RADIOACTIVE MATERIALS HANDLING FACILITY DECONTAMINATION AND DECOMMISSIONING ENGINEERING EVALUATION/COST ANALYSIS

Prepared by The Boeing Company

for the Department of Energy

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Executive Summary

This Engineering Evaluation/Cost Analysis (EE/CA) has been prepared to fulfill the requirements of Section 300.415(b)(4)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for a proposed non-time critical removal action. It summarizes the objectives of the removal action and evaluates alternatives to implement the decontamination and decommissioning (D&D) of the Department of Energy's (DOE) Radioactive Materials Handling Facility (RMHF), situated within the Energy Technology Engineering Center (ETEC) at the Santa Susana Field Laboratory (SSFL). SSFL is not on the National Priorities List; however, the U.S. Environmental Protection Agency (EPA) and DOE agreed in a joint policy statement (May 22, 1995) that DOE decommissioning activities will be conducted as non-time critical removal actions consistent with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), effectively integrating EPA oversight responsibility, DOE lead agency responsibility, and state and stakeholder participation.

This document provided an opportunity for interested persons to comment on the project objectives and the proposed removal action alternative for the RMHF as required by Section 300.820(a) of the NCP.

The Department of Energy is conducting the cleanup activities at ETEC pursuant to its authority under the Atomic Energy Act. In addition, the removal action will be conducted in accordance with the 1995 joint DOE/ EPA Policy Memorandum in a manner that is consistent with CERCLA.

The RMHF was designed and constructed in 1959 for the safe storage and handling of new and irradiated nuclear fuel and other radioactive materials from ETEC as well as other DOE locations. In 1989, three buildings at the RMHF were authorized under the Federal Resource Conservation and Recovery Act for the storage and treatment of mixed wastes generated at ETEC.

The RMHF operated in its original capacity until research at ETEC involving radioactive materials was completed in 1988. When the DOE-sponsored activities at ETEC began to focus on the D&D of the ETEC facilities, RMHF was dedicated to the exclusive support of D&D activities at SSFL. In this capacity, only radioactive and mixed wastes were managed at the RMHF. As the D&D of ETEC and subsequent removal of radioactive materials approaches completion, the RMHF has been progressively deactivated. Ten numbered structures at the RMHF currently remain.

The scope of the RMHF D&D involves the complete removal of all above- and below-grade structural components and any radiologically impacted soil that fails to achieve removal action objectives discussed in Section 2 of this EE/CA. The desired outcome of the removal action is an RMHF footprint that meets radiological standards of protectiveness for unrestricted use.

This EE/CA identifies "Demolition/Removal and Off-site Disposal" as the preferred alternative to address the objectives of the RMHF D&D compared against a "No Action" alternative. Both alternatives are evaluated for their relative effectiveness, implementability, and cost as the basis for a removal action decision.

The public was encouraged to comment on the preferred alternative presented in this EE/CA during a public comment period. Following public comment, this document will be used as the basis for an Action Memorandum to initiate implementation of the chosen D&D approach, Demolition/Removal and Offsite Disposal.

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Acronyms and Abbreviations

Acronym	Meaning
AEA	Atomic Energy Act
ARARs	Applicable or Relevant and Appropriate Requirements
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Constituent of Concern
D&D	Decontamination and Decommissioning
DM	Decommissioned Material
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EE/CA	Engineering Evaluation and Cost Analysis
EPA	U.S. Environmental Protection Agency
ETEC	Energy Technology Engineering Center
ISF	Interim Status Facility
LLW	Low-Level Radioactive Waste
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MLLW	Mixed Low-Level Waste
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	Picocuries per gram
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act
RMHF	Radioactive Materials Handling Facility
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SSFL	Santa Susana Field Laboratory
USC	United States Code

Glossary

Applicable or Relevant and Appropriate Requirement (ARAR): The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires compliance with any promulgated standard requirements, criteria, or limitation under Federal and more stringent State environmental laws. Examples include the Clean Water Act, Endangered Species Act, etc.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): A Federal law, known as Superfund passed in 1980, and reauthorized by the Superfund Amendments and Reauthorization Act (SARA) in 1986. The law authorizes the Federal government to respond directly to releases of hazardous substances that may endanger public health or the environment.

Curie: A unit of radioactivity that represents the amount of radioactivity associated with one gram of radium. To say that a sample of radioactive material exhibits one curie of radioactivity means that the element is disintegrating at the rate of 37 billion times per second.

Deactivation: The process of placing a facility in a stable and known condition including the removal of hazardous and radioactive materials to ensure adequate protection of the worker, public health and safety, and the environment, thereby limiting the long-term cost of surveillance and maintenance. Actions include the removal of fuel, draining and/or de-energizing nonessential systems, removal of stored radioactive and hazardous materials, and related actions. Deactivation does not include all decontamination necessary for the dismantlement and demolition phase of decommissioning, e.g., removal of contamination remaining in the fixed structures and equipment after deactivation.

Decommissioning: Decommissioning is inclusive of activities that take place after a facility has been deactivated and placed in an ongoing surveillance and maintenance program. Decommissioning can include decontamination and dismantlement. Decontamination encompasses the removal or reduction of radioactive or hazardous contamination from facilities. Dismantlement involves the disassembly or demolition, and removal, of any structure, system, or component and the interim or long-term disposal of waste materials in compliance with applicable requirements.

Decommissioned Material (DM): Structural materials and soil from decommissioned radiological facilities that have been surveyed/sampled and determined to meet state and federal cleanup standards. These materials have therefore been determined to be suitable for unrestricted use. These materials may or may not have low levels of residual contamination exceeding background. In 2002, California issued a moratorium on the disposal of decommissioned material above background levels at Class III or unclassified (unlined) waste disposal sites.

Decontamination: The removal or reduction of residual radioactive and hazardous materials by mechanical, chemical or other techniques to achieve a stated objective or end condition.

Excess Cancer Risk: A figure that calculates the risk of contracting cancer on a probability scale based on current and future use exposure pathways (i.e., activities that may result in an individual contacting soil, sediment, etc.). Exposure pathways consider how frequently the individual is exposed to the constituent of concern (COC), the quantity of COC that is ingested, inhaled, or absorbed through skin contact, and the period of time for which the individual is exposed to the COC. Based on the NCP, the Environmental Protection Agency's (EPA) regulations for the

evaluation of risk at Superfund sites, the acceptable excess cancer risk range for residential areas is from 10^{-4} (one in ten thousand) to 10^{-6} (one in a million excess risk of developing cancer).

Executive Order 12580: An order entitled "Superfund Implementation" signed on January 23, 1987 by the President of the United States. This document delegates authority and responsibility to implement certain provisions of CERCLA to a number Federal departments (including the Department of Energy (DOE)) and agencies.

Low-Level Waste (LLW): Low-level radioactive waste is defined as any radioactive waste that does not belong in one of the following three categories for radioactive waste: high-level waste (spent nuclear fuel or the highly radioactive waste produced if spent fuel is reprocessed), uranium milling residues, and waste with greater than specified quantities of elements heavier than uranium. Low-level radioactive waste is generated at commercial facilities such as nuclear power plants, hospitals, and research institutions. It includes radioactive materials used in various processes as well as supplies and equipment that have been contaminated with radioactive materials.

Low-Level Waste Disposal Site: Low-level waste disposal occurs at facilities licensed by the Nuclear Regulatory Commission (NRC). The facilities must be designed, constructed, and operated to meet safety standards. The operator of the facility must also extensively characterize the site on which the facility is located and analyze how the facility will perform for thousands of years into the future.

Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM): A document developed by the DOE, the Department of Defense (DOD), EPA, and NRC to provide detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. MARSSIM focuses on the demonstration of compliance during the final status survey following scoping, characterization, and any necessary remedial actions.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The federal government's blueprint for responding to both oil spills and hazardous substance releases. The NCP is the result of our country's efforts to develop a national response capability and promote overall coordination among the hierarchy of responders and contingency plans.

Non-Time Critical Removal Action: This is a type of response action recognized by the EPA as appropriate for addressing hazardous substance threats where a planning horizon of six months or more is appropriate. Under an EPA/DOE agreement, DOE uses a non-time critical removal action approach tailored for decommissioning DOE facilities. That approach is comprised of: a threat assessment; identification, analysis, and documentation of decommissioning alternatives; opportunities for public participation in the decommissioning decision; and planning and performance of decommissioning activities.

Picocurie (pCi): One one-trillionth (1/1,000,000,000,000) of a curie.

Removal Action: When DOE identifies a threat of exposure to, or migration of, hazardous substances that poses a risk to health, welfare, or the environment, DOE is authorized by CERCLA to exercise removal action authority to implement an appropriate response to the risks posed. Activities that may be taken under CERCLA removal action authority include any activity that reduces risks or potential risks in a relatively short time frame and can be identified as

appropriate with a relatively limited analysis of alternatives. Removal actions are not limited to immediate action, or action in response to an emergency. (See non-time critical removal action.)

Surveillance and Maintenance: These activities are conducted through-out the facility life cycle phase including when a facility is not operating and is not expected to operate again and continues until phased out during decommissioning. Activities include providing in a cost effective manner periodic inspections and maintenance of structures, systems and equipment necessary for the satisfactory containment of contamination and protection of workers, the public and the environment.

Survey Unit: A physical area consisting of structure or land areas of specified size and shape for which a separate decision will be made as to whether or not that area exceeds the release criterion. The size and shape of the survey unit are based on factors, such as the potential for contamination, the expected distribution of contamination, and any physical boundaries (e.g., buildings, fences, soil type, surface water body) at the site.

Section 1.0 — Introduction

This Engineering Evaluation/Cost Analysis (EE/CA) has been prepared to fulfill the requirements of Section 300.415(b)(4)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for a proposed non-time critical removal action. It summarizes the objectives of the removal action and evaluates alternatives to implement the decontamination and decommissioning (D&D) of the Department of Energy's (DOE) Radioactive Materials Handling Facility, situated within the Energy Technology Engineering Center (ETEC) at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. SSFL is not on the National Priorities List, however the U.S. Environmental Protection Agency (EPA) and DOE agreed in a joint policy statement (May 22, 1995) that DOE decommissioning activities will be conducted as non-time critical removal actions consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), effectively integrating EPA oversight responsibility, DOE lead agency responsibility, and state and stakeholder participation (EPA, 2003).

This document provided an opportunity for interested persons to comment on the project objectives and the proposed removal action alternative for the RMHF as required by Section 300.820(a) of the NCP.

1.1 Overview of the Radioactive Materials Handling Facility

The RMHF is owned by DOE and co-operated by The Boeing Company (Boeing) on Boeing-owned land. Figure 1-1 is a location map of the RMHF within ETEC at SSFL.

The RMHF was designed and constructed in 1959 for the safe storage and handling of new and irradiated nuclear fuel and other radioactive materials from ETEC as well as other DOE locations. In 1989, the RMHF was authorized under the Federal Resource Conservation and Recovery Act (RCRA) for the storage and treatment of mixed wastes generated at ETEC. The RMHF is authorized for the storage of mixed wastes in containers at three specific locations: Building 4021, Building 4022, and Building 4621 and its associated outdoor asphalt-paved storage yard. The treatment of wastes was limited to the small-scale neutralization of acids and waste stabilization at Building 4021.

The RMHF operated in its original capacity until research at ETEC involving radioactive materials was completed in 1988. When the DOE-sponsored activities at ETEC began to focus on the D&D of the ETEC facilities, the RMHF was dedicated to the exclusive support of D&D activities at SSFL. In this capacity, only radioactive and mixed wastes were managed at the RMHF. As the D&D of ETEC and subsequent removal of radioactive materials approaches completion, the RMHF has been progressively deactivated.

Ten numbered structures at the RMHF currently remain: Building 4021, Building 4022, Building 4621 and the adjacent storage yard, Building 4075, Building 4044, Building 4563, Building 4665, Building 4688, Building 4034, and Building 4658. Figure 1-2 displays the layout of the structures within the RMHF. Appendix A provides a summary of operational use, contamination history, physical components, and evidence of radiological impact for each numbered structure at the RMHF.

Removal of the RMHF is part of the ongoing D&D of the former ETEC.

1.2 Conceptual Site Model

A contaminant conceptual site model identifies contamination sources and potential exposure pathways. This section identifies the potential sources and potential pathways for the RMHF, and Figure 1-3 illustrates this contaminant conceptual site model.

The primary potential for radiological constituent release to the environment derives from historical leaks and spills from the RMHF waste handling buildings. The entire RMHF facility is covered by an asphalt cap, which acted as a barrier between RMHF building contamination and the underlying surface soil in the facility footprint. Contamination is suspected to exist in the asphalt. There is a potential for contamination in the underlying soil.

The below-grade storage vaults in Building 4022 have been used to store a number of radioactive and mixed wastes. The sides of the vault are constructed of 30-inch thick concrete to a depth ranging from 11 to 20 feet below ground surface. There is a potential for contamination in subsurface soil and bedrock beneath the vaults.

Potential groundwater impacts are not within the scope of this EE/CA and will be addressed during action for the adjacent Former RMHF Leach Field.

1.3 Scope of Proposed Action

The scope of the RMHF D&D entails the complete removal of all above- and below-grade structural components of the RMHF and any radiologically impacted soil within the facility footprint that fails to achieve the removal action objectives in Section 2. The scope of the proposed action includes:

- All RMHF buildings and remaining equipment;
- All concrete foundations;
- Subsurface vaults in Building 4022;
- All underground utilities, including utility lines;
- All asphalt and incidental soils (i.e., soil directly underneath the asphalt); and
- Any residual radiological contamination where the building footprints and surrounding area fail to achieve the removal action objectives.

Contamination is suspected to exist in the asphalt within the RMHF facility footprint. Excavation and removal of asphalt and incidental soils will likely remove this residual contamination; however, the extent of impacts to soil beneath the asphalt is unknown. DOE will conduct characterization surveys after the asphalt has been removed to determine whether any soil areas fail to achieve the removal action objectives discussed in Section 2. DOE will remove all radiologically contaminated soil that fails to achieve the removal action objectives.

The former RMHF leach field has been impacted with radiological constituents and, possibly, chemical constituents. The leach field and adjoining slope from the RMHF will be addressed in a separate removal action and is not within the scope of this proposed action.

