repair, conducted by B-?, involves investigations of the molecular mechanisms of damage to DNA in living organisms. Both internal and external collaborations provide a diversity of investigations and approaches. Chemical and radiological damage are investigated to determine how and where DNA is damaged and how repair mechanisms operate. Sealed radioactive sources are used to irradiate test material causing damage to the DNA. Small quantities of suspect carcinogens and toxic chemicals are used in damage studies. The research utilizes standard molecular and biochemical methods including hybridization, sequence analysis, and electrophoretic and chromatographic separations. Radioactive (beta-emitters with half lives less than 85 days, such as phosphorus-32 and sulfur-35) tracers are used.

4.2.5 Environmental Biology

The environmental biology programs, primarily conducted in B-?, focus on microbial ecology in stressed environments to understand and predict how components of an ecosystem respond to human-induced changes in the environment. Unique DNA/protein signatures of microorganisms are studied to understand how these respond to changes. There are applications that have implications for energy production and national security (classified information). There are broad-based internal and external collaborations contributing to the diversity of this work (classified). The procedures used, however, are standard molecular biology/biochemistry in nature. The work done in HRL is unclassified work. The operations produce typical wastes for these types of procedures, including the production of hazardous chemical wastes. There are no radiological operations associated with this work and no biosafety concerns.

Structural Biology. The goal of the structural biology program is to understand the structure, function, and interactions of biological macromolecules. This work is principally conducted by the staff of B?8. They are actively involved in developing a variety of strategies and technologies to accomplish these purposes. Researchers investigate the structure, function and interactions DNA, proteins and DNA complexes. The work utilizes computer modeling of complex molecules, derived from crystallographic images and chemical analyses. The work is contributing to an understanding of the AIDS virus, to detection of disease agents, to development of chemotherapeutic agents, chelating agents, and regulatory proteins of all types. The studies could also contribute to the development of strategies and materials for preventing environmental degradation through the understanding of molecular structures and interactions.

The radiological work is limited to medium energy beta-emitters with short half-lives (<85 days) and crystallographic techniques utilizing Fe59 ionization source.

There are extensive internal and external collaborations for this work including work done at LANSCE, the Neutron Scattering Center at Los Alamos. NIH and the Laboratory's research and development fund (LDRD) are currently the principal sources of funding for this work, although funding proposals have been submitted to DOE following a request for submittals in the area of Structural Biology.

4.2.6 Neurobiology

The goal of neurobiological research is to understand the function of the human brain by mapping the functional activities associated with sensory and cognitive function. Brain activity produces magnetic fields that can be detected outside the head by advanced physics devices referred to as Superconducting Interference Devices (SQUIDs). LANL is well situated for research in this area because of its position in superconducting technology and electromagnetic field theory. The neurobiology research at HRL is performed in a shielded basement room using a seven-channel SQUID system which is cooled by cryogenic fluids. The computer data acquisition system is in the next room. Research is conducted using volunteer human subjects. A variety of sensory stimuli such as visual and auditory presentations are made to the volunteer. The magnetic fields from localized areas are detected by the SQUIDs. The research is completely non-invasive and involves no danger to the volunteer. This work generates only

administrative type wastes (paper) and has no biosafety or radiological concerns, and is monitored by the LANL Committee for Human Studies.

The neurobiology research at LANL has been reduced in recent years as a larger collaborative facility has been established in the Veterans Administration Hospital in Albuquerque where data can be taken more rapidly. The equipment and shielded room in HRL-1 may be relocated to TA-3, Building SM-40, which is a part of P Division space.

4.2.7 In Vivo Monitoring

In vivo monitoring is a service to other operations at LANL, part of the personnel protection and monitoring program. This activity is located in three rooms in the sub-basement at HRL-1 because of the shielding offered by the concrete structure and the isolation from other sources of radioactive emissions. Extremely sensitive detection equipment measures the photons emitted by the bodies of workers to determine whether they have inhaled any internal photoradioactive material. This monitoring is available as needed to LANL employees and LANL subcontractors. DOE personnel such as WIPP staff and other individuals are monitored by contract and special agreements. Most of the scans are performed on individuals who work at TA-55 in PF-4 and at TA-53 in LANSCE. This work generates only administrative wastes, has no biosafety or radiological concerns, and is monitored by the LANL Committee for Human Studies.