Figure 1-1. Location of the RMHF at SSFL

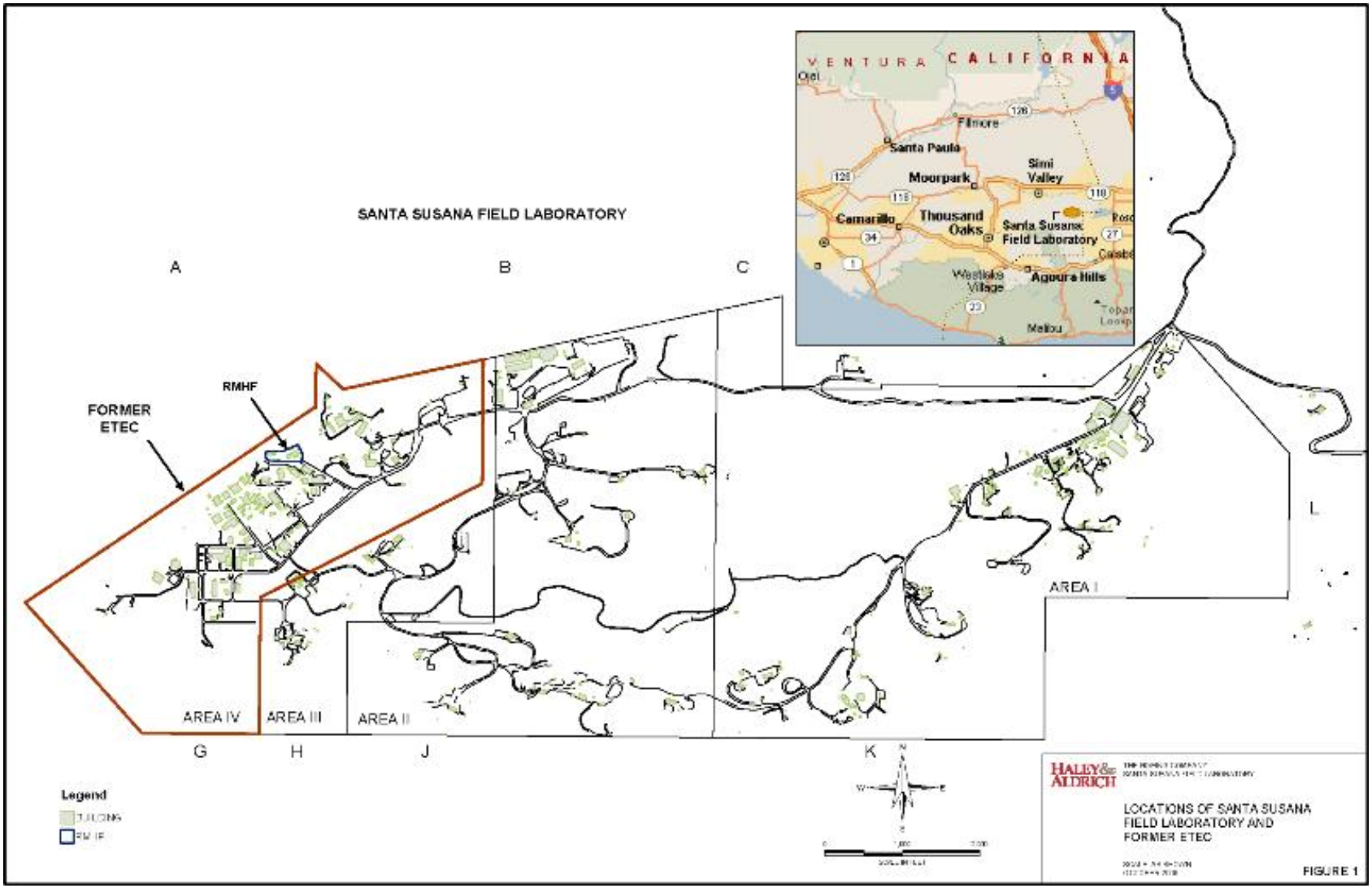


Figure 1-2. RMHF Layout

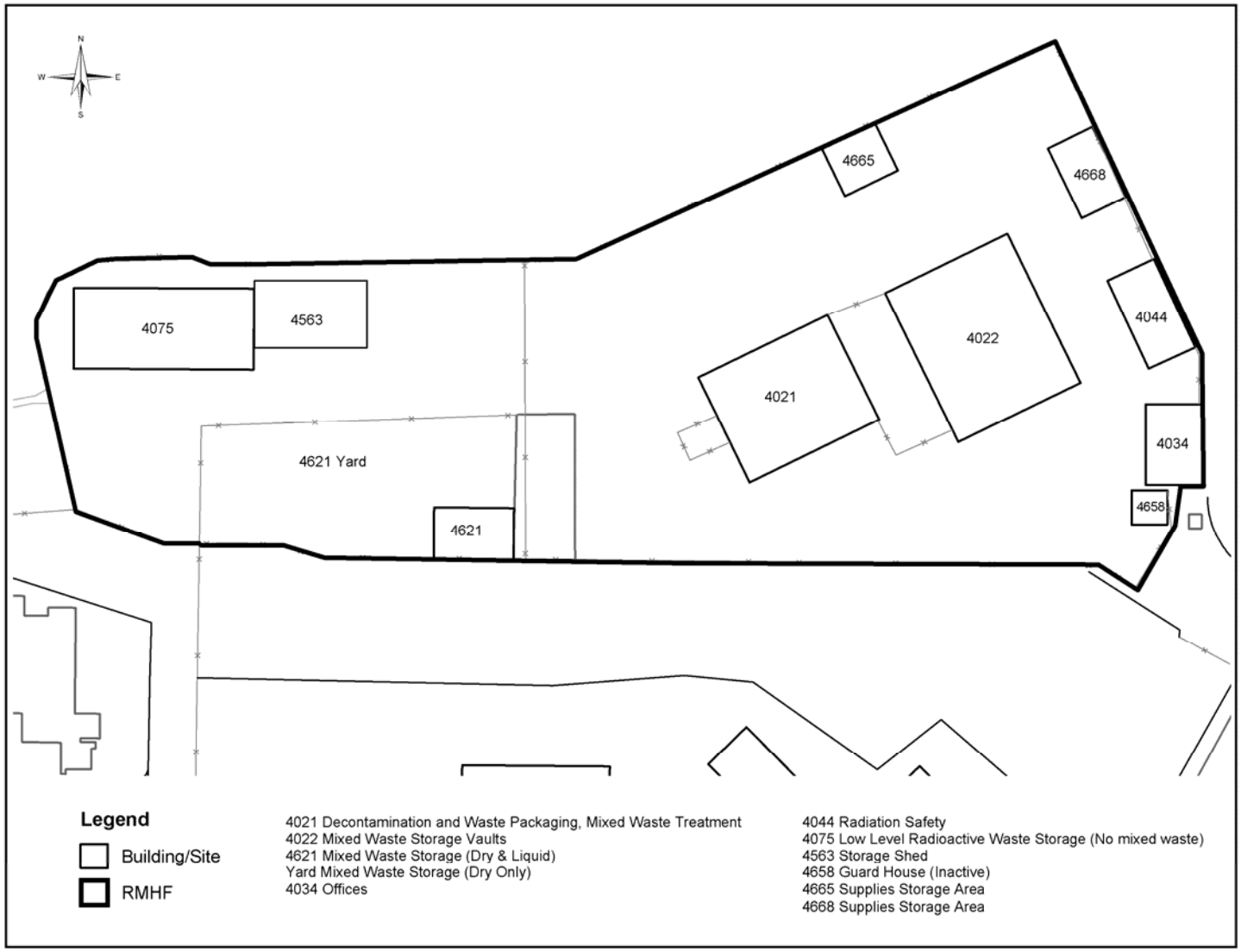
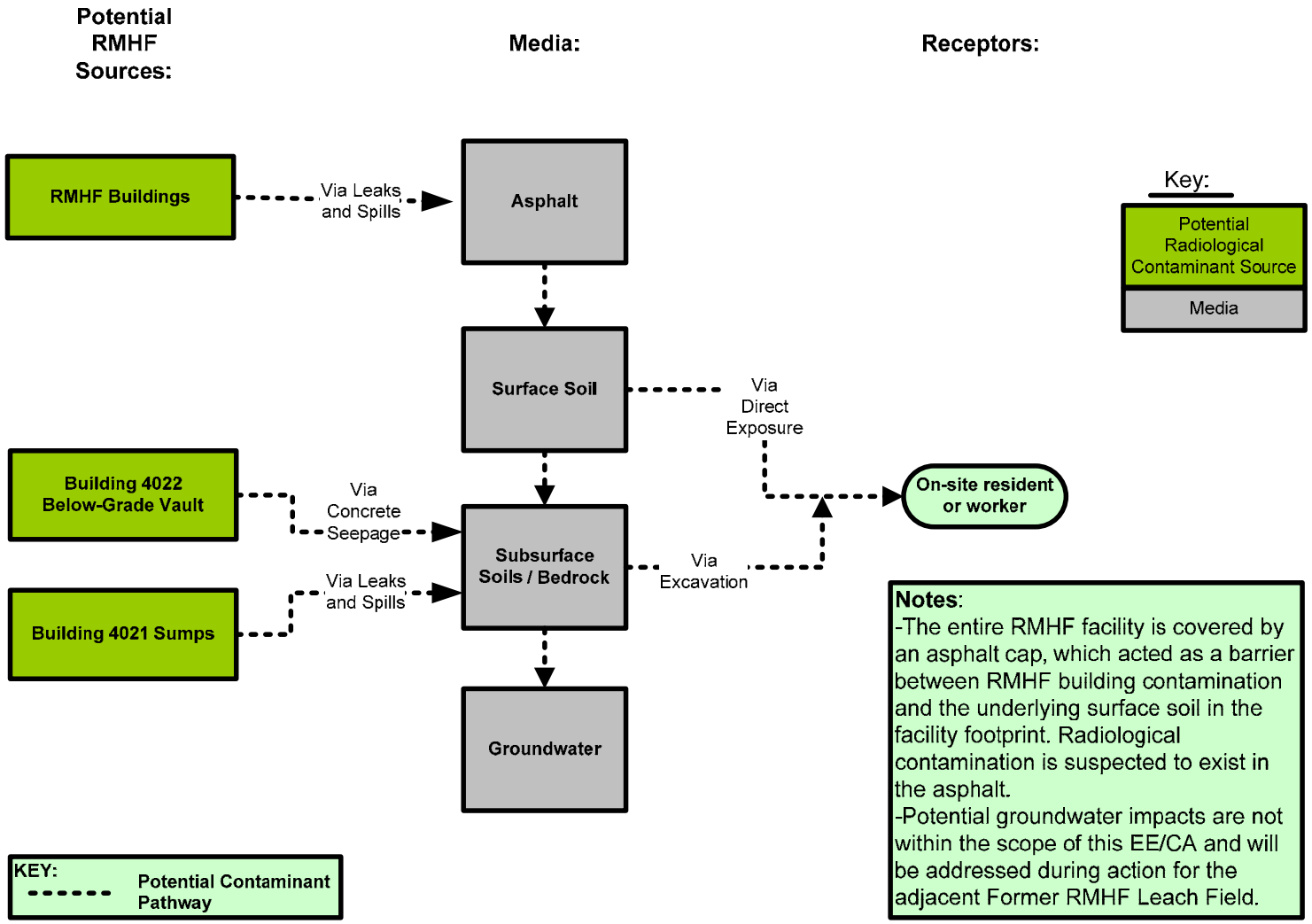


Figure 1-3. RMHF Contaminant Conceptual Site Model



1.4 Justification for the Proposed Action

DOE has chosen a non-time critical removal action approach, which is consistent with CERCLA, as the best strategy to address the RMHF D&D because it will provide the most appropriate level of analysis, oversight, public participation, and flexibility to conduct decommissioning in a cost-effective manner that fully protects human health and the environment.[1]

DOE is conducting the clean up activities at ETEC pursuant to its authority under the Atomic Energy Act (AEA), 42 U.S.C. §2011, et seq. Furthermore, DOE is abiding by its own policies and its 1995 Joint DOE/Environmental Protection Agency (EPA) Policy Memorandum, to conduct these D&D activities in a manner that is consistent with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), although the ETEC site is not listed by EPA on the National Priority List and is not subject to CERCLA.

RCRA closure of the RMHF will occur under the regulatory authority of California's Department of Toxic Substances Control (DTSC). The D&D of the RMHF described in this EE/CA will precede the RCRA closure process as an independent action to allow the site footprint to meet radiological standards of protectiveness for unrestricted use. DOE is authorized by Congress through the AEA to oversee the radiological component of mixed wastes and administer the removal of radioactive materials from the RMHF footprint. The radiological contamination places the cleanup of the RMHF buildings similarly under the authority of the AEA as administered by DOE consistent with CERCLA.

After the RMHF structures and radiologically impacted soils have been removed, chemical contamination in underlying soils in the RMHF footprint will be addressed as part of the RCRA permit closure. In addition to RCRA permitted unit closure of the RMHF, the facility will undergo investigation as part of the SSFL site-wide RCRA Corrective Action effort[2] in the future. RCRA closure and RCRA Corrective Action activities are not within the scope of this EE/CA.

[1] "Unless the circumstances at the facility make it inappropriate, decommissioning activities will be conducted as non-time critical removal actions. Non-time critical removal actions generally will provide the most appropriate level of analysis, oversight, public participation, and flexibility to conduct decommissioning in a cost-effective manner that fully protects [human] health and the environment. Using non-time critical removal action authority will enable DOE to exercise the flexibility provided in the NCP to reduce risks and achieve results without unnecessary expenditure or delay." - *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA,* (May 1995).

[2] The RMHF was identified as a Solid Waste Management Unit in the *SSFL RCRA Facility Assessment* report (1994), and is included in the SSFL site-wide corrective action program.

Section 2.0 — Removal Action Objectives

The selected alternative will remove all remaining RMHF physical components and any radiologically impacted soil above acceptable limits from the RMHF footprint. The desired outcome of this removal action is an RMHF footprint that meets radiological cleanup standards of protectiveness for unrestricted use. Attainment of this objective will require:

1) Removal of all above- and below-grade RMHF structures, including buildings, foundations, utilities, and physical components associated with the RMHF; and
2) Survey and removal of all radiologically impacted soils above unrestricted use criteria within the RMHF footprint.

2.1 Criteria and Cleanup Objectives for Action in Soil

Based on the Preamble to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the acceptable excess cancer risk[3] to humans from exposure to carcinogens (e.g., radiological constituents) in residential areas is 10^{-4} (one in ten thousand) to 10^{-6} (one in a million) excess risk of developing cancer. EPA's National Preliminary Remediation Goals (PRG) Calculator for residential land provides the concentrations in Table 2-1 as the equivalent of a 10^{-6} risk from individual radionuclides. The objectives of the removal action are:

1) Lower the excess cumulative cancer risk to an individual from exposure to site radiological contaminants in soil to a nominal range of 10^{-4} to 10^{-6}, using 10^{-6} as the point of departure;
2) Reduce the non-cancer hazard indices of radiological constituents below a value of 1; and
3) Mitigate potential ecological impacts during and after the removal action.

After the RMHF has been removed and the characterization survey of the facility footprint has been completed, if any single soil sample fails to achieve the above objectives, DOE will remove soil. This is to ensure that the RMHF facility footprint is radiologically protective of human health and the environment.

Table 2-1 includes a number of radionuclides that have the potential to be present at the RMHF. These are radiological COCs that potentially originated as products of: the fission process (i.e., Cesium-137, Strontium-90); possible neutron activation in concrete, rebar, or reactor coolant (Cobalt-60, Europium-152, Europium-154, Hydrogen-3, Iron-55, Nickel-59, Nickel-63, Manganese-54, Potassium-40, Sodium-22); uranium fuel materials (Uranium-234, Uranium-235, Uranium-238), thorium breeder materials (Thorium-228, Thorium232); or transuranic isotopes formed by neutron absorption of uranium-238 (Americium-241, Plutonium-238, Plutonium-239/240, Plutonium-241, Plutonium-242). These radiological COCs are listed alphabetically in Table 2-1 and will be included in the soil sampling and analysis plan for the proposed action at the RMHF.