4.3 Comparison of Missions/Programs Under the No Action and Expanded Operations Alternatives

The no action alternative would apply to continued operations as they are presently being conducted. It would assume the current level of effort and funding by the identified sponsors. Buildings l and 20 are currently designated as non-nuclear, low hazard facilities. There are about 190 FTEs at HRL, composed of 155 research personnel and 35 facility support staff including technicians, computer support technicians, and administrative support personnel. Annual waste generation for the HRL Complex would be about 70,000 kg of chemical wastes, 450 kg biomedical wastes, 145 kg LLW, and 30 kg mixed LLW.

In general, expanded operations would mean increasing the number of researchers to the maximum capacity of the HRL buildings, to about 210 research workers and 40 support staff. This 35% increase in personnel would mean increases in experiments performed, personnel doses, and in wastes generated. Inventories of chemicals and other materials would remain about constant but annual use (throughput) would increase, possibly double for some chemicals. Annual waste generation rates for the HRL Complex would exceed those for the No-Action Alternative, particularly for chemical and biomedical wastes. Utility demand - water and electrical power usage - would increase but natural gas demand would remain the same.

4.3.1 Genomics

Under the No Action Alternative, the number of FTEs will remain at about 40. The scope of the work will continue to focus on work for the DOE through the CHGS and the Library Project with some work for NIH. The work produces are low volumes of chemical and radiological wastes. The radiological work is limited to medium energy beta-emitters with short half-lives (<85 days).

Under the Expanded Operations Alternative, the number of FTEs would expand to 50. The scope and content of work would escalate, but the impact would principally be on space in Building 1 to accommodate the increased number of people. The volume of radiological work would likely increase slightly. The volumes of hazardous waste chemicals would not increase as much as the increase in researchers and increases in work.

4.3.2 Cell Biology

Under the No Action Alternative, the number of FTEs will remain at about 25. The scope of the work will remain focused on projects funded by DOE. The work generates low volumes of hazardous chemical and radiological wastes. The radiological work includes irradiation of cells using sealed alpha-and gamma-emitting sources and labeled isotope work with beta-emitters having short half-lives (<85 days).

Under the Expanded Operations Alternative, the number of FTEs would increase to 35. The scope and content of work would escalate, but the impact would principally be on space in Building 1 to accommodate the increased number of people. The volumes of hazardous waste chemicals would increase somewhat but not in direct proportion to the increase in researchers. The volume of radiological work and radioactive wastes would likely increase slightly.

4.3.3 Cytometry

Under the No Action Alternative, the number of FTEs will remain at about 30, fluctuating with collaborations and availability of post-doctoral candidates. The current instrument complement is 10 cytometers belonging to B and 7 belonging to C collaborators. These instruments are water cooled and require many gallons of water/hour during operation. The scope of the work would remain as it is, including DOE work and DoD/CRADA work. Several cytometers have been developed for specific applications which will be transferred to the customers for use.

Under the Expanded Operations Alternative, the number of FTEs would increase to 40 and the number instruments to 20. The impact of this magnitude of expansion would affect water and electrical power utilization at TA-43. The volumes of hazardous waste chemicals would increase slightly. The volume of radiological work and radioactive wastes would likely increase slightly.

4.3.4 DNA Damage and Repair

Under the No Action Alternative, the number of FTEs will remain at about 25. The scope of the work will remained focused on work for DOE. The work generates low volumes of hazardous chemical and radiological wastes. The radiological work includes irradiation of cells using sealed alpha- and gamma-emitting sources and labeled isotope work with beta-emitters having short half-lives (<85 days). Under the Expanded Operations Alternative, the number of FTEs would increase to 35. The scope and content of work would escalate, but the impact would principally be on space in Building1 to accommodate the increased number of people. The volumes of hazardous waste chemicals would not increase very much. The volume of radiological work would likely increase and radioactive wastes would likely increase slightly.

4.3.5 Environmental Biology

Under the No Action Alternative, the number of FTEs will remain at about 20. The scope of the work will remain at the current levels. There are classified aspects to the content and scope of this work. However, the work done in HRL is unclassified. The operations produce hazardous chemical wastes. There are no radiological operations associated with this work.

Under the Expanded Operations Alternative, the number of FTEs would increase to 25. The scope and content of the work would escalate, but the impact would principally be on space in Building1 to accommodate the increased number of people. The volumes of hazardous waste chemicals would increase slightly.

4.3.6 Structural Biology

Under the No Action Alternative, the number of FTEs will remain at about 10. The scope of work would remain focused and would limit interactions with outside collaborators and internal collaborations with LANSCE. The only impacts are low volumes of chemical and radiological wastes. The radiological work is limited to medium energy beta-emitters with short half-lives (<85 days) and crystallographic techniques utilizing an iron-59 (Fe59) ionization source.

Under the Expanded Operations Alternative, the number of FTEs would increase to 15. The scope and the focus of the work would expand and wastes would likely increase slightly. More collaborative work would be done at LANSCE.

4.3.7 Neurobiology

Under the No Action Alternative, currently, 2 FTEs conduct neurobiology testing in HRL-1. This work generates only administrative type wastes (paper) and has no biosafety or radiological concerns. Neurobiology may be moved to TA-3 Building SM-40 (P Division) within the next few years. All equipment including the detection apparatus, computerized data system, and the screened room would be moved. The vacated space in HRL-1 has not been contaminated so there would be no waste issues from relocating the research.

Under the Expanded Operations Alternative, the number of FTEs would increase to 4. The sensor system would be replaced with a larger and more sensitive unit and the shielding of the experimental room would be improved. The entire research operation could be relocated to TA-3, Building SM-40, where it would be integrated with the existing sensor development efforts. These upgrades to equipment and particularly relocation would permit more experiments to be conducted. Waste volumes would not be increased, however.

Neurobiology may be moved to TA-3 Building SM-40 (P Division) within the next few years. All equipment including the detection apparatus, computerized data system, and the screened room would be moved. The vacated space in HRL-1 has not been contaminated so there would be no waste issues from relocating the research.

4.3.8 In Vivo Monitoring

Under the No Action Alternative, a staff of 3 FTEs conducts 1,500 in vivo scans annually. Each whole body scan requires about 33 minutes. This work generates only administrative wastes, has no biosafety or radiological concerns.

Under the Expanded Operations Alternative, expansion of operations at LANL, particularly in TA-55 and at LANSCE, would require more individuals to be monitored. By adding two more technicians (to 5 FTEs) and upgrading the computer, electronics, and detectors, 3,000 whole-body scans could be performed annually. If more were needed, the number of technicians would have to be increased and a second shift of work would be initiated. There is no room to expand equipment at the present location.

4.4 Discussion of Operational Capabilities as They Support Programs

The following technologies/capabilities are available in TA-43 HRL: molecular biology technologies, radiological assays, biochemical technologies, cytometrics, cell/microbe culture, computation, radiological exposure facility for cultured cells and live animal modeling.

4.4.1 Molecular Biology Technologies

Molecular biology technologies are procedures, techniques and processes that provide data about the organization, function and relationships of molecules derived from living organisms. These include methods of recombinant DNA, culture of microorganisms and cells, electrophoresis, automated sequence analysis, preparation of novel DNA libraries, isolation and purification of DNA/RNA or proteins. The research utilizes standard methods and protocols as well as development of new procedures, equipment and strategies for characterizing genomic information or messages.

DNA sequences can be isolated, fragmented, hybridized, and automatically sequenced as needed. Olgonucleotides can be synthesized using several template techniques. Proteins can be synthesized and identified from natural, damaged, and synthesized nucleic acid sequences. Separation techniques include chromatographic and electrophoretic methods. Reaction products are detected using ultraviolet absorption and various staining techniques. Cytogenetic analysis is facilitated by several types of light and electron microscopes and marking techniques including immunoradio- and immunofluorescent tagging.