[3] Excess cancer risk is a figure that calculates the risk of contracting cancer on a probability scale based on current and future use exposure pathways (i.e., activities that may result in an individual contacting soil, sediment, etc.). Exposure pathways consider how frequently the individual is exposed to the COC, the quantity of COC that is ingested, inhaled, or absorbed through skin contact, and the period of time for which the individual is exposed to the COC. Based on the NCP, EPA's regulations for the evaluation of risk at Superfund sites, the acceptable cancer risk range for residential areas is from 10^{-4} (one in ten thousand) to 10^{-6} (one in a million).

Table 2-1. Radiological Cleanup Goals for Soil

Radiological Constituent of Concern	Cleanup Goals for Soil (pCi/g)
Americium-241	1.87E+00
Cobalt-60	3.61E-02
Cesium-134	1.57E-01
Cesium-137	5.97E-02
Europium-152	4.16E-02
Europium-154	4.99E-02
Hydrogen-3	2.28E+00
Iron-55	2.69E+03
Manganese-54	6.92E-01
Nickel-59	2.08E+02
Nickel-63	9.48E+01
Plutonium-238	2.97E+00
Plutonium-239	2.59E+00
Plutonium-240	2.60E+00
Plutonium-241	4.06E+02
Plutonium-242	2.73E+00
Potassium-40	1.08E-01
Sodium-22	8.65E-02
Strontium-90	2.31E-01
Thorium-228	2.02E+01
Thorium-232	3.10E+00
Uranium-234	4.01E+00
Uranium-235	1.95E-01
Uranium-238	7.42E-01

2.2 Final Status Survey and Confirmation Report

When all radiologically impacted soil that fails to achieve the removal action objectives has been excavated, DOE will conduct a Final Status Survey of the RMHF facility footprint and surrounding area using the guidance of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) to confirm that the removal action objectives have been met.[4] DOE will prepare a Removal Action Confirmation Report, which will include the results of the Final Status Survey and recommendations for additional cleanup activities, if any. EPA guidance "Superfund Removal Procedures, Removal Response Reporting: POLREPS and OSC Reports" (1994) will be used as a reference.

[4] MARSSIM was developed by the DOE, U.S. Department of Defense (DOD), EPA, and Nuclear Regulatory Commission (NRC) to provide detailed guidance for planning, implementing, and evaluating environmental and facility radiological surveys conducted to demonstrate compliance with a dose- or risk-based regulation. MARSSIM focuses on the demonstration of regulatory compliance during the final status survey following scoping, characterization, and any necessary remedial actions.

An area in which all individual sample concentrations are below the levels of concern in Table 2-1 will be confirmed suitable for unrestricted use. If any soil activities fall between 10^{-6} and 10^{-4}, a risk management decision will be made. The locations and activities of the samples will be evaluated to determine if there is a need for any further engineering (e.g., excavation) or administrative (e.g., land use controls) response.

A map will be provided clearly delineating the area that has been (and has not been) surveyed and classified for re-use.

2.3 Sampling and Analysis Plan

Prior to conducting post-removal sampling or analysis, DOE will submit a Sampling and Analysis Plan (SAP) for EPA comment consistent with EPA guidance "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations" (October 1997) and "Preparation of a U.S. EPA Region 9 Field Sampling Plan for Private and State-Lead Superfund Projects" (August 1993). The SAP will address the cleanup goals identified in Table 2-1, and will include development of data quality objectives and a Quality Assurance Project Plan. The SAP will follow MARSSIM guidance and protocols.

2.4 Mitigating Potential Ecological Impacts

Before field work begins, DOE will conduct a biological assessment of the area to ensure that implementation of the D&D of the RMHF will not pose any negative impacts to onsite ecological receptors (i.e., plants and animals). DOE will consider and mitigate the potential impacts to ecological receptors identified in the biological assessment.

2.5 Applicable or Relevant and Appropriate Requirements

In accordance with the NCP, non-time-critical removal actions conducted under CERCLA are required to attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable, considering the scope and urgency of the situation.

ARARs include federal and state environmental or facility siting laws or regulations and action-specific requirements such as occupational safety or worker radiation protection regulations. Additionally, other advisories, criteria, or guidance may need to be considered when determining remedies (40 Code of Federal Regulations (CFR) §300.405(g)(3)).

ARARs are divided into three groups: (1) constituent-specific, (2) location-specific, and (3) action-specific. Constituent-specific ARARs establish an acceptable amount or concentration that may remain in or be discharged to the ambient environment. Location-specific ARARs include restrictions placed on the conduct of activities solely because they occur in special locations such as wetlands, floodplains, historic properties, or critical habitat. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances or other particular circumstances at a site. Action-specific ARARS include requirements imposed on removal actions such as worker safety, dust control requirements, storm water pollution plans and runoff control, transportation and disposal of hazardous and non-hazardous wastes, and control of air emissions. State requirements are ARARs if they are more stringent than Federal requirements.

In order to meet the obligations for RCRA closure, DOE will characterize and manage any chemical components in waste originating from the RMHF treatment and storage units in accordance with all applicable RCRA requirements. DOE will submit a closure plan for DTSC approval of the hazardous waste management units.

The D&D of the RMHF will adhere to all practicable Federal, state and local ARARs identified by DOE for the RMHF land area. ARARs are summarized in Appendix B and will be updated as needed.

Section 3.0 — Identification of Removal Action Alternatives

Using the removal action objectives as standards for evaluation, DOE identified two plausible alternatives for the RMHF D&D: No Action; and Demolition/Removal and Off-Site Disposal. This section summarizes the projected scope for each alternative.

3.1 No Action Alternative

Under this alternative, the RMHF would not undergo final D&D and would not achieve the removal action objectives identified in Section 2 of this EE/CA. Surveillance and maintenance operations would continue indefinitely to monitor and address site needs and radiological risk to human health and the environment as the facility ages. Inclusion of a No Action alternative is consistent with CERCLA. This alternative provides a baseline against which other alternatives can be compared.

3.2 Demolition/Removal and Off-Site Disposal Alternative

This alternative would involve removal of all RMHF buildings and any soil in the RMHF footprint that fails to achieve the removal action objectives. The following activities are included in this alternative:

- Remove equipment and demolish buildings;
- Remove all concrete foundations, including the Building 4022 vaults;
- Remove all underground utilities;
- Remove asphalt and incidental soils;
- Conduct sampling and remove soil or bedrock that fails to achieve removal action objectives, repeating this process as necessary until objectives are achieved;
- Characterize, segregate, package, and load waste materials for transport and disposal at approved off-site permitted facilities;
- Regrade and backfill the area with clean soil from an onsite source;
- Perform a MARSSIM-guided final status survey of the RMHF footprint; and
- Finish site restoration

All structures and pavement would be removed using all appropriate safety and protection considerations. Soil would be excavated using standard construction equipment with all appropriate safety and protection considerations similarly in place.

Fugitive dust mitigation and storm water pollution prevention measures would be taken during all earthwork activities, and proper safeguards would be implemented for the transport of wastes to appropriate disposal facilities.

A MARSSIM-guided final status survey in the excavated areas would ensure that the objectives described in Section 2.1 have been achieved. The California Department of Health Services, Radiation Health Branch and the Oak Ridge Institute for Science and Education (ORISE) will then be requested to perform verification surveys. The excavations would then be backfilled with clean fill material and compacted. The backfilled footprint would then be subject to a second

MARSSIM-guided final status survey and verification will be requested from the California Department of Health Services, Radiation Health Branch and ORISE.

Wastes generated from this removal action alternative will be characterized and may be segregated by waste type (i.e., decommissioned material (DM), low-level radioactive waste (LLW), or mixed low level waste (MLLW)). DOE may choose to manage and dispose of all waste as LLW or MLLW, as appropriate. For prior waste generation activities at ETEC, DHS has provided concurrence for decommissioned materials characterization. DHS will be requested to provide similar concurrence for the RMHF decommissioned materials.

All waste will be sent to an approved federally-owned or commercial disposal site for each waste type. No waste would be sent to any municipal landfills.

All waste shipments would be containerized according to U.S. Department of Transportation requirements, and would be transported using established commercial truck routes.

Section 4.0 — Analysis of Alternatives

This section evaluates the alternatives for the D&D of the RMHF based on their effectiveness, implementability, and cost. The NCP and the DOE guidance document for non-time critical removal actions *Phased Response/Early Actions, Module 4* (DOE, 1995) identify these three criteria for the evaluation of removal action alternatives as a basis for decision-makers to compare removal action alternatives.

4.1 Effectiveness

Alternatives were evaluated relative to their effectiveness in meeting the removal action objectives presented in Section 2. For this evaluation, the following NCP threshold and balancing criteria were considered:

- Overall protection of human health and environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Short-term effectiveness
- Reduction of toxicity, mobility, or volume
- Ability to achieve removal action objectives

No Action:

The No Action alternative does not reduce or remove any of the suspected radiological COCs from the facility footprint. The buildings and all associated equipment and structures would remain onsite under surveillance and maintenance. The No Action alternative would prevent the facility from meeting its removal action objectives established in Section 2 and would also hinder the RCRA closure process.

Demolition/Removal and Off-site Disposal:

This alternative represents a complete removal option, and the area will meet unrestricted land use requirements and be protective of human health and the environment in the long term. Exposure or release of radiological contaminants to the public will be reduced or prevented in the short-term through compliance with ARARs, including safe-handling requirements for workers and appropriate material transportation controls. This action will allow the facility to meet removal action objectives and support the closure of the RMHF RCRA Part A permit.

4.2 Implementability

When evaluating the implementability of the retained alternatives, the following questions were considered:

- Is the alternative technically feasible with currently available technology?
- Is the alternative technically complex or difficult to implement?
- Is the alternative administratively feasible in terms of administrative or procedural requirements?
- Are there services and materials readily available for performing the alternative?

No Action:

The No Action alternative is highly implementable because it requires no action. This alternative, however, would require continued surveillance and maintenance for an indefinite period of time.

Demolition/Removal and Off-site Disposal:

Based on D&D experiences at other DOE facilities nationwide, this alternative is implementable and relatively straightforward. Decontamination, demolition, and excavation are not technically complex and could be readily performed with the proper equipment, materials, and protective gear. Services and materials are readily available for decontamination, demolition, and excavation activities. Conventional earthmoving equipment is available from contractors with experience working at radiological and hazardous waste sites, and personnel experienced with decontamination techniques are available.

This alternative is administratively feasible because administrative or procedural requirements are met on a continual basis for D&D efforts implemented by DOE. The scope of this alternative does not diverge from actions commonly employed by DOE.

4.3 Cost

In this section, costs of alternatives are presented for comparison purposes only. In general, cost estimates include capital costs, labor costs, transportation and disposal costs, and surveillance and maintenance costs.

EPA guidance for feasibility studies suggests that actual costs should be within -30% to +50% of the estimate included in the feasibility study. The same estimation standards will be applied in this EE/CA for the purposes of analysis.

No Action:

The no action alternative would result in the need for continued surveillance and maintenance activities at the RMHF under existing RCRA authorization requirements. Annual surveillance and maintenance program costs assume a 30-year duration for estimation purposes. The approximate cost to fulfill these requirements would be $30 million dollars over the 30-year period and includes radiation safety labor support and materials (dosimeters, etc.), and the production of an Annual Site Evaluation Report. Surveillance and maintenance costs would continue as long as the facility remains. The sustained presence of the RMHF would require DOE to secure a full RCRA Part B permit to supplant its current RCRA authorization, which would require a one-time cost of approximately $450,000. This estimate does not include the cost of future D&D activities if DOE deems such activities to be desirable or necessary.

Demolition/Removal and Off-site Disposal:

Total implementation costs for this alternative were determined based on standard unit costs from a commonly used cost estimating manual (R.S. Means) and estimated quantities of materials, professional judgment, previous experience of performing work at ETEC, and vendor estimates. The estimated cost for D&D of the RMHF under this alternative is approximately $13 million, which includes demolition of the physical structures, excavation of soil, packaging, transportation, and off-site disposal of waste, verification surveys, site restoration, and completion of the RCRA closure process.

No surveillance and maintenance costs would be necessary after D&D is complete, and it is assumed that this alternative would not incur any other future costs.

Examples of items that may affect the actual cost of this alternative during D&D activities include:

- Changes in the anticipated characteristics of the wastes generated, resulting in higher disposal fees;
- Discovery of unanticipated contamination which would increase the volume of debris and soil that must be handled and/or disposed; and
- Changes in the cost of labor, fuel, and regulations that differ from historical averages.

4.4 Preferred Alternative

The analysis in this section demonstrates that Demolition/Removal and Off-site Disposal is the preferred alternative based on overall effectiveness, implementability, and cost. This alternative will provide the most effective protection of human health and the environment while facilitating the final closure of the RMHF. An evaluation of risks associated with the implementation of this alternative is included as Appendix C.

Section 5.0 — Recommended Removal Action Alternative

The selected removal action alternative for the D&D of RMHF is the preferred alternative identified in Section 4, Demolition/Removal and Offsite Disposal.

The public was encouraged to comment on the preferred alternative during the public comment period that ended April 30, 2007. DOE conducted a public meeting on April 17, 2007, to provide relevant information, as well as to solicit public comment on this proposal.

All comments submitted during the comment period were reviewed and considered by DOE, and all DOE responses to relevant public comments are addressed in the RMHF Decontamination and Decommissioning Responsiveness Summary, which is included in the administrative record file, and is also available on the ETEC website. This document was revised to reflect public comments.

Additional copies of this EE/CA and its administrative record file are available at the following locations:

Simi Valley Library
2969 Tapo Canyon Road
Simi Valley, CA 93063
(805) 526-1735

Platt Branch Library
23600 Victory Blvd.
Woodland Hills, CA 91367
(818) 340-9386

California State University, Northridge
Oviatt Library
2nd Floor, Room 265
Northridge, CA 91330
(818) 677-2285

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Appendix A — RMHF Site Characterization

Appendix A provides an overview of the RMHF and characterizes the buildings and the RMHF footprint. Site characterizations include a summary of operational use, structural components, history, and evidence of radiological impact. Appendix A compiles and summarizes pertinent information from the *Historical Site Assessment of Area IV Santa Susana Field Laboratory* (Boeing, 2006) and the *Closure Plan for the Radioactive Materials Handling Facility (RMHF)* (Haley & Aldrich, Inc., 2006). Additional information is available in the online version of the *Historical Site Assessment,* which can be found at: http://apps.em.doe.gov/etec/hsa.html.

A.1 Building 4021

Operational Use and History

Building 4021 was constructed in 1959 for the purpose of handling and processing LLW. This building was used as a processing area for wastes associated with various D&D activities at ETEC post-1988. Radioactive materials were handled in Building 4021 primarily in the form of items contaminated with mixed fission products and fuels. Portions of the building were exposed to radioactive materials and are presently considered radiologically impacted. Metallic lead removed from cast iron pipe joints and possibly other locations is expected to be generated during the demolition of Building 4021.