4.4.2 Radiological Assay Systems

Radio-labeled components of biological molecules (DNA/RNA) are chemically incorporated into more complex molecules that are then identified by autoradiography. This is a standard technique for identifying homologous, similar, molecules of DNA/ RNA or proteins. Autoradiography is a sensitive, accurate, visual tool to describe complex genetic information. These techniques use isotopic species that emit medium energy beta particles. They have relatively short half-lives (<85 days). The specific activities used are high (l millicurie/ milliliter), but the volumes are small, being in the microliter range.

4.4.3 Biochemical Technologies

Studying the structure and function of intra- and extra-cellular molecules derived from living systems requires application of chemical techniques. Chemical reactions on a micro scale provide all the chemical reactions used to isolate, purify and manipulate biological molecules. These can have toxic, mutagenic, carcinogenic, irritant and/or caustic properties. While the chemicals used to conduct these procedures can have hazardous characteristics, they are used in micro-volumes. Although many toxic and hazardous chemicals are used in research projects, the quantities maintained in inventory are small, typically gram to milligram, and the quantities used in individual experiments are still smaller. Solvents and reagents in regular use include alcohols, acetone, chloroform, formalin solution, methylene chloride, trichloroethylene, xylene, ammonia, mineral and organic acids, and short chain hydrocarbons such as hexane.

4.4.4 Flow Cytometry

Cytometry is both a mission (development and applications) and a tool. The National Flow Cytometry Resource is a part of this capability. Much of the research conducted in B uses flow cytometric capabilities as an integral part of the work. These systems use commercial lasers to visualize, sort and characterize cells and molecules. Detection for data collection or manipulation is based on laser light excitation of fluorescent tags attached to the cells, particles or molecules of interest. The instrumentation is computer assisted to provide resolution and sensitivity to the detection/manipulation procedures. The lasers require water for cooling, at present, all in-coming water is removed into the sanitary sewer system. The fluorescent dyes used to tag samples to be analyzed are, in many cases, mutagenic and or irritants. These compounds are used in micromolar concentrations.

4.4.5 Cell/Microbe culture

Culture of single cells and microbes (bacteria, yeast and viruses) permits observation and manipulation to support research in cell response, production of cell process-regulating proteins, and amplification of genetic material. These techniques are routinely used internationally in the scientific community for application in medical research and treatment, teaching and production of commercial materials. The biological research activities at TA-43, 35, 46, and XX are limited to work that can be performed at BSL-1 or BSL-2. All biological waste materials from culture operations are treated to kill infectious agents prior to disposal (autoclave heating or viricide/bactericide).

Most of the operations consist of procedures that involve cells from human or animal tissues, microorganisms (bacteria, yeast), or cell components (proteins, nucleic acids, enzymes).

4.4.6 Computation

Data generation and collection is accomplished for many research projects using computer-assisted methods. This is involves the use of commercially available systems that range from stand alone personal computers to Internet service. Computational management of genome data uses both commercial systems and novel systems being developed by personnel focusing on informatics problems. These operations have no unique hazards associated with them as applied

to Biosciences research and actually contribute to the reduction of redundant work by providing world-wide access to work done here and access to work done elsewhere.

4.4.7 Radioactive Materials and Ionizing Radiation Sources

The radiological processes using solutions of radioisotope-labeled compounds are also small-volume operations involving no bulk or batch work. Radioisotopes are limited to phosphorus-32 (^{32}P) and -33 (^{33}P) and sulfur-35 (^{35}S). These are used as tracers, to follow reaction sequences. At present, no work involves tritium (^{3}H) or carbon-14 (^{14}C); such work could only be done following special protocol, after administrative review.

There are several sealed sources (one Pu^{238}, two ^{137}Cs, and one ^{60}Co), used to expose cells to gamma radiation. A suite of rooms in HRL-1 provides a unique exposure facility permitting living cells to be irradiated for the purpose of observing effects. Cellular systems provide a powerful tool to study radiation effects in very controlled conditions and provide information about radiation effects at a cellular/molecular level without risking human exposure or utilizing living animals. This facility has stringent access/ user control. The sources are commercial-type sources similar to those used for cancer treatment. This facility is not at this time identified as a nuclear facility. These sources are interlocked and shielded to protect workers or the public from accidental exposure. Sealed, depleted uranium (D-38) sources are used as checks for personnel monitoring equipment.

4.4.8 Imaging

Imaging techniques include scanning tunneling microscopy and atomic force microscopy. HRL - 1 has a resource for microscopic subject image acquisition, digital enhancement, analysis, and processing. Imaging techniques include scanning tunneling microscopy and atomic force microscopy. Image analysis and enhancement capabilities are available through various software packages.

4.4.9 Programs Supported

These technologies support work for DOE, LANL LDRD, DoD and NIH funded programs focusing on the Human Genome, Cell Biology, DNA Damage and Repair, Structural Biology, Environmental Biology and Cytometry. They are utilized in every group in B as well as collaborating groups in C, and ??.

5.0 References

DOE 1999a: “Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory,” US Department of Energy, Albuquerque Operations Office DOE/EIS-0238 (January 1999).

DOE 1999b: “Record of Decision: Site Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory in the State of New Mexico,” 64FR50797, Washington, D.C. (September 19,1999).

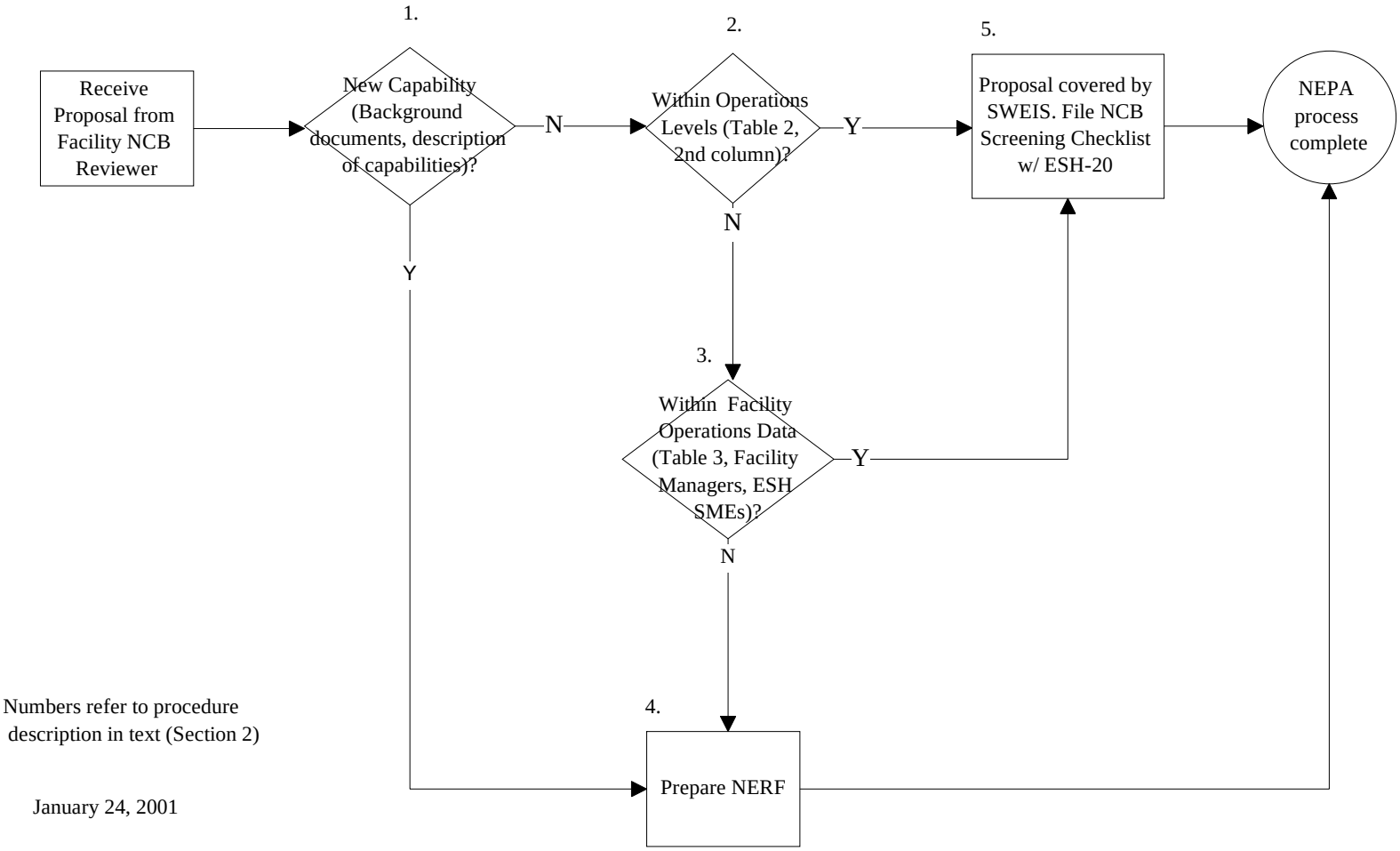
LANL 1996: “Background Information for Health Research Laboratory for Site-Wide Environmental Impact Statement Los Alamos National Laboratory, transmitted to Mr. Thomas Anderson, GRAM, Inc., by Doris Garvey, Project Leader (December 2, 1996).