Structural Components

Figure A-1 is a picture of the building from the exterior. Building 4021 is a 3,000 square foot building constructed with a steel frame, sheet steel sides, and roofing. The floor is a concrete slab on grade. Building 4021 consists of a packaging room, a decontamination room with a work area, a hot and cold change room, a laundry room, and an administrative area. Two sumps are located within 4021. One sump, located in the Decontamination Room, is approximately 19 by 19 by 32 inches deep. The second sump is located in the Packaging Room and is 30 by 30 by 15 inches deep. Equipment such as the cement style mixer and drum style mixer used for stabilization and amalgamation of mixed wastes will be removed and disposed.

Figure A-1. Building 4021 Exterior

A.2 Building 4022

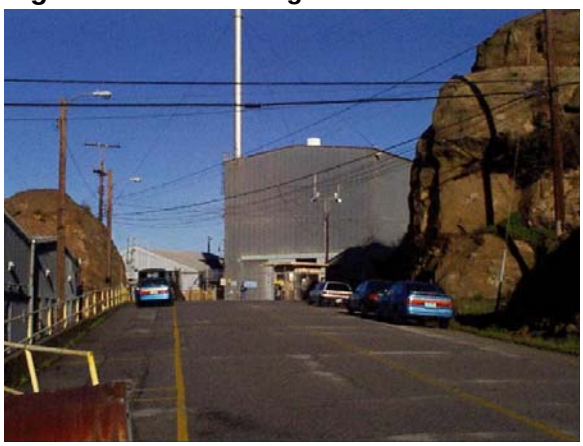
Operational Use and History

Building 4022, constructed in 1959, was designed and used for the dry storage of used and unused nuclear fuel. The building contains seven vaults that were used as a storage area for containerized wastes from various D&D activities throughout ETEC including mixed low-level waste (MLLW) and LLW. Radioactive materials were handled in Building 4022 primarily in the form of items containing mixed fission products and fuels. The subsurface vaults are presently considered radiologically impacted. Metallic lead removed from cast iron pipe joints and possibly from other locations within the building is expected to be generated during the demolition of Building 4022.

Structural Components

Figure A-2 is a picture of Building 4022 from the exterior. Building 4022 is a high bay metal building with seven below grade storage vaults. The building is constructed with a steel frame, sheet steel sides, and roofing. The building houses a 50-ton above grade bridge crane that was used to handle materials stored in the vaults and a compactor used for size-reducing radiological waste. The vaults are constructed of reinforced concrete and outfitted with air-cooling systems. The vaults vary in size from 7.5 feet wide by 24.5 feet long to 17.5 feet wide by 25 feet long with 30 inch thick concrete walls. The depth of each vault varies from 11.5 feet to 20 feet. Vault 1 and Vaults 3 through 7 were used for the storage of mixed waste and LLW.

Figure A-2. Building 4022 Exterior



A.3 Building 4621 and Mixed Waste Storage Yard

Operational Use and History

Building 4621 was constructed in the mid-1960's to store low-activity, containerized waste. Radioactive materials were stored in this facility primarily in the form of mixed fission products from various waste sites. Contaminated equipment and other materials at the RMHF were also stored in this building, including mixed waste. The mixed waste storage yard is a paved open area contiguous with Building 4621 on the north, east, and west side. Only non-liquid mixed

waste in closed containers was stored in this area pending off-site shipment. Building 4621 and the storage yard are presently considered radiologically impacted.

Structural Components

Figure A-3 provides an image of the building from the exterior. Building 4621 is approximately 500 square feet. The building foundation and floor is composed of a concrete slab on grade, while the structure itself is constructed with a steel frame, sheet steel sides, and roofing. This building was used for the storage of dry and liquid mixed wastes in 55-gallon drums. Containers holding mixed waste in liquid form were stored on spill containment pallets.

Figure A-3. Building 4621 Exterior

A.4 Building 4075 and 4563

Operational Use and History

Building 4075 was constructed in 1971 and served as a storage area for radioactive waste pending shipment to off-site disposal sites. In 2001 the building ceased to be used as a storage area and has remained unused since. Building 4075 is presently considered radiologically impacted.

Structural Components

Figure A-4 is an image of the building from the exterior. Building 4075 is a 2,160 square-foot building with a concrete floor, steel frame and sheet steel sides, and roofing. Building 4563 is a covered area adjacent to Building 4075.

Figure A-4. Building 4075 and 4563 Exterior

A.5 Building 4563

Operational Use and History

Building 4563, also known as the covered storage area adjacent to Building 4075, was constructed in 1958 and has served as a storage area for containerized radioactive waste. Although there are no incident reports associated with this building, radioactive waste was stored here and the building is considered radiologically impacted.

Structural Components

Figure A-4 also shows Building 4563 from the exterior. Building 4563 is the paved area with a steel frame and metal roof located just east of Building 4075.

A.6 Building 4044

Operational Use and History

Building 4044 was constructed in the mid-1960s and served various roles including that of a clean shop, a health physics office, and a break room. The health physics office has been used as a counting area for removable contamination measurements and storage and use of calibration sources. Although no other regulated radiological materials were managed specifically in this building it is considered radiologically impacted.

Structural Components

Figure A-5 is an image of Building 4044 from the exterior. Building 4044 is approximately 1,000 square feet. The building foundation and floor is composed of a concrete slab on grade, while the structure itself is constructed with a steel frame, sheet steel sides, and roofing.

Figure A-5. Building 4044 Exterior

A.7 Building 4665

Operational Use and History

Building 4665 was constructed in the mid-1960s as an oxidation facility for the RMHF. The building is now used as a storage area for non-radioactive equipment and materials. Although there are no accidental releases or incident reports associated with this building, it is presently considered radiologically impacted.

Structural Components

Figure A-6 is an image of Building 4665 from the exterior. Building 4665 is approximately 600 square feet. The building foundation and floor is composed of a concrete slab on grade, while the structure itself is constructed with a steel frame, sheet steel sides, and roofing.

Figure A-6. Building 4665 Exterior

A.8 Building 4688

Operational Use and History

Building 4688 was constructed in approximately 1962 and moved to the RMHF to serve as a storage area. The structure is currently active as a non-radioactive storage area. Building 4688 is not considered radiologically impacted.

Structural Components

Figure A-7 is an image of Building 4688 from the exterior. Building 4688 is a less than 500 square-foot portable shed-like storage structure with no walls.

Figure A-7. Building 4688 Exterior

A.9 Building 4034

Operational Use and History

Building 4034 was constructed in 1961 to serve as an office building for the RMHF. This building was never used for the purpose of storing or handling radiological or mixed wastes. Building 4034 is not considered radiologically impacted.

Structural Components

Figure A-8 is an image of Building 4034 from the exterior. The building is a small steel structure, approximately 650 square feet, which contains two main office areas and restrooms.

Figure A-8. Building 4034 Exterior

A.10 Building 4658

Operational Use and History

This building was constructed in the 1980s and served as a guard shack and main entrance point for the RMHF. This building was never used for the purpose of storing or handling radiological or mixed wastes. Building 4658 is not considered radiologically impacted.

Structural Components

Figure A-9 is an image of Building 4658 from the exterior. Building 4658 is a small structure, approximately 100 square feet, located at the east end of the RMHF, adjacent to the entrance gate.

Figure A-9. Building 4658 Exterior

Appendix B — Identified Applicable or Relevant and Appropriate or To-Be-Considered Requirements for the RMHF D&D

In accordance with the NCP, non-time critical removal actions must comply with applicable or relevant and appropriate requirements (ARARs) to the extent practicable, considering the scope and urgency of the situation.

ARARs are divided into three groups: (1) constituent-specific, (2) location-specific, and (3) action-specific. Constituent-specific ARARs establish an acceptable amount or concentration that may remain in or be discharged to the ambient environment. Location-specific ARARs include restrictions placed on the conduct of activities solely because they occur in special locations such as wetlands, floodplains, historic properties, or critical habitat. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances or other particular circumstances at a site. Action-specific ARARS include requirements imposed on removal actions such as worker safety, dust control requirements, storm water pollution plans and runoff control, transportation and disposal of hazardous and non-hazardous wastes, and control of air emissions. State requirements are ARARs if they are promulgated, substantive laws or regulations that are consistently applied and are more stringent than Federal requirements.

The D&D of the RMHF will adhere to all practicable ARARs specific to the RMHF. These ARARs are identified in the table below.

Table B-1. ARARs and To-Be-Considered Requirements

Citation & Title	Federal, State, or Local	Description of Requirement	Type of ARAR or To Be Considered
40 CFR 61 Subparts H and I— National Emission Standards for Hazardous Air Pollutants (NESHAPs) and 42 USC §7401— Clean Air Act	Federal	Limits emissions of radionuclides so that the total effective dose equivalent to any member of the public must be less than 10 mrem/year. Emissions of radioactive iodine must not exceed 3 mrem/year.	Applicable, Chemical-specific
California Hazardous Waste Control Law Health and Saf. Code, div. 20, chap. 6.5 and division 4.5 of the title 22 of the Ca. Code Regs., tit. 22, div. 4.5	State	RCRA permitted unit closure requirements relative to waste management resulting from treatment and storage units, decontamination and decommissioning.	Applicable, Chemical-Specific
40 CFR Part 61, Subpart M— National Emission Standard for Asbestos	Federal	Requires EPA notification when demolition of asbestos-containing materials is planned.	Relevant And Appropriate, Chemical-Specific
15 USC §2601— Toxic Substance Control Act	Federal	Regulates manufacturing, processing, distributing in commerce, using, or disposing substances that may present an unreasonable risk of injury to health or the environment.	Relevant and Appropriate, Chemical-Specific
49 USC 1801— Hazardous Material Transportation Act (HMTA) and 49 CFR Part 171 Hazardous Materials regulations	Federal	Requires specific packaging, labeling, handling, and reporting requirements for the transportation of hazardous materials.	Applicable, Action-Specific
10 CFR Part 835— Occupational Radiation Protection	Federal	Establishes requirements for controlling and managing radiologically contaminated areas.	Applicable, Action-Specific
16 USC §1531— Endangered Species Act of 1973 and 30 CFR Parts 200 and 402.	Federal	Requires that actions taken do not cause or contribute to the taking of any federally-listed endangered or threatened species of plants or wildlife.	Relevant and Appropriate, Location-Specific

Citation & Title	Federal, State, or Local	Description of Requirement	Type of ARAR or To Be Considered
DOE Order 5400.5 – Radiation Protection of the Public and the Environment	Federal	Specifies soil concentration limits for remediation.	To Be Considered
DOE Order 231.1A—Environment, Safety and Health Reporting Note: This Order cancels paragraph 1a(3)(a) of Chapter 2 of DOE O 5400.5.	Federal	Ensure timely collection, reporting, analysis, and dissemination of information on environment, safety, and health issues as required by law or regulations or as needed to ensure that DOE is kept fully informed of events that could adversely affect the health and safety of the public or the workers, the environment, the intended purpose of DOE facilities, or the credibility of the Department.	To Be Considered
DOE Order 440.1—Worker Protection Management for DOE Federal and Contractor Employees	Federal	Establishes Department of Energy work safety requirements that are at least as stringent as OSHA requirements.	To Be Considered
DOE Order 435.1—Radioactive Waste Management	Federal	Ensure that all DOE radioactive waste is managed in a manner that is protective of worker and public health and safety, and the environment.	To Be Considered
California H&SC section 25100-24250, 22 CCR 66001-67786 Hazardous Material Control Law (HMCL)	State	Controls hazardous wastes from point of generation through accumulation, transportation, treatment, storage, and disposal.	Applicable, Action-Specific
California Department of Fish and Game § 2050-2068—California Endangered Species Act	State	Requires that actions taken do not cause or contribute to the taking of any California-listed endangered or threatened species of plants or wildlife.	Relevant and Appropriate, Location-Specific

Citation & Title	Federal, State, or Local	Description of Requirement	Type of ARAR or To Be Considered
8 CCR 4; 8 CCR 5; 8 CCR 7; and 8 CCR Sections 1504, 1539-1543 — Construction Safety Orders, Electrical Safety Orders, and General Safety Orders	State	Establishes California work safety requirements.	To Be Considered
Ventura County Environmental Health Division (VCEHD) Codes and Standards	Local	Ensures conformance with State laws and County ordinances pertaining to hazardous materials, hazardous waste, land use, and solid waste.	Applicable, Action-Specific
South Coast Air Quality Management District (SCAQMD) Rule 1166--	Local	Requires air monitoring when excavating contaminated concrete, soil, and asphalt to manage VOC emissions and dust control.	Applicable, Action-Specific
Ventura County Air Pollution Control District (VCAPCD) Rules, including Rule 62.7— Asbestos, Removal and Demolition	Local	Requires notification, permitting, and payment of fees for activities such as demolition of structures with asbestos-containing materials.	Applicable, Action-Specific
Site Work, Demolition, and Construction Uniform Building Code, Chapter 33	Other	Provides guidance on safe construction, modification, and demolition projects.	To Be Considered
American National Standards Institute (ANSI) Series A-10 and Series B-30.9— Safety Requirements for Construction and Rigging	Other	Provides guidance on safe construction and rigging activities.	To Be Considered

Citation & Title	Federal, State, or Local	Description of Requirement	Type of ARAR or To Be Considered
National Fire Protection Association (NFPA) Standard 241—Standard for Safeguarding Construction, Alteration, and Demolition Operations	Other	Provides guidance on safe construction, modification, and demolition projects.	To Be Considered
CFR 36 part 63 Determinations of Eligibility for inclusion in the National Register of Historic Places	Federal	Provides regulations for the identification of potentially historical places.	Site specific
CFR 36 part 800.9 Council review of section 106 compliance	Federal	Requires consultation with state historic preservation officer to determine site eligibility for the National Register.	Site specific

Appendix C — Risks Associated with Implementation of the Preferred Alternative

Appendix C outlines the risks associated with the implementation of the RMHF Demolition/Removal and Off-site Disposal alternative, their potential impact on the project, their likelihood of occurrence, and how each risk will be mitigated prior to implementation.

Table C-1. Risks Associated with Implementation of the Preferred Alternative

Risk	Impact	Likelihood	Mitigation Approach
Volume of excavation larger than expected	**Medium -** Increased excavation/disposal costs, but sites are relatively small.	**Medium -** Actual contamination may differ from expected footprint.	An additional volume contingency will be added, and excavation site sampling will confirm volume accuracy.
Resource availability (budget, equipment, workers)	**High -** Work cannot progress.	**Low**	Resources will be secured before the removal action begins.
Kettleman Hills Disposal Facility ceases to accept decommissioned material	**High –** Cost of disposal will increase, but the proposed action will not be hindered from implementation.	**Low/Medium**	Wastes would be transported to an alternate waste disposal facility (possibly a low level waste disposal facility).
Radiological contamination requiring removal exists in the bedrock below the 4022 vault	**Medium –** Extra labor and cost will be needed to dispose of the excess bedrock.	**Low –** There is a substantial concrete layer at the base of the 4022 vault.	An additional contingency will be added to account for possible bedrock removal.
Adverse weather (rain) interferes with excavation	**Medium –** May cause schedule delays or contaminant spread.	**Low**	Actions will be scheduled for the dry season.
Worker safety (physical hazards during excavation)	**High -** Potential for injury and work stoppage.	**Low**	Job-specific Environmental Health and Safety plans and DOE Order 440.1 protocols will be followed and all appropriate training given to workers.