LANL 1999: “SWEIS 1998 Yearbook: Comparison of 1998 Data to Projections of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory,” Los Alamos National Laboratory LA-UR-99-6391 (December 1999).

LANL 2000a: “NEPA, Cultural Resources, and Biological Resources (NCB) Process Laboratory Implementation Requirement,” Los Alamos National Laboratory LIR 404-30-02.0 (January 20, 2000).

LANL 2000b: “Facility NCB Reviewer Determination Documents,” LA-UR-01-1273.

Attachment 1: ENV-ECO Screening Flow Chart



Attachment 2: NCB Screening Checklist

REVIEWER: DATE:

PROJECT TITLE:

PROJECT IDENTIFIER/Reference No:

DESCRIPTION/Comments:

Air or water emissions to environment: Yes ☐ No ☐
Describe issue or resolution:

LOCATION: FMU No: FMU No:

TA:__ Building:_____ TA:__ Building:_____ TA:__ Building:_____
TA:__ Building:_____ TA:__ Building:_____ TA:__ Building:_____
Other: _____

CRITERIA:

2a. 1. Schedule or location modified to avoid T&E concerns? Yes ☐ No ☐
2. After project modification is there an unresolved T&E issue?: Yes ☐ No ☐
3. For T&E buffer areas, map of project footprint is attached or has been sent to ENV-ECO? Yes ☐ No ☐

2b. Floodplain issue: Yes ☐ No ☐
2c. Wetland issue: Yes ☐ No ☐
Wetland BMPs implemented? Yes ☐ No ☐
2d. Modifications to a historic building: Yes ☐ No ☐
2e. Archaeological resources affected: Yes ☐ No ☐
Sites within project area were avoided (notify ENV-ECO and provide map): Yes ☐ No ☐

3a. NEPA Documentation:
CX (specify): LAN-__-_____ LAN-__-_____
Site-wide EIS (specify): Facility NCB Document No.: _____ Operations Level (Use Table 2): _____

3b. Conditions that preclude a cx or SWEIS reference:
Connected action: Yes ☐ No ☐
Extraordinary circumstances Yes ☐ No ☐
Siting/expansion - Treatment, Storage, Disposal facility? Yes ☐ No ☐
Uncontrolled releases of contaminants Yes ☐ No ☐

Reviewed by ENV-ECO NCB staff:

NEPA: Name Date Comment:
Biological Resources: Name Date Comment:
Cultural Resources: Name Date Comment:

Attachment 2: NCB Screening Checklist

Other: Name Date Comment: