APPENDIX B: TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX B: WASTE MANAGEMENT

The U.S. Department of Energy (DOE) established its *National Environmental Policy Act* (NEPA) implementing procedures (10 *Code of Federal Regulations* [CFR] §1021.330) that allow preparation of site-wide documents for certain large, multiple-facility sites, such as the Lawrence Livermore National Laboratory (LLNL). Pursuant to the NEPA of 1969 (42 United States Code [U.S.C.] §4321 et seq.), the Council on Environmental Quality's (CEQ's) NEPA regulations (40 CFR Parts 1500-1508), and DOE NEPA implementing procedures (10 CFR Part 1021), the National Nuclear Security Administration (NNSA) decided to complete this appendix as part of this *Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (LLNL SW/SPEIS).

The format was modified in consideration of the Department of Toxic Substances Control (DTSC) request for information to complete a special initial study for LLNL permit modifications in accordance with the *California Environmental Quality Act* of 1970 (CEQA) (§21000 et seq., *California Public Resources Code*) and implementing guidelines (§15000 et seq., Title 14, *California Code of Regulations*). The objective of this appendix is to provide NNSA, other agencies, and the public with:

- An analysis of the potential environmental impacts caused by ongoing and reasonably foreseeable new operations and facilities and reasonable alternatives at LLNL
- A basis for site-wide decisionmaking
- Improved coordination of agency plans, functions, programs, and resource utilization
- A clearer understanding of the impacts created by LLNL permit modifications and LLNL waste management operations separate from overall LLNL operations
- Sufficient information to facilitate routine decisions by NNSA regarding verification of operational status
- Sufficient information to facilitate permit modification decisions by the DTSC

This appendix provides authorization limits for the LLNL. This appendix will also enable NNSA to ''tier'' its NEPA documentation, eliminate repetitive discussion of the same issues in future NEPA reviews, and focus on the actual issues ready for decisions at each level of environmental review.

In December 2002, NNSA identified the need to update waste management benchmark information and impact analysis to support the current LLNL waste management site planning. To meet this need, NNSA decided to prepare this appendix and provide project-specific information in one report.

This appendix includes a comprehensive review of the practices of onsite waste handling, packaging, and treatment; treatment and storage units; and estimates of waste generation types. Unless otherwise specified, the appendix analyzes the Livermore Site and Site 300 collectively to bound potential impacts, and the term "permitted" refers to the *Resource Conservation and*

Recovery Act (RCRA) hazardous waste permit from the State of California. Similarly, radioactive and hazardous waste management (RHWM) facilities are considered collectively, including pertinent facilities managed by Plant Engineering and the Chemistry and Material Science Directorate. This review of the Proposed Action, No Action Alternative, and Reduced Operation Alternative includes a series of permit modifications, consolidation of existing capabilities, equipment transfers, increased utilization of the Decontamination and Waste Treatment Facility (DWTF), and several RCRA closures.

Section B.1 introduces waste categories, waste management practices, and waste management facilities, both hazardous and radioactive, at LLNL. Section B.2 presents the agency purpose and need. Descriptions of the alternatives are presented in Section B.3. Section B.4 provides a description of the affected environment, including historical and current waste generation and waste management activities. Section B.5 presents the environmental consequences. This appendix concludes with a summary on levels of significance for each resource area and a brief discussion on CEQA impacts (Section B.6).

Figure B–1 illustrates how major program and facility information, related studies, and historical information flow into the waste management appendix. Additionally, this appendix supports other sections of the LLNL SW/SPEIS.

B.1 INTRODUCTION

Wastes at LLNL are routinely generated from the ongoing programmatic operations and infrastructure support activities described in Volume I of this LLNL SW/SPEIS. Wastes are also generated from special, limited duration projects. This section describes the types of wastes historically generated and managed at LLNL, the steps in the waste generation and management process, the current and proposed facilities in which waste management operations are conducted, and the waste treatment processes used.

B.1.1 Types of Waste Generated and Managed at the Livermore Site and Site 300

LLNL generates and manages both routine and nonroutine wastes. Routine wastes are those generated during the normal operation of laboratories, test facilities, and research and development (R&D) operations. Special, limited-duration projects, such as construction, that generate nonroutine wastes are considered separately from facility operations. These types of projects can make a large contribution to the overall waste generation at LLNL and are difficult to reasonably forecast on an annual basis. Three types of projects are considered special operations: construction, decontamination and decommissioning (D&D), and environmental restoration.

The types of wastes generated and managed at the Livermore Site and at Site 300 include low-level waste (LLW), mixed low-level waste (MLLW), transuranic (TRU) waste, mixed TRU waste, hazardous waste, construction waste, sanitary solid waste, industrial wastewater (nonsewerable), and sanitary wastewater. Descriptions of these waste types are shown in Table B.1.1–1. Table B.1.1–2 lists typical wastes accumulated in a generator area or managed in one of the waste management facilities. Detailed descriptions of actual waste streams, of which there are over 100, are listed in the RCRA permits.

TABLE B.1.1–2.—*Typical Waste Types Stored in Waste Accumulation Areas*

Waste Types	
Acids (liquid)	Mixed radioactive waste (liquid/solid)
Asbestos	Oils (liquid/solid)
Combustible liquids	Oxidizers (liquid/solid)
Compressed gases	Paints (liquid/solid)
Flammable liquids	PCB waste (liquid/solid)
Halogenated and nonhalogenated solvents	Photochemicals (liquid)
Lab packs	Poisons
Laboratory debris (solid)	Radioactive waste (liquid/solid)
Mercury and mercury-contaminated waste	Reactive materials
Miscellaneous chemical waste and contaminated debris	Wastewaters (liquid)

Source: LLNL 2001aq.
PCB = polychlorinated biphenyl.

B.1.2 Waste Management at Lawrence Livermore National Laboratory

LLNL uses trained personnel and approved program procedures to control waste from the point of generation through storage, treatment, and disposal. LLNL waste management procedures cover identifying, generating, handling, packaging, storing, treating, and transporting all wastes including radioactive, hazardous, mixed, and medical wastes. The generators are primarily responsible for proper waste management in generator areas and receive assistance from several organizations including the LLNL RHWM Division, Environmental Protection Department, Plant Engineering Department, and other staffs. In this appendix, the term RHWM often refers to all activities or facilities at LLNL that manage radioactive and hazardous waste, regardless of organization. Accordingly, facilities managed by the Plant Engineering Department and the Chemical and Materials Science Directorate are included in the term RHWM.

LLNL maintains control of hazardous, radioactive, and mixed wastes that are potentially harmful to human health and/or the environment. This control occurs through four types of waste management areas that can be used to accumulate such wastes:

- At the point of generation (i.e., at a Satellite Accumulation Area [SAA])
- At a Waste Accumulation Area (WAA)
- In a hazardous waste retention tank with a 90-day waste accumulation time limit
- At an interim status or permitted storage and/or treatment unit at LLNL

Specific conditions that govern the accumulation of wastes at each of these areas are described below.

An SAA is an area at LLNL where small quantities of hazardous, radioactive, and mixed wastes are temporarily accumulated at or near the initial point of generation without a California DTSC RCRA permit. Each SAA and the accumulation of waste at that SAA are under the direct control of the individual generating the waste (the term individual includes organization or department, for which a specific point of contact is assigned the lead). These waste generators control the waste container at all times. Hazardous and mixed wastes accumulated at an SAA are transferred to other waste management facilities or shipped offsite before either accumulation time limits or

quantity limits are reached. Also, waste containers that have been filled are transferred from the SAA or shipped offsite, as appropriate.

A WAA is an officially designated area at LLNL where hazardous, radioactive, and mixed wastes generated by an organization are accumulated in containers for up to 90 days. Before the 90-day time limit expires, the waste is transported to an approved RCRA-permitted Treatment, Storage, and Disposal Facility (TSDF), either onsite or offsite. A WAA serves an important role in the life cycle of waste management in that it provides temporary waste accumulation, without requiring a permit, after hazardous or mixed wastes reach SAA time or quantity limits. The number of WAAs in service at any time varies with programmatic need. In 2001, there were 22 WAAs in service at the Livermore Site and one in service at Site 300.

Routinely, wastes managed in SAAs and WAAs are transported to LLNL waste management facilities or directly to offsite waste management facilities. Waste management facilities currently in operation at LLNL and facilities that are in the process of being closed are discussed below.

B.1.3 Waste Management Facilities at the Livermore Site

Treatment, storage and other waste management operations have been conducted historically in Building 233, Areas 514 and 612, and Building 693, at the Livermore Site (see Figure B.1.3–1). In 1996, construction of a new, consolidated waste treatment facility, the DWTF began in the northwest corner of the Livermore Site (see Figure B.1.3-1). An assessment of the environmental impacts associated with the DWTF construction and operation can be found in the *Environmental Assessment for the Decontamination and Waste Treatment Facility*, DOE/EA-1150 (LLNL 1996c) and the *Health Risk Assessment for Hazardous and Mixed Waste Management Units at the Lawrence Livermore National Laboratory* (LLNL 1997q). The DWTF construction has been completed and currently consists of Buildings 6951, 693, 694, 695, 696, and 697 and associated yard areas. The DWTF replaces waste management operations in Area 514 and Building 233 and consolidates other waste management activities into one facility. After relocation of waste operations from Area 514 and Building 233 to DWTF is complete, Area 514 and Building 233 will be closed. Waste management operations in Area 612 will continue.

Wastes stored in the Building 233 container storage unit (CSU) were removed in January 2002, and the facility is no longer active. Waste operations in Area 514 are currently being relocated to DWTF. In accordance with RCRA requirements, Area 514 and Building 233 will undergo RCRA closure. Final closure plans were submitted to DTSC in May 2000.

Although Building 419 has historically been used for waste management operations, it has undergone closure and is being maintained in a mothballed state. The State of California has not taken any action to approve the closure, but no post-closure care is anticipated. Building 419 will not be mentioned again in this appendix. Another Livermore Site facility, Building 280, is permitted for hazardous and mixed waste storage, but storage operations have not and will not commence. As such, Building 280 will undergo administrative closure using the permit modification process.

The treatment and storage capacities associated with individual units of the various RHWM facilities are indicated in Table B.1.3–1.

B.1.3.1 *Area 612 Complex*

For the purpose of safety analysis, Area 612 is divided into two segments, the Building 612 Segment and the Building 625 Segment, based on location and management needs. Each segment contains a number of storage or treatment units. The structures and areas within the Building 612 Segment are:

- Area 612 Portable Tank Storage Unit
- Area 612-1 CSU
- Area 612-2 CSU
- Area 612-5 CSU
- Building 612 Consolidation Waste Accumulation Area
- Building 612 Drum/Container Crushing Unit
- Building 612 Size Reduction Unit
- Building 612 CSU
- Building 614 East Cells CSU
- Building 614 West Cells CSU
- Building 612 Segment Yard Areas

The structures and areas within the Building 625 Segment are:

- Building 625 CSU
- Area 612 Tank Trailer Storage Unit
- Building 625 Segment Yard Areas

Area 612 segments and yard areas are shown in Figure B.1.3.1–1. Detailed descriptions of the Area 612 segments are presented below.

Building 612

Building 612 houses the drum crusher for hazardous or radioactive drums and containers, a radioactivity-measuring unit, the CSU that supports the lab packing of small quantities of nonradioactive waste chemicals, and the bulking of corrosive materials, and a mixed waste storage area. The permit capacities are identified in Chapter 4, Table 4.16.2–1. The drum crusher is connected to a high-efficiency particulate air (HEPA) filter to remove any airborne particulate contaminants.

A small room adjacent to the lab packing area is used for bulking corrosive materials (i.e., mixing smaller quantities together to form larger quantities) and for sorting chemicals prior to taking the materials into the lab packing area.

The mixed waste storage area in Building 612 has a total inventory capacity of 7,150 gallons or approximately 130 55-gallon drums of waste. Hazardous and mixed wastes stored in this building are stored on pallets.

Storage Areas 612-1 and 612-5

Storage Area 612-1 consists of two enclosed tents constructed of plastic-coated canvas. Tent A is 49 feet by 82 feet. Tent B is 30 feet by 98 feet with a total capacity of approximately 38,400 cubic feet of solid waste. Storage Area 612-5 consists of a fenced area and a tent made of plastic-coated canvas. The fenced area contains four 8-foot by 8-foot by 40-foot containers used to store classified solid mixed wastes. The tent is 49 × 98 feet with storage capacity of 26,900 cubic feet.

A staging area is available in the yard area where wastes are loaded on and off vehicles, inspected, prepared, and transferred.

Storage Area 612-2

Storage Area 612-2 is a 30-foot by 47-foot, covered area used for storage of hazardous and mixed waste with a capacity of 10,560 gallons, surrounded by a 6-inch-high concrete berm with a capacity of approximately 3,700 gallons. Liquid wastes are stored in the area in 55-gallon drums or smaller containers (generally 5 gallons or less) that are placed on secondary containment pallets. Liquid waste can also be stored in portable tanks, with capacities of 300, 600, 660, 750, and 1,100 gallons. These tanks are typically not placed on secondary containment pallets unless segregation of incompatible wastes is required.

Storage Area 612-4

Storage Area 612-4 is the primary receipt, segregation, and storage area (less than 90 days) for most wastes generated at LLNL prior to their distribution to the appropriate treatment, storage, process, or disposal site. The 40-foot by 100-foot area is covered by a roof and has an epoxy-coated concrete floor that is subdivided into five areas by berms that provide secondary containment. Three of the areas can store 144 55-gallon drums each and the other two can store 216 55-gallon drums each, totaling 864 55-gallon drums.

Building 614

Building 614 is divided into eight rooms or cells for storage of hazardous wastes and bulking of small quantities of compatible materials. The types of waste handled and stored in these cells may vary depending on need. Only compatible wastes, however, are managed in any single room at one time. Wastes stored in these cells include, but are not limited to, the following:

- Waste mercury
- Oxidizers
- Flammables

- Alkali and earth alkali solids
- Chlorosolvents and oils
- Caustics
- Acids
- Compressed gases
- Radioactive and mixed waste
- Aqueous solutions containing precious metals

The four cells on the west side of the building each have a maximum storage capacity of 168 gallons of waste. The four cells on the east side of the building each have a maximum storage capacity of 880 gallons of waste. In addition to storage, the east cells may also be used for bulking and lab-packing small quantities of compatible materials.

Building 625

This building handles and stores TRU and mixed TRU wastes and wastes regulated under the *Toxic Substances Control Act* (TSCA), such as polychlorinated biphenyls and asbestos. The building is also used to store wastes (state-regulated) regulated by the DTSC. The building has a total floorspace of approximately 4,800 square feet and may store 42,416 gallons of waste volume. An epoxy-coated concrete berm inside the building separates the radioactive wastes (east side) from the nonradioactive wastes (west side) and provides a secondary containment capacity of about 17,954 gallons. Wastes are typically stored in steel drums or steel boxes.

Portable Tank Storage Unit

The Area 612 Portable Tank Storage Unit is used to store liquid hazardous wastes in portable tanks. The storage unit has a design capacity of 10,000 gallons and is divided into two cells by a concrete curb. Cell A is designed to store up to 4,000 gallons of hazardous waste while Cell B has a design capacity of 6,000 gallons. The area consists of an uncovered 1,200-square-foot concrete pad surrounded on the north, east, and west sides by a concrete curb. The concrete pad slopes northward 11 inches high over 16 feet and the curb heights range from 11 inches along the north side to 0 inches along the southern edge of the storage area.

The internal dimensions of Cell A are 30 feet by 16 feet, and the internal dimensions of Cell B are 45 feet by 16 feet. Cell A is designed for storage of portable tanks as large as 330 gallons, while Cell B can store tanks as large as 660 gallons. The south end of the storage unit provides personnel and equipment access for managing, inspecting, and maintaining the containers.

Tank Trailer Storage Areas

The Area 612 Tank Trailer Storage Area is designated for storage of hazardous or mixed liquid wastes in tank trailers or in portable tanks on flatbed trailers. The area has a total storage capacity of 5,000 gallons and the largest volume of any individual container that can be stored in the area is 5,000 gallons. The storage area is an uncovered recessed loading dock. The unit is 9 feet wide

and 77.5 feet long and is recessed down to 4 feet below grade with a ramp on the east end for access. More than one tank trailer or flatbed trailer with portable tanks may be stored in the area as long as the wastes are compatible (i.e., will not create an additional hazard if mixed).

B.1.3.2 *Decontamination and Waste Treatment Facility*

The DWTF is a hazardous, radioactive, and mixed waste treatment and storage facility located in the northeast corner of the Livermore Site. Figure B.1.3.2–1 provides a footprint of the DWTF and identifies the facility segments. Hazardous and mixed waste management activities involve five individual facilities: Buildings 693, 694, 695, 696, and 697, and associated yard areas. Building 693 is a container storage unit and activities include waste packaging and storage. Building 695 provides storage and waste treatment capabilities including bulking and blending of wastes into treatment tanks; treating liquid and solid hazardous, mixed, and low-level radioactive wastes; storing; container rinsing; and waste transfer. Building 694 is the operational support facility and Building 697 is a Chemical Exchange Warehouse used for chemical exchange operations. Building 696 provides radioactive waste storage and solid waste receiving and processing capabilities. Building 695 is a maintenance shop. Areas within the DWTF yard include a rainwater management area, a tanker storage area, a covered truck bay, and truck scales. In the future, yard areas would be used by mobile vendors to certify TRU waste and load it for shipment to WIPP. Such an action could result in two new segments.

As with Area 612, the DWTF is divided into three segments, based on location and management needs, for the purpose of safety analysis. Each segment contains a number of storage or treatment units. The segments within the DWTF are:

- Building 693 Segment
- Building 695 Segment
- Building 696R Segment

Detailed descriptions of the structures and areas within the DWTF segments are presented below.

The Building 693 Segment consists of the following structures and areas:

- Building 693
- Building 693 Annex CSU
- Building 693 Freezer Storage Unit
- Building 693 Roll-off Bin Storage Unit
- DWTF Portable Tank Storage Unit
- DWTF Underground Storage Tank
- Building 693 Segment Yard Areas

Building 693 is a single-story, rigid structural steel frame building that is 80 feet wide and 120 feet long. The building interior is divided into four cells where wastes are segregated according to compatibility. The cells are approximately 30 by 80 feet and are separated by rated partitions. The two end cells (1000 and 1012) are designed to store 21,117 gallons each of hazardous and mixed waste. The center cells (1004 and 1008) are designed to store 21,118 gallons each of hazardous and mixed waste. The foundation floor slab consists of 10-inch-thick, reinforced concrete slab. The curbing system which surrounds the floor slab and divides the four cells is continuous, seamless, 8 inches wide, 6 inches high, and constructed of reinforced concrete. The concrete floor is finished with fiberglass-reinforced epoxy coating to ensure containment and cleanup of any leaks or spills. This unit stores solid, liquid, and gaseous wastes.

The Building 693 CSU is used to store RCRA and DTSC regulated hazardous and mixed wastes as well as TSCA regulated waste and TRU waste. The unit stores solid, liquid, and gaseous wastes. Other handling operations conducted in this unit include lab packing, over packing, bulking, sampling, and transferring. Ignitable, reactive, toxic, and corrosive wastes are grouped by compatibility and segregated appropriately in each of the four cells in Building 693.

As part of the construction of DWTF, the Building 693 Annex was added to the north end of Building 693. The Annex was designed for waste storage as well as providing a pad for the Building 693 Freezer Storage Unit. In addition to its planned use for waste storage, the Building 693 Annex will be used to thermally stabilize TRU waste in preparation for head space gas sampling, one of the processes required to certify the waste for shipment to the Waste Isolation Pilot Plant (WIPP) for disposal.

The Building 693 Roll-off Bin Storage Unit, DWTF Portable Tank Storage Unit and DWTF Underground Storage Tank are located in the Building 693 Segment Yard Area north of the building. The Building 693 Roll-off Bin Storage Unit is a concrete pad on which up to two vendor supplied large metal bins (roll off bins) are stored while collecting RCRA hazardous and non-RCRA hazardous solid waste. The DWTF Portable Tank Storage Unit is a coated, bermed, concrete pad designed to hold portable tanks of liquid waste. The liquid waste could be low-level, hazardous or mixed waste liquid. These liquids primarily contain water. The DWTF Underground Storage Tank is connected by underground pipes to several DWTF facilities, including the Building 693 Annex, to capture overflow water from sprinklers in case of a fire.

Building 695 Segment

The Building 695 segment consists of the following structures and areas:

- Building 695
- Building 696S Solid Waste Processing Area (SWPA)
- Tanker Storage Area
- Other Yard Areas

Building 695 is used to manage both solid and liquid wastes, some of which are regulated under RCRA. The building is approximately 123 feet wide by 213 feet long. Building 695 is used to store and treat radioactive, mixed, and hazardous waste, and it also contains equipment used in conjunction with waste processing operations to treat various liquid and solid wastes. Waste

management areas within Building 695 have sloping, epoxy-line concrete floors that provide secondary containment in the case of spills.

Building 695 is divided into the following areas:

- The liquid-waste processing area (LWPA) is a high bay that houses various unit operations, such as the Tank Farm for storing and treating wastewater, evaporators, wastewater filtration module, bulking station, carbon adsorption unit, centrifuge, and waste blending station. The wastewater treatment tank farm consists of nine 5,000-gallon treatment tanks, and associated, valves, pumps and controls. The purpose of the tank farm is to treat wastewater that may be contaminated with hazardous constituents and/or radioactive isotopes. The LWPA also houses primary Process Off-Gas Systems that consists of air filtration equipment for treating offgases from waste treatment operations. This equipment includes carbon filters; acid gas scrubbers; volatile organic compound scrubbers; HEPA filters; and other associated air-handling equipment.

- The Building 695 airlock is used for transferring and storing containers, and it may house various portable treatment units when space permits.

- Processing rooms east of the Building 695 airlock house the shredder/chopper, solidification unit, and debris washer.

- The reactive materials area includes the reactive waste processing area (RWPA), four reactive waste storage rooms used for segregated storage of reactive wastes (e.g., water-reactive materials), and the reactive materials cell. The RWPA includes acid fume hoods and the combination, inert, and radioisotope gloveboxes. This area may also include units such as the mercury amalgamation unit, small laboratory operation hardware, and pressure reaction vessel. The reactive materials cell is a general-purpose area used for operations such as repackaging, uranium deactivation, and other bench scale processes.

- The small-scale treatment lab is operated in a manner similar to the reactive-materials area and may include units such as the mercury amalgamation unit, small laboratory operation hardware, and pressure reaction vessel.

- The instrument laboratory houses various analytical instruments, such as a gas-chromatograph/mass spectrometer, x-ray fluorescence spectrometer, and a dry electrolytic conductivity detector, and is used for real-time radiological and almost real-time metals and volatile organic carbon analyses to aid in treating mixed and radioactive wastes and developing improved treatment processes.

- The Building 695 Mezzanine contains air-handling units, water heater, communications equipment, and some power distribution (e.g., those items normally found in industrial complexes). The north section of the mezzanine contains HEPA filters for particulate removal from building air and process vents. The main building stack is located on the mezzanine in the northeast corner of the building.

- Building 695 Lobby, Office Space, Locker Rooms, and Utility Rooms.

Equipment was selected specifically to treat the waste streams RHWM expects will be generated at LLNL. However, some wastes might have unique characteristics that preclude treatment by

existing equipment and shipment to an offsite treatment, storage, and disposal facility. Because unique wastes are generated infrequently, installing dedicated equipment is neither practical nor cost effective. Bench-scale, tabletop treatment processes can be developed on a case-by-case basis and conducted in one or more of the reactive materials area work stations.

The SWPA, located at the west end of Building 696, is a one-story, structural steel frame building measuring approximately 83 feet by 135 feet by 35 feet high. The building's exterior walls are metal panels on steel girts with a sloped, corrugated metal roof. The SWPA includes the waste receiving/classification room, solid waste processing room, a room that houses the Building 696S glovebox, and an airlock. The drum crushers are located in Room 1009, the Building 696S glovebox is located in Room 1008, and a fume hood is provided for waste management operations, e.g., lab-packing, in Room 1001. A 5-ton industrial bridge crane is located in both Rooms 1009 and 1001. The SWPA also houses primary air handling and HEPA filtration equipment for treating offgases from waste treatment operations. Building air and air from treatment operations is routed from Building 696S to the main building HEPA filters in Building 695 before passing out the Building 695 stack. The SWPA is used primarily to manage solid radioactive waste. Operations specific to the SWPA include sorting and segregating LLW and TRU waste, lab-packing, sampling, and crushing empty drums that previously contained LLW. The Building 696 SWPA may be used to store hazardous and mixed waste for up to 90 days in compliance with RCRA.

The west yard area includes a covered truck bay located directly between the west end of Building 696S and the north end of Building 695. The truck bay is used to receive incoming vehicles delivering waste containers. The truck bay is a 12-inch-thick concrete slab that has a polymeric coating and measures approximately 80 feet long by 50 feet wide. The pad is sloped towards a central trench. The truck bay is covered with a roof that prevents direct precipitation, and run-on is prevented because the adjacent asphalt drive slopes away from the containment area. To the west of Building 696S is a truck scale and a ramped loading dock used for loading and unloading vendor supplies and some waste transport vehicles. The area on the southwest side of Building 695 includes chemical reagent storage tanks, and a small metal storage shed.

The DWTF tanker storage area is a sloped pad to the west of Building 696S that provides secondary containment. This consists of an outdoor concrete sloping slab with concrete curbing and a collection trench along the north side of the pad. It is used to store tankers containing dilute concentrations of radioactive and hazardous materials, e.g., rainwater. The most common storage containers are tankers that have nominal volumes of 5,000 to 7,000 gallons. The containment pad is capable of holding approximately 18,000 gallons. This area also has a direct connection to the sanitary sewer for releases of liquids that meet sewer discharge limits.

Other nonwaste management areas in the Building 695 Segment include:

- **T6951 Maintenance Area—** This area is for routine maintenance of facility equipment. This building and yard areas are separated from the rest of the DWTF facility by fences, and gates. It contains only small amounts of solvents and lubricants for maintenance purposes, compressed gas cylinders, and fueled vehicles, and does not contain radionuclides.

- **DWTF Transformer Area—** This yard area contains the DWTF emergency generator and transformer. This area is separated from the nuclear facility by fences. It contains only fuel for the generator and does not contain radionuclides.

Building 696R Segment

The Building 696R segment consists of Building 696R and other yard areas.

Building 696R is a single-story, rigid, structural steel frame building approximately 83 feet wide by 120 feet long. The building is divided into two rooms. The foundation floor slab consists of 10-inch-thick, reinforced-concrete slab that slopes to the north of the building. The concrete floor is finished with fiberglass-reinforced epoxy coating to ensure containment and cleanup of any leaks or spills. Building 696R is not connected to the Building 695 ventilation system and has only passive ventilation.

Building 696R is designed for the storage of solid TRU waste, solid and liquid low-level waste, and combined waste (i.e., radioactive and California-regulated hazardous waste). The Building 696R Segment is not currently permitted. Therefore, hazardous and mixed waste will not be allowed in this area until the permit is obtained. However, TRU waste or LLW contaminated with California-only regulated hazardous constituents (that is, combined waste) may be stored in Building 696R. Operations in the Building 696R segment include loading, unloading, staging, storage, over packing, LLW sampling, and periodic visual inspections of waste containers.

TRU Waste Segments

The mission performed in the TRU Waste Segments is to characterize LLNL TRU waste, repackage it as necessary, and load the waste drums into Transuranic Package Transporter Model II (TRUPAC-II) casks for offsite shipment. The waste needs to meet both the U.S. Department of Transportation (DOT) shipping requirements and the waste acceptance criteria for the receiving facility, which will be the WIPP.

B.1.4 Descriptions of Radioactive and Hazardous Waste Management Facilities at Site 300

Because Site 300 is part of the LLNL operations, the waste management procedures are similar for identifying, handling, packaging, storing, and transporting radioactive, hazardous, mixed, and medical wastes. The onsite generators have the same responsibilities as those at the Livermore Site and also receive the same assistance from the LLNL waste management staff. Wastes generated at the buildings are accumulated in SAAs and then transported to the Site 300 waste management facilities. Hazardous wastes are stored at the Building 883 Container Storage Area, and low-level radioactive wastes are staged and stored at Buildings 804 and 883 WAAs. Site 300 also stores high explosive wastes at the Explosive Waste Storage Facility (EWSF) and treats high explosives waste at the Explosive Waste Treatment Facility (EWTF) (Building 845). The following sections describe these operations: the generation, collection, and storage of radioactive, mixed, and hazardous waste. Treatment and storage capacities are presented in Table B.1.3–1.

Explosive Waste Treatment Facility

The EWTF, located in Building 845, was built to replace the Building 829 High Explosives Open Burn Treatment Facility (RCRA closure was completed in 1999). The EWTF consists of two open burn units (burn pan and burn cage) and one open detonation unit (gravel pad). After treatment, residual wastes are managed in two storage units (S1 and S2) with a permitted storage capacity of 275 gallons and 110 gallons, respectively. In 2002, the EWTF treated 2,735 pounds

of explosive-related hazardous waste (LLNL 2003be). Treatment quantity limits are shown in Table B.1.4–1. Biological, radioactive, and mixed wastes are not permitted at the EWTF.

TABLE B.1.4–1.—*Explosive Waste Treatment Facility Treatment and Quantity Limits*

	Burn Pan	Burn Cage	Detonation Pad
Annual limit	100 open burns/yr	100 open burns/yr	100/yr
Daily limit	1 open burn/day	1 open burn/day	1/day
Gross weight limit	150 lb/event	260 lb/event	350 lb/event

Source: California EPA 1997.
lb = pounds.

Explosive Waste Storage Facility

The EWSF consists of three earth-covered, concrete magazines; two earth-covered, corrugated-metal magazines; and one prefabricated metal building. The magazines are built in a semicircle in a knoll with their doors facing out from the knoll. The materials and methods of construction are designed to minimize sympathetic fires and explosions by maintaining a fairly consistent temperature and humidity within each structure. Compliance with explosive weight and distance limits also helps to ensure the safe operation of the EWSF.

Building 883—Hazardous Waste Storage Facility

Building 883, the Hazardous Waste Storage Facility, consists of a roofed, rectangular structure 50 feet by 35 feet with a total inventory capacity of 3,300 gallons consisting of sixty 55-gallon drums or their equivalent. The facility is a RCRA Part B-permitted facility for storage of designated hazardous wastes. The floor area is surrounded by a berm for secondary containment and slopes to a sump in the southwest corner of the building. The facility is not used for the storage of radioactive wastes.

B.1.5 Waste Management Facilities to be Shut Down and Closed

Three facilities at LLNL that are approved for waste management operations have been or will be shut down and closed. The Building 233 CSU has been shut down and all wastes removed. Building 280, although permitted for storage of hazardous waste, was never operated. Prior to FY2005, Building 514 operations will be transferred to the DWTF. Final closure plans for Building 233 and Area 514 were submitted to DTSC in May 2000. Since Area 514 will continue operations in the near term, descriptions of the waste management units in Area 514 are presented below. Treatment and storage capacities are presented in Table B.1.3–1.

Building 513

Building 513 houses a size reduction treatment unit (designed to operate with hand tools) and a radioactive and mixed waste container storage area. A solidification unit that was previously located in Building 513 has been relocated to Building 695 as part of the transition plan. This unit processes up to 8.32 cubic yards per day. Figure B.1.5–1 provides a footprint of Area 514. Area 514 is operated as a radiological facility.

The storage area has a total storage capacity of 15,760 gallons, or approximately 286 55-gallon drums of regulated waste. Incompatible wastes (i.e., wastes that cause a potential hazard if mixed) have been stored on secondary containment pallets to contain leaks or spills.

Building 514

This building houses the wastewater filtration unit. As water is processed through the rotating drum vacuum filter, solids are filtered out by the diatomaceous earth, built up on the outside of the rotating drum, and continuously scraped off as the drum rotates during operation. The scraped material is collected for storage as a mixed waste. If the filtrate meets release limits, it is discharged to the sanitary sewer. If it does not meet the release criteria, the filtrate is reprocessed until the release limits are met.

Building 514 Wastewater Treatment Tank Farm and Storage Tanks

The wastewater treatment tank farm consists of six 1,850-gallon treatment tanks, and a quadruple tank unit (4-4,600 gallon storage tanks). The purpose of the tank farm is to treat wastewater that may be contaminated with hazardous constituents and/or radioactive isotopes. The purpose of the quadruple tank unit is to store, transfer, pump, bulk, and sample wastewater.

For the treatment tanks, the majority of liquid wastes arrive at the Building 514 Complex in portable tanks and are pumped into the 1,850-gallon tanks through a pump station. Wastes in containers such as 55-gallon drums and 5-gallon carboys are consolidated and transferred to the 1,850-gallon tanks via the bulking station. The treatment process may involve batch chemical treatments consisting of neutralization, flocculation, oxidation, reduction, precipitation, and separation. Filtration is accomplished by a diatomaceous earth-precoated vacuum filter located in Building 514.

For the quadruple tank unit, the tanks are filled through a pump station and can be pumped to any of the treatment tanks. The wastewater is stored until such time as treatment can be effectively performed. No treatment operations are performed in the quadruple tanks.

Storage Areas 514-1 and 514-2

These areas are designated for the storage and treatment of mixed wastes. They consist of epoxy-coated, covered concrete storage pads with sloped floors contained by 12-inch-high berms on three sides. Storage Area 514-1 contains a cold vapor evaporator. The cold vapor evaporator, which is used to remove greater than 85 percent of the water from a waste stream, will be removed from the facility in fiscal year (FY) 2004.

Storage Area 514-2 is subdivided into three areas by concrete berms in order to separate incompatible chemicals. The types of mixed waste stored in these areas include radioactive acid and alkaline solutions, dilute coolant with oil residue, and wastes containing low concentrations of metals including copper, beryllium, chromium, nickel, and/or zinc. Waste containers are stored on pallets.

Storage Area 514-3

This area is used as a portable tank and container storage area to store waste prior to treatment at the wastewater treatment tank farm. The types of waste stored in these areas include acid and

alkaline solutions, dilute coolant with oil residue, and wastes containing low concentrations of metals including copper, beryllium, chromium, nickel, and/or zinc. The majority of these wastes contain radioactive constituents and are consequently treated as mixed wastes. The area is also used to store solid waste generated by the wastewater filtration unit as well as empty tanks. The total storage capacity for the area is 22,050 gallons or approximately 400 55-gallon drums

B.2 PURPOSE AND NEED

The NNSA needs to enhance the efficiency and safety of its current waste operations. NNSA proposes to meet its need by preparing a series of permit modifications, phasing out older facilities, and increasing operations to the design capabilities of the DWTF. The DWTF would continue to consolidate current waste operations, provide a facility to conduct hazardous operations, provide for the treatment and processing of stored wastes, improve waste minimization, and fully implement facility capabilities for waste treatment, storage, and processing. This centralized facility would concentrate like activities in one area, thus providing safer and more efficient working conditions.

The proposed modifications are evaluated in this LLNL SW/SPEIS because of the integral nature of the radioactive and hazardous waste management operations to the overall LLNL mission. This appendix serves as the NEPA documentation for these modifications. One purpose of this appendix is to provide the NNSA decisionmaker, the DTSC, and the public with permit modification-specific information in one report, even though the impact analysis also appears under the individual environmental resources and issue areas of this LLNL SW/SPEIS.

B.3 DESCRIPTIONS OF THE NO ACTION ALTERNATIVE, PROPOSED ACTION, AND REDUCED OPERATION ALTERNATIVE FOR WASTE MANAGEMENT

CEQ regulations (40 CFR Parts 1500-1508) require that DOE and other Federal agencies use the review process established by the NEPA of 1969, as amended (42 U.S.C. §4321 et seq.), and the DOE regulations implementing NEPA (10 CFR Part 1021) to evaluate not only the Proposed Action, but also to identify and review reasonable alternatives to the Proposed Action, as well as a No Action Alternative. This comprehensive review ensures that environmental information is available to public officials and citizens before decisions are made and before actions are taken.

The Proposed Action would continue to operate and enhance LLNL waste management facilities. The Proposed Action also provides new facilities that will generate wastes. NNSA developed the No Action Alternative, Proposed Action, and Reduced Operation Alternative to accomplish this action and to assess environmental impacts of waste management activities at LLNL. This appendix examines and compares the No Action Alternative, Proposed Action, and Reduced Operation Alternative. LLNL activity descriptions, by facility, are also provided. All of the activities discussed in this appendix were used in evaluating the impacts of each alternative presented in Chapter 3 of the LLNL SW/SPEIS. The alternatives are defined in the following sections:

- No Action Alternative (Section B.3.1)
- Proposed Action (Section B.3.2)
- Reduced Operation Alternative (Section B.3.3)

These three alternatives represent the range of levels of operation necessary to carry out the NNSA missions, from the reduced levels of activity that maintain core capabilities (Reduced Operation Alternative) to the highest reasonable activity levels that could be supported by current facilities, closing facilities no longer needed (including Area 514) and the potential expansion and construction of new capabilities for specifically identified future actions (Proposed Action).

Under the No Action Alternative, ongoing NNSA programs and activities at LLNL would continue operating at planned levels as reflected in current NNSA management plans. In some cases, these planned levels would include increases over today's operating levels. The No Action Alternative would include any recent activities that have already been approved by the NNSA (including submitted permit modifications) and that have existing NEPA documentation.

Under the Proposed Action, NNSA programs and activities at LLNL would increase to the highest reasonable activity levels, as set forth in this LLNL SW/SPEIS, that could be supported by current facilities and by their potential expansion and modification for future actions specifically identified in the LLNL SW/SPEIS.

Under the Reduced Operation Alternative, NNSA would conduct operations at the minimum levels of activity required to maintain core capabilities.

This appendix analyzes the environmental impacts of LLNL waste management activities associated with the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

Table B.3–1 provides a brief summary of the waste management activity levels (DWTF and Area 612) evaluated in this appendix. Table B.3–2 provides a comparison of parameters used in analyzing the alternatives. Table B.3–3 provides planned permit and other activities by alternative. Table B.3–4 provides a brief summary of the waste management activity levels for Site 300 facilities evaluated in the appendix.

In order to provide comprehensive existing conditions descriptions (in most cases the base period for data was 1992 through 2002) from which operational levels could be projected, the NNSA gathered the best available data. The following documents have been extensively used in this appendix and are not cited repeatedly:

- *Final Environmental Impact Statement and Environmental Impact Report for Continued Operation of Lawrence Livermore National and Sandia National Laboratories* (1992 LLNL EIS/EIR) (LLNL 1992a)
- 1992 through 2001 routine and nonroutine waste generation data (LLNL 2001aq)
- 2001 and 2002 routine and nonroutine waste generation data in cubic meters and metric tons (LLNL 2002cc, LLNL 2002p)
- Waste minimization and pollution prevention data (LLNL 2002cc)
- Part B Permit application, including previous application data as referenced (LLNL 2002cd)
- Recently submitted Class 1 and Class 2 Permit modifications (Sandhu 1999, Sandhu 2001, LLNL 2003aj, LLNL 2002z, LLNL 2003b)
- Health risk assessments (LLNL 2001ar, LLNL 2000aa, LLNL 2003r)
- Site-Wide Environmental Impact Statement and Supporting Environmental Documentation Comparison of Parameters to be Used to Analyze LLNL Waste Management Facilities Under the No Action, Proposed Action, and Reduced Operation Alternatives (TtNUS 2003)

NNSA is not revisiting any programmatic decisions previously made in other NEPA documents, such as those addressing weapons complex, materials disposition, TRU waste shipments, or waste management and LLNL permit modification submittals. The LLNL SW/SPEIS includes these programmatic activities and permitting activities in order to provide the NNSA, California DTSC, and public with an overall understanding of the waste management activities at LLNL.

B.3.1 No Action Alternative

Under the No Action Alternative, ongoing NNSA and interagency programs and activities at LLNL would continue operating at planned levels as reflected in current DOE/NNSA management plans for 2004 through 2014 (e.g., recent Class 1 and Class 2 Permit modification submittals). The No Action Alternative includes the continuing and historical onsite waste management operations, continuing environmental protection and environmental restoration, continuing pollution prevention and waste minimization programs, and transportation of waste to offsite approved waste management facilities (includes a wide variety of DOE and commercial facilities). The DWTF use would increase by implementing planned permit modifications (see Table B.3.1–1). In some cases, projected waste generation levels would include increases over today's waste generation levels (e.g., National Ignition Facility [NIF] contributions). This would also include any recent activities that have already been approved by NNSA and have existing NEPA documentation. If these planned operations are implemented in the future, they could result in increased activity above present levels. Thus, the No Action Alternative forecasts, over

10 years, the level of activity for LLNL RHWM operations that would implement current management plans (e.g., RCRA closure of Building 514) for assigned programs.

TABLE B.3.1–1.—*Examples of Possible Permit Modifications Under the No Action Alternative*

Class 1	Class 2
Administrative and informational changes	Changes in frequency or content of inspection schedules
Correction of typographical errors	Changes to corrective action program
Equipment replacement or upgrading with functionally equivalent components	Changes to detection monitoring program
Changes in names, addresses, and phone numbers of emergency coordinators	Extensions of post-closure care period
Changes to waste sampling and analysis methods to comply with new regulations	Changes to facility training plan that affect the type or amount of employee training
Changes to analytical quality assurance and quality control plan to comply with new regulations	Changes in number, location, depth, or design of groundwater monitoring wells

Source: 40 CFR §270.42, EPA n.d.
Note: Permit modifications are classified in more detail in 40 CFR §270.42, Appendix I.

The CEQ's NEPA implementing regulations (40 CFR Parts 1500-1508) require analyzing the No Action Alternative to provide a benchmark against which the impacts of the activities presented in the other alternatives can be compared.

Other plans used to prepare the description of the No Action Alternative include the site development plans for LLNL, Programmatic Environmental Impact Statements (PEISs), Part B Permit modifications, and guidance. Some documents have future projects included for planning purposes; other future projects have been omitted due to schedule constraints, because they are not ripe for decisionmaking, or for other reasons. The activities reflected in this alternative include planned increases in some LLNL operations and activities over previous years' levels.

Over the next 10 years the following actions are planned for the No Action Alternative:

- Increase use of DWTF
- Transfer several Area 514 operations to Building 695 (Table B.3–3)
- Close Area 514 storage and treatment operations (Table B.3–3)
- Continue Class 1 (DTSC-approved, various dates) modifications (Table B.3.1–1)
- Fully implement approved Class 2 (DTSC-approved, December 2002) modifications (Table B.3.1–1)
- Fully implement March 2003 permit modification
- Add (radioactive waste-only) 600-ton per year Drum/Container Crusher to Building 696
- Begin lab packing and waste verification in Building 696

- Install second evaporator for radioactive waste in Building 695
- Relocate Building 695 modification equipment to Building 696
- Relocate Building 513 encapsulation HEPA filter to Building 695 debris treatment room
- Add a glovebox into Building 695
- Submit approximately 75 Class 1 permit modifications over the next 10 years (Table B.3.1–1)
- Submit approximately 5 to 10 Class 2 permit modifications over the next 10 years (Table B.3.1–1)
- Submit one permit renewal
- Begin TRU waste shipments to WIPP
- Receive a one-time shipment of Lawrence Berkeley National Laboratory TRU and mixed TRU waste at LLNL for interim storage and eventual shipment to WIPP
- Begin TSCA-mixed waste treatment campaign with Oak Ridge, Tennessee, incinerator, including return of ash (residues) for storage prior to final disposal
- Begin closure of Buildings 233 CSU and 280
- Annually manage (routine) waste quantities presented in Table B.3.1–2

TABLE B.3.1–2.—*Routine and Nonroutine Operations Annual Waste Generation Quantities Under the No Action Alternative*

Waste Type	Annual Quantities	
	Routine	Nonroutine
LLW	200 m^3/yr	630 m^3/yr
MLLW	61 m^3/yr	72 m^3/yr
Total hazardous	390 metric tons/yr	1,500 metric tons/yr
TRU	50 m^3/yr	55 m^3/yr
Mixed TRU	1.7 m^3/yr	0
Sanitary solid	4,800 metric tons/yr	Included in Routine
Wastewater	310,000 gal/day	Included in Routine

Source: TtNUS 2003.

gal/day = gallons per day; LLW = low-level waste; m^3/yr = cubic meters per year; MLLW = mixed low-level waste; TRU = transuranic.

The following sections describe the activities that would occur at specific facilities because of implementing assignments under the No Action Alternative.

Radioactive and Hazardous Waste Management Facilities

The DWTF (Buildings 693, 695, and 696) would receive, treat, handle, package, store (short-term), and ship hazardous, radioactive, and nonhazardous chemical wastes. The facility is located in a fenced compound in the northeast corner of the Livermore Site. Except for Building 696, the DWTF is a RCRA, Part B-permitted facility that would support waste generators throughout

LLNL. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would normally operate one shift. Modifications to the existing facility to improve flexibility and operational efficiencies (see Table B.3.1–1) would be completed. Building 696 would continue to manage radioactive and nonhazardous wastes only. Quantities of total hazardous waste managed (see Table B.3–1) would be up to 1,900 metric tons per year. Quantities of MLLW managed (see Table B.3–1) would be up to 130 cubic meters per year. Quantities of TRU and mixed TRU wastes managed (see Table B.3–1) would be up to 11 cubic meters per year plus the legacy inventory of 89 cubic meters.

Building 694, the Operational Support Building, and Building 697, the Chemical Exchange Warehouse, are situated adjacent to the DWTF. While part of the waste management support operations at LLNL, these facilities do not currently receive, treat, handle, package, store (short-term), or ship hazardous and nonhazardous chemical wastes. Building 694 activities would be limited to office work. Building 697 would be used to prepare chemicals for reuse onsite as a method for avoiding disposal at licensed facilities, but could eventually house a WAA. These facilities would normally operate one shift. Modifications to the existing facilities to improve flexibility and operational efficiencies (see Table B.3.1–1) would be minor.

Area 612 Complex (Buildings 612, 614, 624, and 625) would receive, treat, handle, package, store (short-term), and ship hazardous, radioactive, and nonhazardous chemical wastes. The complex is located in a fenced compound in the southern part of the Livermore Site. The facility is a RCRA, Part B-permitted facility that would support waste generators throughout LLNL. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would normally operate one shift. Modifications to the existing facility to improve flexibility and operational efficiencies (see Table B.3.1–1) would be completed. Quantities of total hazardous waste managed (see Table B.3.1–2) would be up to 1,900 metric tons per year. Quantities of other wastes managed would be expected as presented in Table B.3–1.

The Area 514 Complex (Buildings 513 and 514) would receive, treat, handle, package, store (short-term), and ship hazardous and nonhazardous chemical wastes until RCRA closure would be initiated. The facility is located in a fenced compound in the southern part of the Livermore Site. The facility is a RCRA, interim-status facility that would support waste generators throughout LLNL. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would normally operate one shift until RCRA closure would be initiated. Treatment and storage operations would be transferred to the DWTF and the facility would undergo RCRA closure.

Although never made operational, Building 280 would also undergo RCRA closure. The building is located in the northwest quadrant of the Livermore Site. In 2001, LLNL notified the DTSC that the facility was no longer required to support waste generators throughout LLNL. The storage operation planned for Building 280 would be relocated to Building 696.

The Building 233 CSU would undergo RCRA closure. The facility is located in a fenced compound in the southwest quadrant of the Livermore Site. The facility is a RCRA, interim-status facility that prepared wastes for offsite transportation for recycling, treatment, or disposal at approved facilities. The facility does not currently store waste. The storage operation previously conducted in Building 233 CSU would be relocated to Building 696.

The EWTF treats and stores (short-term for treated debris only) hazardous (i.e., explosive) wastes. The facility is located in a fenced compound in the center of Site 300 and is RCRA, Part B-permitted. This facility would support explosive waste generators throughout Site 300 and at the High Explosives Application Facility (HEAF) at the Livermore Site. The quantities of wastes treated (see Table B.3–4) would be up to 3,300 pounds per year.

The EWSF (M816, M2, M3, M4, and M5) receives, handles, packages (through B805), stores, and ships hazardous (i.e., explosive) wastes. The facility is located in a fenced compound in the southeast central portion of Site 300 and is RCRA Part B-permitted. This facility supports explosive waste generators throughout Site 300 and at the HEAF. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would operate one shift. The quantities of explosive waste managed (see Table B.3–4) would be up to 6,500 pounds (gross) per year. No mixed hazardous waste would be managed.

Building 883 would receive, handle, package, store (short-term), and ship hazardous and nonhazardous chemical wastes. The facility would not accept radioactive materials and explosives. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. Modifications to the existing facility to improve flexibility and operational efficiencies would be completed.

B.3.2 Proposed Action

The Proposed Action would include all operations and activities identified in the No Action Alternative. The Proposed Action would include the continuing and historical onsite waste management operations, continuing environmental protection and environmental restoration, continuing pollution prevention and waste minimization programs, and continuing transportation of waste to offsite approved waste management facilities (includes a wide variety of DOE and commercial facilities).

Under the Proposed Action, new missions would generate waste volumes currently not managed at Livermore Site or Site 300. In general, over 10 years, waste management activities would change and planned facility operations for the DWTF would increase in support of LLNL's assigned missions. Waste management changes would include implementing a series of recent permit modifications (see Table B.3–3), improving overall RHWM operations, beginning new projects, and routinely submitting additional permit modifications as required. This alternative addresses the same facilities described in Section 3.1 for the No Action Alternative.

This alternative differs from the No Action Alternative in that

- Permitted treatment and storage operations would be conducted in B696 in addition to radioactive and nonpermitted waste handling operations
- Annual waste generation at LLNL would increase 7 percent over the No Action Alternative site-wide over the next 10 years to quantities presented in Table B.3–1
- The 600-ton per year drum/container crusher would be moved from Area 612 to Building 696

- A 250-ton per year size reduction unit operation would be relocated from Area 612 to Building 696
- Building 280 hazardous and mixed wastes storage capacity would be moved to Building 696
- Storage of hazardous and mixed wastes would begin in Building 696
- Approximately 100 Class 1 permit modification requests (which could include one or more items) would be submitted over the next 10 years (Table B.3.2–1)
- Approximately 20 Class 2 permit modification requests (which could include one or more items), would be submitted over the next 10 years (Table B.3.2–1)
- Two Class 3 permit modifications would be submitted over the next 10 years (Table B.3.2-1)
- Waste quantities presented in Table B.3.2–2 would be managed annually

TABLE B.3.2–1.—*Examples of Possible Permit Modifications Under the Proposed Action*

Class 1	Class 2	Class 3
Administrative and informational changes	Changes in frequency or content of inspection schedules	Addition of corrective action program
Correction of typographical errors	Changes to corrective action program	Creation of a new SWMU as part of closure
Equipment replacement or upgrading with functionally equivalent components	Changes to detection monitoring program	Modification or addition of tank units resulting in greater than 25% increase in the facility's tank capacity
Changes in names, addresses, and phone numbers of emergency coordinators	Extensions of post-closure care period	Addition of compliance monitoring to groundwater monitoring program
Changes to waste sampling and analysis methods to comply with new regulations	Changes to facility training plan that affect the type or amount of employee training	Reduction in post-closure care period
Changes to analytical quality assurance and quality control plan to comply with new regulations	Changes in number, location, depth, or design of groundwater monitoring wells	Addition of temporary treatment unit for closure activities

Source: 40 CFR §270.42, EPA n.d.
Note: Permit modifications are classified in more detail in 40 CFR §270.42, Appendix I.
SWMU = solid waste management unit.

TABLE B.3.2–2.—*Routine and Nonroutine Operations Annual Waste Generation Quantities Under the Proposed Action*

Waste Type	Annual Quantities	
	Routine	Nonroutine
LLW	340 m^3/yr	710 m^3/yr
MLLW	88 m^3/yr	81 m^3/yr
Total Hazardous	510 metric tons	1,700 metric tons
TRU	60 m^3/yr	10 m^3/yr
Mixed TRU	2.8 m^3/yr	0
Sanitary Solid	5,100 metric tons/yr	Included in Routine
Wastewater	330,000 gal/day	Included in Routine

Source: TtNUS 2003.
gal/day = gallons per day; LLW = low-level waste; m^3/yr = cubic meters per year; MLLW = mixed low-level waste; TRU = transuranic.

The following sections summarize the activities that would be performed at each of the LLNL waste management facilities.

Radioactive and Hazardous Waste Management Facilities

The DWTF (Buildings 693, 695, and 696) would receive, treat, handle, package, store (short-term), and ship hazardous, radioactive and nonhazardous chemical wastes. The facility is located in a fenced compound in the northeast corner of the Livermore Site. After completing the modification for Building 696, the facility would be a RCRA Part B-permitted facility that would support waste generators throughout LLNL. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at approved facilities. The facility would normally operate one shift. Modifications (within the list of Proposed Actions) to the existing facility to improve flexibility and operational efficiencies (see Table B.3.2–1) would be completed. Building 696 would obtain permit status. Quantities of total hazardous waste managed (see Table B.3–1) would be up to 2,200 metric tons per year. Quantities of MLLW managed (see Table B.3–1) would be up to 170 cubic meters per year. For other wastes see Table B.3–1.

Building 694, the Operational Support Building, and Building 697, the Chemical Exchange Warehouse, would continue to support operations at LLNL. As with the No Action Alternative, these facilities would not receive, treat, handle, package, store (short-term), and ship hazardous and nonhazardous chemical wastes. Modifications (within the list of Proposed Actions) to the existing facilities to improve flexibility and operational efficiencies (Table B.3.2–1) would be minor.

Area 612 Complex (Buildings 612, 614, 624, and 625) would receive, treat, handle, package, store (short-term), and ship radioactive hazardous and nonhazardous chemical wastes. As with the No Action Alternative, activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities.

Modifications (within list of Proposed Action) to the existing facility to improve flexibility and operational efficiencies (see Table B.3.2–1) would be completed. Quantities of total hazardous waste managed (see Table B.3–1) would be up to 2,200 metric tons per year. For other wastes see Table B.3–1.

Area 514 Complex (Buildings 513 and 514) would receive, treat, handle, package, store (short-term), and ship hazardous, radioactive and nonhazardous chemical wastes. The facility is located

in a fenced compound in the southern part of the Livermore Site. Prior to FY2005, Area 514 Complex operations would cease. The existing capabilities would be transferred to the DWTF. Once the operations are transferred, the Complex would undergo RCRA closure.

As with the No Action Alternative, Building 280 would undergo RCRA closure. The storage capacity planned for Building 280 would be relocated to Building 696.

As with the No Action Alternative, Building 233 CSU would undergo RCRA closure. The storage operation previously conducted in Building 233 CSU would be relocated to Building 696.

The EWTF would continue to treat and store (short-term for treated debris only) hazardous (explosive) wastes. The facility is located in a fenced compound in the center of Site 300 and is RCRA Part B-permitted. The facility would support explosives waste generators throughout Site 300 and at the HEAF at the Livermore Site. The quantities of wastes treated (see Table B.3–4) would be up to 3,300 pounds per year.

The EWSF (M816, M2, M3, M4, and M5) would continue to receive, handle, package (through B805), store, and ship hazardous (i.e., explosive) wastes. The facility is located in a fenced compound in the southeast central portion of Site 300 and is RCRA Part B-permitted. This facility would support explosive waste generators throughout Site 300 and at the HEAF. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would normally operate one shift. The quantities of explosive waste managed (see Table B.3–4) would be up to 7,200 pounds (gross) per year. No mixed hazardous waste would be managed.

Building 883 would receive, handle, package, store (short-term), and ship hazardous, toxic, and nonhazardous chemical wastes. The facility would not accept radioactive wastes and explosives. As with the No Action Alternative, activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. Modifications (within the list of Proposed Actions) to the existing facility to improve flexibility and operational efficiencies (see Table B.3.2–1) would be completed. Quantities of total hazardous waste managed would be up to 13 metric tons per year.

B.3.3 Reduced Operation Alternative

The Reduced Operation Alternative would reflect minimum levels of activity required to maintain waste management operations and activities assigned to support LLNL capabilities over the next 10 years. In some specific operations, waste management operations would increase over the base period. The operations are those that, during the base period, have not yet been operated (e.g., the NIF).

This alternative would not eliminate assigned missions or capabilities, but could entail not consolidating, enhancing, or upgrading operations. However, under this alternative, LLNL waste management operations would not be reduced beyond those required to maintain safety, permit requirements, or other agreements, such as the Site Treatment Plan.

Approximately 50 Class 1 permit modifications would be submitted. No Class 2 or Class 3 permit modifications would be submitted. No new construction would be included. All RCRA

closures identified in the No Action Alternative would be completed. Building 696 would not obtain RCRA permit status. It should be noted that the Reduced Operation Alternative would allow only partial fulfillment of the RHWM mission by limiting future permit modifications and limiting Building 696 wastes operations, and it would not fully satisfy the purpose and need for agency action.

This alternative differs from the No Action Alternative in that (see Table B.3–3):

- Approximately 50 Class 1 permit modifications would be submitted over the next 10 years (Table B.3.3–1).
- No Class 2 and Class 3 permit modifications would be submitted over the next 10 years.
- Waste quantities presented in Table B.3.3–2 would be managed annually.

TABLE B.3.3–1.—*Examples of Possible Permit Modifications*

Class 1
Administrative and informational changes
Correction of typographical errors
Equipment replacement or upgrading with functionally equivalent components
Changes in names, addresses, and phone numbers of emergency coordinators
Changes to waste sampling and analysis methods to comply with new regulations
Changes to analytical quality assurance and quality control plan to comply with new regulations

Source: 40 CFR §270.42, EPA n.d.
Note: Permit modifications are classified in more detail in 40 CFR §270.42, Appendix I.

TABLE B.3.3–2.—*Routine Operations Annual Waste Generation Quantities Under the Reduced Operation Alternative*

	Annual Quantities	
Waste Type	**Routine**	**Nonroutine**
LLW	180 m^3/yr	550 m^3/yr
MLLW	42 m^3/yr	63 m^3/yr
Total Hazardous	300 metric tons/yr	1,300 metric tons/yr
TRU	45 m^3/yr	5 m^3/yr
Mixed TRU	0.7 m^3/yr	0
Sanitary Solid	4,400 metric tons/yr	Included in Routine
Wastewater	290,000 gal/day	Included in Routine

Source: TtNUS 2003.
gal/day = gallons per day; LLW = low-level waste; m^3/yr = cubic meters per year; MLLW = mixed low-level waste; TRU = transuranic.

This alternative addresses the same facilities described in Section B.3.1 for the No Action Alternative. This alternative differs from the No Action Alternative in that operations would decrease to the lowest reasonably foreseeable levels over the next 10 years. The following sections describe the activities that would occur at specific facilities because of implementing assignments under the Reduced Operation Alternative.

The DWTF (Buildings 693, 695, and 696) would receive, treat, handle, package, store (short-term), and ship hazardous, toxic, and nonhazardous chemical wastes. The facility is located in a fenced compound in the northeast corner of the Livermore Site. Except for Building 696, the DWTF is a RCRA Part B-permitted facility that would support waste generators throughout LLNL. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would normally operate one shift per day.

Building 696 would not obtain permit status. Future modifications to the existing facility to improve flexibility and operational efficiencies would not be completed. Quantities of total hazardous waste managed (see Table B.3–1) would be up to 1,600 metric tons per year. Quantities of MLLW managed (see Table B.3–1) would be up to 110 cubic meters per year. For other wastes see Table B.3–1.

Area 612 Complex (Buildings 612, 614, 624, and 625) would receive, treat, handle, package, store (short-term), and ship hazardous, radioactive, toxic, and nonhazardous chemical wastes. As with the No Action Alternative, activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. Future modifications to the existing facility to improve flexibility and operational efficiencies would not be completed. For quantities of waste managed see Table B.3–1.

Area 514 Complex (Buildings 513 and 514) would receive, treat, handle, package, store (short-term), and ship hazardous, toxic, and nonhazardous chemical wastes. As with the No Action Alternative, activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities until RCRA closure would be completed.

Building 280 would undergo RCRA closure.

Building 233 CSU would undergo RCRA closure.

The EWTF would treat and store (short-term for treated debris only) hazardous (explosive) wastes. The facility is located in a fenced compound in the center of Site 300 and is RCRA Part B-permitted. The facility would support explosives waste generators throughout Site 300 and at the HEAF at the Livermore Site. The quantities of wastes treated (see Table B.3–4) would be up to 2,800 pounds per year.

The EWSF (M816, M2, M3, M4, and M5) would continue to receive, handle, package (through B805), store, and ship hazardous (i.e., explosive) wastes. The facility is located in a fenced compound in the southeast central portion of Site 300 and is RCRA, Part B-permitted. This facility would support explosive waste generators throughout Site 300 and at the HEAF. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would normally operate one shift. The quantities of explosive waste managed (see Table B.3–4) would be up to 6,200 pounds (gross) per year. No mixed hazardous waste would be managed.

Building 883 would receive, handle, package, store (short-term), and ship hazardous, toxic, and nonhazardous chemical wastes. As with the No Action Alternative, activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. Future modifications to the existing facility to improve flexibility and operational efficiencies would not be completed.

B.3.4 Alternatives Eliminated from Detailed Review

The CEQ regulations implementing NEPA require that all reasonable alternatives be evaluated in an EIS (40 CFR §1502.14[a]). The term *reasonable* has been interpreted by the CEQ to include those alternatives that are practical or feasible from a common sense, technical, and economic standpoint. The range of reasonable alternatives is, therefore, limited to continued LLNL

operations. NNSA mission line assignments to LLNL define the Administration's purpose and need for action, as discussed in Chapter 1 of the LLNL SW/SPEIS.

NNSA carefully considered public input and comments received during the pre-scoping and scoping processes. No additional alternatives were considered in detail in the LLNL SW/SPEIS because the range of alternatives were adequate for assessing impacts associated with the Administration's purpose and need.

B.4 DESCRIPTION OF THE AFFECTED ENVIRONMENT FOR WASTE MANAGEMENT

B.4.1 Environmental Setting/Existing Conditions

Understanding the environmental setting and existing conditions is necessary for understanding potential impacts from waste operations at LLNL. This section describes the existing conditions of the physical and natural environment for LLNL waste management facilities and operations, and the relationship of people with that environment. Descriptions of the affected environment provide a framework for understanding the direct, indirect, and cumulative effects of each of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The discussion is categorized by resource area to ensure that all relevant issues are included. This section is divided into the following 16 resource areas and topic groupings that support the impact assessment discussed in Section B.5:

- Land Use and Applicable Plans
- Socioeconomic Characteristics and Environmental Justice
- Community Services and Recreation
- Prehistoric and Historic Cultural Resources
- Aesthetic and Scenic Resources
- Meteorology
- Geological Resources and Hazards (including soils)
- Ecology
- Air Quality
- Water Resources and Hydrology
- Noise
- Minerals
- Traffic and Transportation
- Materials and Waste Management

- Utilities and Energy
- Worker Safety and Human Health

The information in this appendix comes primarily from the comprehensive environmental monitoring and surveillance programs that DOE maintains at LLNL and web-based information. Data for 1992 through 2002 are also included where necessary to present trends. Other relevant information is summarized and incorporated by reference.

Detailed discussions of each environmental resource in the overall affected environment for LLNL is the same as would be discussed for RHWM facilities. Because overall LLNL operations and RHWM operations are interdependent and interconnected, the affected environment and impacts under the various alternatives may be discussed collectively (site-wide basis). As appropriate, each resource and topic area includes a discussion of the area that may be affected by RHWM activities. The discussion establishes the scope of analysis and in general focuses the appendix on relevant information specific to RHWM facilities. Because resources and topic areas are often interrelated, one section may refer to another.

Potential releases of materials from LLNL can reach the environment and people in a number of ways. The routes that materials follow from LLNL to reach the environment and subsequently people are called transport and exposure pathways. LLNL conducts environmental monitoring to determine whether radioactive and nonradioactive materials and wastes were potentially released into the environment. Environmental monitoring also assesses the potential for people to encounter these materials and wastes by any route of exposure. Sampled media include air, vegetation, groundwater, stormwater runoff, and wastewater discharge. LLNL publishes an annual site environmental report that contains details on these sampling programs (SNL 1997, LLNL 1998b, LLNL 1999c, LLNL 2000g, LLNL 2001v, LLNL 2002cc, LLNL 2003l).

Pursuant to the management of hazardous, radioactive, mixed, and medical wastes generated, RHWM programs implement site-wide plans and operating practices to comply with regulatory requirements. Inspections and findings of the Livermore Site and Site 300 by external agencies in 2001 are listed in Table B.4.1–1. A summary of permitting activities is presented in Table B.4.1–2. Table B.4.1–3 contains summaries of major laws, regulations, and orders relevant to LLNL RHWM facilities.

TABLE B.4.1–3.—*Summary Of Major Laws, Regulations, and Orders*

Laws, Regulations, and Orders	Description
Solid Waste Disposal Act of 1976 (42 U.S.C. §6902)	This Act regulates the management of solid waste. Solid waste is broadly defined to include any garbage, refuse, sludge, or other discarded material including solid, liquid, semisolid, or contained gaseous materials resulting from requirements and controls for transport, test procedures, and administrative requirements. Schedules include industrial, commercial, mining, or agricultural activities. Specifically excluded as solid waste is source, special nuclear, or by product material as defined by the *Atomic Energy Act*.
Resource Conservation and Recovery Act of 1976 (42 U.S.C. §6901)	This Act amends the *Solid Waste Disposal Act* and establishes requirements and procedures for the management of hazardous wastes. As amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), RCRA defines hazardous wastes that are subject to regulation and sets standards for generation, treatment, storage, and disposal facilities. The HSWA emphasize reducing the volume and toxicity of hazardous waste. They also establish permitting and corrective action requirements for RCRA-regulated facilities. RCRA was also amended by the *Federal Facilities Compliance Act* (FFCA) in 1992. It requires the EPA, or a state with delegated authority, to issue an order for compliance. A Federal facilities compliance order was issued by the California EPA, requiring the DOE and LLNL to comply with the FFCA. Compliance with the order is achieved through Site Treatment Plans prepared by DOE.
Underground Storage Tanks (42 U.S.C. §6901, Subtitle I)	Underground storage tanks are regulated as a separate program under RCRA, which establishes regulatory requirements for underground storage tanks containing hazardous or petroleum materials. California EPA has been delegated authority for regulating LLNL.
Federal Facility Compliance Act of 1992 (42 U.S.C. §6961)	This 1992 Act waives sovereign immunity from fines and penalties for RCRA violations at Federal facilities. However, it postponed the waiver for three years for storage prohibition violations with regard to land disposal restrictions for the DOE's mixed wastes. It required DOE to prepare plans for developing the required treatment capacity for each site at which it stores or generates mixed waste. The state or EPA must approve each plan (referred to as a Site Treatment Plan) after consultation with other affected states, consideration of public comments, and issuance of an order by the regulatory agency requiring compliance with the plan. The Act further provides that DOE will not be subject to fines and penalties for storage prohibition violations for mixed waste as long as it complies with an existing agreement, order, or permit. The FFCA requires that Site Treatment Plans contain schedules for developing treatment capacity for mixed waste for which identified technologies exist. The DOE must provide schedules for identifying and developing technologies for mixed waste without an identified existing treatment technology. A Federal Facility Compliance Order was signed in 1997 to address treatment and disposal of mixed waste, as well as characterization and disposal of TRU waste.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as Amended (42 U.S.C. §9601, et seq.)	This Act, commonly referred to as the CERCLA, or Superfund, establishes liability standards and governmental response authorization to address the release of a hazardous substance or contaminant into the environment. The EPA is the regulating authority for the Act. CERCLA was amended by the *Superfund Amendments and Restoration Act* (SARA) in 1986. SARA Title III establishes additional requirements for emergency planning and reporting of hazardous substance releases. These requirements are also known as the *Emergency Planning and Community Right-to-Know Act* (EPCRA), which, due to its unique requirements is discussed separately below. SARA also created liability for damages to or loss of natural resources resulting from releases into the environment and required the designation of Federal and state officials to act as public trustees for natural resources. LLNL is subject to, and required to report releases to the environment under the notification requirements in 40 CFR Part 302 (Designation, Reportable Quantities, and Notification) and EPCRA, as applicable. Pursuant to CERCLA Section 120, DOE signed a Federal Facility Agreement for LLNL in 1989 and Site 300 in 1992.

TABLE B.4.1–3.—*Summary of Major Laws, Regulations, and Orders (continued)*

Laws, Regulations, and Orders	Description
Hazardous Waste Control Act (California Health and Safety Code § 25100 et seq.)	This Act is the state authorization to implement the state hazardous waste program pursuant of RCRA.
Hazardous Waste Reduction Act (California Health and Safety Code § 25244.12-25)	This Act expands the State of California hazardous waste source reduction activities to accelerate reduction in hazardous waste generation.
Pollution Prevention Act of 1990 (42 U.S.C. §13101)	This Act sets the national policy for waste management and pollution control that focuses first on source reduction, followed sequentially by environmentally safe recycling, treatment, and disposal. In response, the DOE committed to voluntary participation in EPA's 33/50 Pollution Prevention Program, as set forth in Section 313 of SARA.
Toxic Substances Control Act of 1977 (15 U.S.C. §2601)	This Act, unlike other statutes that regulate chemicals and their risk after they have been introduced into the environment, was intended to require testing and risk assessment before a chemical is introduced into commerce. It also establishes record keeping and reporting requirements for new information regarding adverse health and environmental effects of chemicals. The Act governs the manufacture, use, storage, handling, and disposal of PCBs; sets standards for cleaning up PCB spills, and establishes standards and requirements for asbestos identification and abatement in schools. It is administered by the EPA. Because LLNL's R&D activities are not related to the manufacture of new chemicals, PCBs are LLNL's main concern under the Act. Activities at LLNL that involve PCBs include, but are not limited to, management and use of authorized PCB-containing equipment, such as transformers and capacitors, management and disposal of substances containing PCBs (dielectric fluids, contaminated solvents, oils, waste oils, heat transfer fluids, hydraulic fluids, paints, slurries, dredge spoils, and soils), and management and disposal of materials or equipment contaminated with PCBs as a result of spills. At LLNL, PCB-contaminated wastes are transported offsite for treatment and disposal unless they also have a radioactive component. Nonradioactive wastes containing PCBs are disposed of at an offsite facility that has been approved by the EPA for such disposal (provided that strict requirements are met with respect to notification, reporting, record-keeping, operating conditions, environmental monitoring, packaging, and types of wastes disposed). Radioactive PCB waste, typically known as TRU mixed waste or mixed waste, is currently stored at one of LLNL's hazardous waste storage facilities until the Waste Isolation Pilot Project, or other approved facility, accepts this waste for final disposal. LLNL conducts asbestos abatement projects in accordance with Occupational Health and Safety Administration (OSHA) requirements (29 CFR Part 1926), applicable requirements of the CAA, and the California Solid Waste Management Regulations.
Atomic Energy Act of 1954	This Act, makes the Federal government responsible for regulatory control of the production, possession, and use of three types of radioactive material: source, special nuclear, and byproduct (includes waste). Regulations promulgated by the U.S. Nuclear Regulatory Commission (NRC) under the *Atomic Energy Act* establish standards for the management of these radioactive materials (including waste).
40 CFR 260 Series	The implementing regulations established by EPA governing hazardous wastes (RCRA).

TABLE B.4.1–3.—*Summary of Major Laws, Regulations, and Orders (continued)*

Laws, Regulations, and Orders	Description
Title 22 CCR Division 4.5	The implementing regulations established by California EPA for management of hazardous waste.
DOE Order 435.1, Radioactive Waste Management	DOE Order 435.1 establishes the policies, guidelines, and minimum requirements by which the DOE and its contractors manage radioactive waste, mixed waste, and contaminated facilities. This order establishes DOE policy that radioactive and mixed wastes be managed in a manner that ensures protection of the health and safety of the public, the DOE, contractor employees, and the environment. In addition, the generation, treatment, storage, transportation, and disposal of radioactive wastes, and the other pollutants or hazardous substances they contain, must be accomplished in a manner that minimizes the generation of such wastes across program office functions and complies with all applicable Federal, state, and local environmental, safety, and health laws and regulations and DOE requirements.

Source: LLNL 2002cc.

B.4.2 Land Uses and Applicable Plans

B.4.2.1 *Existing Land Uses*

B.4.2.1.1 *Livermore Site*

Onsite Land Uses

Onsite land uses at the 821-acre Livermore Site include offices, laboratory buildings, support facilities (e.g., cafeterias, storage areas, maintenance yards, and a fire station), roadways, parking areas, and landscaping. The site also includes internal utility and communication networks. See Chapter 2 and Appendix A for detailed descriptions of onsite land uses, facilities, and major programs. A 500-foot wide security buffer zone lies along the northern and western borders of the Livermore Site.

Surrounding Land Uses

The Livermore Site is bordered on the east by Greenville Road. The property east of Greenville Road is agricultural with a few scattered rural residences and is used primarily for grazing. A Western Area Power Administration electrical substation is on the southeast corner of Greenville Road and Patterson Pass Road. The South Bay Aqueduct, a branch of the California Aqueduct, traverses the land east of the Livermore Site in a north-south direction. The Patterson Reservoir and filtration plant for the South Bay Aqueduct are northeast of the Livermore Site along Patterson Pass Road.

Patterson Pass Road runs along the northern boundary of the Livermore Site. Across Patterson Pass Road to the north is a light-industrial park. This area also includes a Pacific Gas and Electric construction training center. Several new industrial park complexes have been completed in recent years. A Union Pacific Railroad line runs in an east-west direction along the northern boundary of the industrial park. Land uses farther north include vacant land, industrial uses, a Union Pacific Railroad line, and Interstate 580 (I-580). Land northeast of the site is agricultural and used primarily for grazing. Wind turbines are installed on the hills of the Altamont Pass, northeast of the site.

On the west, the Livermore Site is bordered by Vasco Road. A low-density, single-family residential subdivision begins at the southwest corner of Patterson Pass Road and Vasco Road and extends south and west. A new housing development of attached single-family residences is currently being completed directly west of the site (north of East Avenue). Medium-density residential areas, mainly apartment complexes, exist on the west side of this new development approximately 2,000 feet west of Vasco Road.

To the south, the Livermore Site is bordered by East Avenue. South of East Avenue is the Sandia National Laboratories, California (SNL/CA), which has land uses very similar to those in LLNL. The primary land uses to the east and west of SNL/CA are rural residential and agricultural (mainly grazing). A K-8 school, The Stivers Academy, is located to the west of SNL/CA on the east side of Vasco Road, between East Avenue and Tesla Road. Public access to the section of East Avenue common to the Livermore Site is administratively controlled beginning in 2003 (DOE 2002h). There is a small light-industrial park on the southwest corner of East Avenue and Vasco Road. South of this industrial park, a new single-family housing development is being built.

B.4.2.1.2 *Site 300*

Onsite Land Uses

Site 300 is on approximately 7,000 acres of largely undeveloped land. Site 300 is primarily a nonnuclear high explosives and other nonnuclear weapons component test facility. The site has three remote high explosive testing facilities supported by a chemistry processing area, a weapons test area, maintenance facilities, and a General Services Area (GSA) at the site entrance. One hundred and sixty acres have been developed as the "*Amsinckia grandiflora* Reserve" to protect this species' natural habitat.

Surrounding Land Uses

The majority of existing land uses surrounding Site 300 are agricultural, primarily for the grazing of cattle and sheep. Two other smaller, privately operated defense-related research and testing facilities are located near Site 300. The property east of and adjacent to Site 300 is now owned by Fireworks America and is currently being used to store pyrotechnics. A portion of the property is leased to Reynolds Initiator Systems, Inc., and is used to manufacture initiators (agents which cause a chemical reaction to commence). A facility, operated by SRI International, that conducts high explosives tests, is approximately 0.6 mile south of Site 300.

Corral Hollow Road borders Site 300 on the south. South of the western portion of Site 300 across Corral Hollow Road is the Carnegie State Vehicular Recreation Area, covering approximately 5,000 acres and operated by the California Department of Parks and Recreation Off-Highway Motor Vehicle Recreation Division for the exclusive use of off-highway vehicles. The nearest urban area is the city of Tracy, approximately 2 miles northeast of Site 300. Rural residences are located along Corral Hollow Road, west of Site 300 and the Carnegie State Vehicular Recreation Area. Power-generating wind turbines occupy the land northwest of the site.

B.4.2.2 *Land Use Plans and Programs*

Livermore Site

The city of Livermore and Alameda County do not have planning jurisdiction over the Livermore Site because it is a Federal facility owned by DOE. However, for purposes of providing a complete description to the public and decision makers of the existing and potentially affected environment, local land use planning in the vicinity of the Livermore Site is presented in this section.

Alameda County General Plan: East County Area Plan

The East County Area Plan replaces the Livermore-Amador Valley Planning Unit General Plan. The East County Area Plan was adopted by the Alameda County Board of Supervisors on May 5, 1994, and was amended most recently in May 2000 (Alameda County 1994). The Livermore Site lies within Alameda County and most of it is zoned "M-P" for industrial-park use. The Alameda County Zoning Code specifies "laboratory, including research, commercial, testing, developmental, experimental or other types" as a permitted use within the M-P Zone. The remaining portions of the Livermore Site lie within the city of Livermore and are not subject to county zoning.

The Livermore Site is designated as being outside the urban growth area for the city of Livermore. Areas north and west of the Livermore Site are designated as lands within the Livermore city limits and are within the urban growth boundary. The area to the south, including SNL/CA, is also within the urban growth boundary. Policy 144 of the East County Plan states that "The County shall ensure that all new uses approved near the Lawrence Livermore National Laboratories in East Livermore are compatible with Laboratory operations." The county's land use designations in and near the Livermore Site include industrial, large parcel agricultural, residential, and other open space.

The portion of the Livermore Site within Alameda County is designated industrial. SNL/CA south of East Avenue is also designated industrial. The areas adjacent to SNL/CA on the east, west, and south are designated limited agriculture. The areas directly east of LLNL, across Greenville Road is designated large parcel agricultural. To the west are residential areas.

There are other designated open space areas in east Alameda County in the general vicinity of the Livermore Site: one is 4 miles south and the other 3 miles north of the Livermore Site. Approximately 3 miles northeast of the Livermore Site is a Wind Resource Area. Running northeast to southwest approximately 100 yards west of the site is a canal, the South Bay Aqueduct, which is designated as Water Management.

Livermore Community General Plan, 1976–2000

The Livermore Community General Plan, 1976–2000, was adopted by the Livermore City Council on March 8, 1976, and updated in August 1998 (City of Livermore 1975). Most of the Livermore Site is designated low intensity industrial, with the northern 500-foot perimeter area designated high intensity industrial. The Livermore Community General Plan designates the areas north of the Livermore Site as high intensity industrial. Areas west of the Livermore Site are designated as urban low-medium residential to urban high residential. Small areas within the

residential areas are designated as open space parks, which include parks, trailways, recreation corridors, and protected areas. Areas south and east of the Livermore Site and SNL/CA are designated low-intensity industrial and the area farther west up to Greenville Road is designated as limited agricultural with a 20-acre minimum lot requirement.

City of Livermore Zoning

The northern perimeter area of the Livermore Site is zoned I-3 for heavy industrial use, and the western perimeter area is zoned I-2 for light industrial use (City of Livermore 2002a). These are the areas within the city of Livermore boundaries. The Livermore Zoning Ordinance provides for manufacturing, warehousing and distribution facilities, research and development facilities; professional and administrative offices, restaurants, wholesale certified recycler and recycle processor, and off-street parking as principal permitted uses within the I-2 zones. In addition to those uses in the I-2 zone, the I-3 zone permits contractor storage yards, truck terminals, or other open storage uses and recycle processor uses (City of Livermore 2002b).

The surrounding areas north of the Livermore Site are designated I-3. Areas west of the Livermore Site are designated as PD for planned development, PDR for planned development residential, RS-3 for residential use with a maximum density of three dwelling units per acre, RG-10 for suburban multiple-residential use (approximately 10 dwelling units per acre), RS-5 for residential use with a maximum density of five dwelling units per acre, and RL-6 for low-density residential with a minimum lot size of 6,000 square feet.

Site 300

Most of Site 300 is in San Joaquin County, with a small portion in Alameda County. The city of Tracy is located approximately 2 miles northeast of the site. Planning programs of these three government entities are addressed below to provide a basis for evaluating Site 300's compatibility with future surrounding land uses. San Joaquin and Alameda Counties and the city of Tracy do not have planning jurisdiction over Site 300 because it is a Federal facility, owned by DOE.

San Joaquin County General Plan

The San Joaquin County General Plan was adopted by the San Joaquin County Board of Supervisors on June 29, 1992 (San Joaquin County 1992). The land use/circulation element of the General Plan contains goals, objectives, and principles for land use development and circulation and transportation within San Joaquin County.

The portion of Site 300 in San Joaquin County is designated public and quasi-public. Areas north and east of Site 300 are designated general agricultural. Areas south of Site 300, along Corral Hollow Road, are designated as recreation and conservation areas. Areas to the north and west are designated as general agriculture.

San Joaquin County Zoning

The portion of Site 300 in San Joaquin County is zoned AG-160 for general agriculture with a 160-acre minimum parcel size. The agricultural zone was established to preserve agricultural lands for the continuation of commercial agricultural enterprises. In addition, hazardous

industrial operations using explosives are permitted within the agricultural zone, subject to use permits (San Joaquin County 1992).

Alameda County General Plan: East County Area Plan

The East County Area Plan designates this portion of Site 300 as major public. The East County Area Plan Policy 138 states that "the County shall allow development and expansion of major public facilities (e.g. hospitals, research facilities, landfill sites, jails, etc.) in appropriate locations inside and outside the Urban Growth Boundary consistent with the policies and Land Use Diagram of the East County Area Plan."

Alameda County Zoning

The portion of Site 300 in Alameda County is zoned A for agricultural use. The Alameda County Ordinance Code specifies "remote testing facilities" as a conditional use within the A district, subject to approval by the zoning administrator for Alameda County (Sections 8-94.0 and 8-25.0).

City of Tracy General Plan

Site 300 is approximately 2 miles southwest of the city of Tracy. The Site 300 area is designated on the city of Tracy Community Areas Map as Federal Reserve/Open Space (FR/O) (City of Tracy 1993). Site 300 borders the city of Tracy's sphere of influence, which is designated as the Tracy Hills area. The Tracy Hills planning area includes both Tracy sphere of influence lands in San Joaquin County and an area southwest of I-580 recently annexed by the city of Tracy. The area adjacent to Site 300 in Tracy's sphere of influence has been designated Open Space Habitat. The Tracy Hills area within the city limits of Tracy has been zoned as low and medium-density residential. A residential development project is proposed for the Tracy Hills area (Lombardo 2002).

B.4.3 Socioeconomic Characteristics and Environmental Justice

B.4.3.1 *Socioeconomic Characteristics*

Employment characteristics of the communities in the region surrounding the Livermore Site and Site 300 are presented in this section by relevant county and city. Approximately 93 percent of the LLNL workforce reside within Alameda, San Joaquin, Contra Costa, and Stanislaus counties. As of September 2002, approximately 10,600 persons comprised the workforce at LLNL (DOE 2002d). This appendix bounds the analysis by estimating the total waste management work force at 150 people.

Alameda County

The California Employment Development Department (EDD) reported a 2001 total employed labor force of 721,000 persons in Alameda County (Table B.4.3.1–1). This represented a 13.3 percent increase over the 1991 annual average of 636,300. The average annual unemployment rate for 2001 was 4.5 percent (33,900 persons), which was lower than the statewide average of 5.3 percent for the same year (EDD 2002a).

TABLE B.4.3.1–1.—*Employment and Income Profile in the Four-County Region*

	Alameda	San Joaquin	Contra Costa	Stanislaus	Region
Number of workers (2001 average)	754,900	264,700	509,800	210,300	1,739,700
Employed	721,000	241,600	493,100	188,800	1,644,500
Unemployed	33,900	23,100	16,700	21,500	95,200
Percent unemployed	4.5	8.7	3.3	10.2	5.5
LLNL Workforce (September 2002)					
Number of workers	4,919	1,636	1,132	533	8,220
Percent of 2001 workforce	0.7	0.6	0.2	0.3	0.5
Personal Income (2000 Average)					
Total personal income ($1,000)	55,972,377	13,208,972	39,194,448	10,302,276	108,375,797
Per capita ($)	38,624	23,242	41,110	22,889	36,479

Source: BEA 2002, EDD 2002a, LLNL 2002v.

San Joaquin County

The EDD reported a 2001 total employed labor force of 241,600 persons in San Joaquin County (Table B.4.3.1–1). This represented a 18.5 percent increase over the 1991 annual average of 203,900. The average 2001 unemployment rate was 8.7 percent (23,100 persons), which is substantially higher than the statewide average for that year (5.3 percent). Agricultural areas, such as San Joaquin County, tend to have greater seasonal variations in employment and higher unemployment rates. Robust job growth is expected through 2006, with services, retail trade, and government experiencing the greatest percentage increase (EDD 2002b).

Contra Costa County

The EDD reported a 2001 total employed labor force of 493,100 persons in Contra Costa County (Table B.4.3.1–1). This represented a 19.9 percent increase over the 1991 annual average of 411,400. The average annual unemployment rate for 2001 was 3.3 percent (16,700 persons), which was significantly lower than the statewide average of 5.3 percent for the same year (EDD 2002a).

Contra Costa County's varied economic base is dominated by the services industry, which accounts for 32 percent of total employment. The job growth forecast to 2006 indicates services jobs will grow at the greatest pace, followed by government and retail trade (EDD 2002b).

Stanislaus County

The EDD reported a 2001 total employed labor force of 188,800 persons in Stanislaus County (Table B.4.3.1–1). This represented a 20.6 percent increase over the 1991 annual average of 156,500. The average annual unemployment rate for 2001 was 10.2 percent (21,500 persons), which was significantly higher than the statewide average of 5.3 percent for the same year (EDD 2002a). Agricultural areas, such as Stanislaus County, tend to have greater seasonal variations in employment and higher unemployment rates.

While agriculture has traditionally been the basis of Stanislaus County's economy, other economic sectors are expanding dramatically. Growth is expected through 2006 in all major industries, with services, manufacturing, and retail trade experiencing the greatest percentage increases (EDD 2002b).

LLNL Workers by County and Major City

The majority of LLNL personnel reside in the Alameda County (see Table B.4.3.1–2), with the largest concentration (approximately 3,270 workers) residing in the city of Livermore. Recent shifts in population have led workers east, making the city of Tracy the second largest concentration of LLNL workers (approximately 720). The city of Pleasanton is home to 550 LLNL employees, while 420 reside in Manteca (LLNL 2002v).

In 2000, the population of Alameda County was 1,443,741. Of that total, 166,972 people lived within the communities of Livermore, Pleasanton, and Dublin, near the Livermore Site. In 2000, the population of San Joaquin County was 563,598. In 2000, the population of Contra Costa County was 948,816. In 2000, the population of Stanislaus County was 446,997 (Census 2002b).

LLNL is the largest employer in the city of Livermore, followed by the Livermore Valley Joint Unified School District (Table B.4.3.1–3).

TABLE B.4.3.1–2.—*Geographic Distribution of LLNL Workers by County and Major City*

County	Livermore Site	Site 300	Total
Alameda	4,871	48	4,919
San Joaquin	1,528	108	1,636
Contra Costa	1,108	24	1,132
Stanislaus	485	48	533
Other	622	11	633
Total	8,614	239	8,853
City			
Livermore	3,239	35	3,274
Tracy	674	48	722
Pleasanton	541	6	547
Manteca	390	32	422
Castro Valley	353	3	356
Modesto	251	28	279
Brentwood	231	8	239
San Ramon	235	1	236
Stockton	218	14	232
Dublin	188	2	190
Oakland	188	0	188

Source: LLNL 2002v.

TABLE B.4.3.1–3.—*City of Livermore Major Employers*

Employers	Description	Number of Employees
LLNL	Government Research and Development	8,000
Livermore Valley Joint Unified School District	Public school system	1,170
Sandia National Laboratories, California	Government research and development	950
Triad Systems Corporation	Computer systems	900
Valley Care Health System	Hospital	850
City of Livermore	City government	490
KLA-Tencor	Semiconductor inspection equipment manufacture	400
Bank of America	Warehouse and distribution	300
Wente Vineyards	Winery	320
Kaiser Permanente Regional Distribution Center	Warehouse and distribution	275
WalMart Stores	Retail	275
Trans Western Polymers, Inc.	Manufacturing	250
Form Factor	Electronic contact	230
Johnson Controls, Inc.	Manufacturing	200
Hexcel	Manufacturing	170
Costco Wholesale	Retail	164
Livermore Area Recreation and Park District	Government	170
Circuit City	Retail warehouse and distribution	150
Codiroli Motors	Retail	139
Dayton Hudson Corp/Target	Retail	130

Source: City of Livermore n.d.

Housing by County

The Alameda County housing stock (all units) totaled 546,735 units as of January 2002. The vacancy rate in the county was 3.0 percent, indicating a low percentage of available housing (DOF 2002).

The San Joaquin County housing stock (all units) totaled 197,279 units as of January 2002. The vacancy rate in the county was 3.9 percent, indicating a moderate percentage of available housing (DOF 2002).

The Contra Costa County housing stock (all units) totaled 361,748 units as of January 2002. The vacancy rate in the county was 2.9 percent, indicating a low percentage of available housing (DOF 2002).

The Stanislaus County housing stock (all units) totaled 156,515 units as of January 2002. The vacancy rate in the county was 3.7 percent, indicating a moderate percentage of available housing (DOF 2002). Table B.4.3.1–4 compares housing units and vacancy rates within the four-county Region of Influence (ROI) and selected cities for 1997 to 2002.

TABLE B.4.3.1–4.—*Housing Units and Vacancy Rates Within the Four-County Region of Influence and Selected Cities, 1997-2002*

	1997			2002			
County	**Housing Units**	**Occupied**	**% Vacant**	**Housing Units**	**Occupied**	**% Vacant**	**Housing Unit Growth (1997-2002)**
Alameda	521,101	495,598	4.9	546,735	530,115	3.0	4.7
San Joaquin	182,444	173,439	4.9	197,279	189,512	3.9	7.5
Contra Costa	342,980	325,659	5.1	361,748	351,134	2.9	5.2
Stanislaus	147,088	139,688	5.0	156,515	150,649	3.7	6.0
City							
Livermore	24,524	23,558	3.9	27,357	26,856	1.8	10.4
Tracy	15,953	14,687	7.9	20,571	20,040	2.6	22.4
Pleasanton	22,085	21,090	4.5	24,517	23,845	2.7	9.9
Manteca	15,616	15,011	3.9	18,649	18,023	3.4	16.3
Modesto	65,693	62,542	4.8	69,848	67,540	3.3	5.9
Brentwood	4,874	4,590	5.8	9,784	9,419	3.7	50.2
San Ramon	16,087	15,272	5.1	17,917	17,296	3.5	10.2
Stockton	79,420	75,333	5.1	84,266	80,722	4.2	5.8
Dublin	7,949	7,731	2.7	11,107	10,496	5.5	28.4
Oakland	154,640	144,285	6.7	158,607	151,843	4.3	2.5

Source: DOF 2002.

Economic Factors by County Including LLNL

Alameda and Contra Costa counties had a total of 69,993 business establishments in 2001, with a combined annual payroll of $38.7 billion (including LLNL) (Table B.4.3.1–5). The services industry was the largest source of revenue, with a $15-billion total payroll (EDD 2002c).

A total of 12,920 business establishments were located in San Joaquin County in 2001. Payroll for these companies totaled $5.0 billion during the year (Table B.4.3.1–5). The services industry was the largest source of revenue, with a $1.5-billion total payroll (EDD 2002c).

A total of 11,276 business establishments were located in Stanislaus County in 2001. Payroll for these companies totaled $4.1 billion during 2001 (Table B.4.3.1–5). The services industry was the largest source of revenue, with a $1.4 billion total payroll (EDD 2002c).

LLNL had an overall budget of $1.5 billion in FY2002. LLNL has a monthly payroll of approximately $59 million. LLNL payroll originates entirely from the Livermore Site in Alameda County, even though some personnel are located at Site 300 in San Joaquin County. As of FY2002, the total annual LLNL payroll was approximately $668 million, representing 1.7 percent of the total combined payroll generated by all business establishments in Alameda County. The RHWM would represent 3 percent of the overall LLNL effect.

LLNL contributes considerably to the economy in direct purchases; it purchased a total of $568 million in goods and services in FY2002. Of that total, $348 million was for purchases in California and $142 million was for purchases in Alameda County.

TABLE B.4.3.1–5.—*Annualized 2001 Payroll for Four-County Area by Industry Sector, 2001 ($1000)*

Industry	Alameda/Contra Costa [a]	San Joaquin	Stanislaus
Agriculture	102,860	346,260	272,492
Mining	350,836	10,740	776
Utilities	222,976	65,700	11,764
Construction	3,493,652	511,460	384,844
Manufacturing	6,194,008	830,308	893,384
Wholesale Trade	2,898,288	281,700	212,284
Retail Trade	3,356,488	588,760	505,948
Transportation & Warehousing	1,484,200	409,728	120,728
Information	2,536,288	138,344	70,676
Finance & Insurance	2,260,504	235,992	151,368
Real Estate Rental & Leasing	655,652	66,392	40,804
Services	15,115,788	1,489,472	1,410,480
Total	**38,671,540**	**4,974,856**	**4,075,548**

Source: EDD 2002c.
[a] Combined Oakland Metropolitan Statistical Area.

B.4.3.2 *Environmental Justice*

Environmental justice has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA 2002a). Concern that minority and/or low-income populations might be bearing a disproportionate share of adverse health and environmental impacts led President Clinton to issue an Executive Order (EO) in 1994 to address these issues; EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", directs Federal agencies to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. When conducting NEPA evaluations, the NNSA incorporates environmental justice considerations into both its technical analyses and its public involvement program in accordance with the U.S. Environmental Protection Agency (EPA) and the CEQ regulations (CEQ 1997).

The NNSA selected an area of influence within a 50-mile radius of the Livermore Site and Site 300 for analysis, an area that encompasses all or portions of 19 counties. This area of influence was selected to be consistent with possible effects evaluated as part of the air impacts and accident consequence analyses.

Identifying Minority and Low-Income Populations

For this analysis, minority populations are considered to be all *people of color*, which includes all ethnic and racial groups except non-Hispanic whites. For California, the minority population is 53.3 percent. Chapter 4, Figure 4.3.5–1, of this LLNL SW/SPEIS shows the location of census block groups within the 50-mile area of influence where the minority population is greater than 53.3 percent.

For this analysis, low-income populations are those individuals living below the poverty threshold, as defined by the 2000 Census. This threshold varies from a household income of $8,259 to $38,138, depending on the number and age of household members. For California, the percent of the population living in poverty is 14.2 percent. Figure 4.3.5–2 of Volume I of this LLNL SW/SPEIS shows the location of census block groups within the 50-mile area of influence where the low-income population is greater than 14.2 percent.

Livermore Site

Minority Populations

A total population of 7,256,274 resides within a 50-mile radius of the Livermore Site. Of these, 3,743,027, or 51.6 percent, are minorities. This percentage is less than the minority percentage in the State of California as a whole. There are no block groups within a 5-mile radius that are categorized as minority. An area of Alameda County approximately 10 miles west of the Livermore Site is categorized as minority. Within 20 miles, higher concentrations of minorities are found within portions of western Alameda County and San Joaquin County in the Central Valley.

Low-Income Populations

Of the total population of 7,256,274 within the 50-mile area of influence, 711,571, or 9.8 percent, are low income. This percentage is less than the low-income percentage in the State of California as a whole. There are no block groups within a 10-mile radius of the Livermore Site that have percentages of low-income populations greater than the state average. Within 20 miles, some higher concentrations of low-income populations are located in the eastern portion of Contra Costa County, San Joaquin County, the southwestern portion of Alameda County, and the northern portion of Santa Clara County.

Site 300

Minority Populations

A total population of 6,406,704 resides within a 50-mile radius of Site 300. Of these, 3,343,660, or 52.2 percent, are minorities. This percentage is less than the minority percentage in the State of California as a whole. There are no block groups within a 5-mile radius that are categorized as minority. Several areas of San Joaquin County approximately 9 miles north and northeast of Site 300 are categorized as minority. Within 20 miles, higher concentrations of minorities are found within western portions of San Joaquin and Stanislaus counties in the Central Valley.

Low Income Populations

Of the total population of 6,406,704 within the 50-mile area of influence, 654,156, or 10.2 percent, are low income. This percentage is less than the low-income percentage in the State of California as a whole. There are no block groups within a 5-mile radius of Site 300 that have percentages of low-income populations greater than the state average. Within 10 miles, two areas of western San Joaquin County to the north and northeast of Site 300 are categorized as low income. Within 20 miles, some higher concentrations of low-income populations are located in

the western portions of San Joaquin and Stanislaus counties, and the northern portion of Santa Clara County.

B.4.4 Community Services

This section describes the existing demands on fire protection and emergency services, police protection and security services, school services, and nonhazardous solid waste disposal from the operation of LLNL.

B.4.4.1 *Fire Protection and Emergency Services*

The Fire Safety Division at the Livermore Site occupies two facilities: a fire station at Building 323 (Fire Station No. 1) and an emergency dispatch center at Building 313. All Livermore Site health and safety alarms are received by the emergency dispatch center through the site-wide alarm system. In addition to monitoring the Livermore Site alarms and dispatching personnel, the emergency dispatch center serves as the Mutual Aid Dispatch Center for Twin Valley and Alameda County, as appropriate.

There are about 62 fire protection and emergency services personnel at LLNL in the following categories: fire protection engineering and fire prevention, training, emergency dispatch, and emergency operations. A minimum staff of eight is on duty at Fire Station No. 1. LLNL Fire Station No. 1 equipment consists of four large-capacity pumpers (1,500 to 1,000 gallons per minute) including one ladder truck and one four-wheel drive, one smaller capacity (325 gallons per minute) four-wheel drive pumper, a special services unit with hazardous material containment equipment, two ambulances, and three command vehicles.

The average LLNL Livermore Site Fire Department response time onsite is 3.5 minutes. One vehicle and four personnel will initially respond to a call onsite. Additional equipment and personnel will respond as needed. Table B.4.4.1–1 provides a summary of the numbers and types of onsite emergency calls to which the LLNL fire safety division responded in 1999, 2000, 2001, and 2002.

Table B.4.4.1–1.—*Summary of Emergency Response Calls for 1999 through 2002*

Type of Incident	Number of Incidents							
	1999		2000		2001		2002	
	Livermore Site	Site 300[a]	Livermore Site	Site 300[a]	Livermore Site	Site 300[a]	Livermore Site	Site 300[a]
Ambulance	141		120		142		196	
Fire	466		319		341		394	
Hazardous materials	74		66		69		61	
Mutual/automatic aid[b]	683		668		1,079[c]		885[c]	
Total	**1,364**	**59**	**1,173**	**68**	**1,631**	**59**	**1,536**	**65**

Source: LLNL 2003b.
[a] Site 300 emergency response calls are not categorized by incident type.
[b] Includes responses under agreements with offsite agencies.
[c] Increase from previous years primarily due to expansion of service area and calls on and after September 11, 2001.

At the Livermore Site, the ambulances transport patients to a medical facility that offers care commensurate with the severity of the injury (based on evaluation using emergency medical service protocols). These facilities include the onsite Health Services Department, Valley Care Medical Center (Pleasanton), or Eden Medical Center (Castro Valley).

The LLNL Fire Safety Division participates in several automatic and mutual aid agreements with various offsite agencies. Automatic aid is dispatched without request on a first alarm. Mutual aid assistance is specifically requested after local agency resources have been depleted. LLNL participates in automatic and mutual aid agreements with the city of Livermore Fire Department and the Alameda County Fire Patrol, respectively. LLNL participates in a mutual aid network that extends throughout the State of California.

The LLNL Fire Department responds to approximately 300 of the Livermore/Pleasanton Fire Department's total annual calls. Conversely, the Livermore/Pleasanton Fire Department responds to 3 of the Livermore Site's total annual calls. LLNL responds to an average of 300 Alameda County Fire Patrol calls per year; the Alameda County Fire Patrol typically is not called on to respond to LLNL calls. The California Department of Forestry, which provides mutual aid to Site 300, does not respond to mutual aid requests at the Livermore Site because it does not maintain structural fire equipment. The Livermore Site fire station assists with approximately three wildland fires per year within the California Department of Forestry's jurisdiction. This constitutes less than 1 percent of the California Department of Forestry's total annual calls (LLNL 2003b).

LLNL Fire Station No. 2 is located in Building 890 at Site 300. This facility is part of the overall Fire Safety Division of LLNL and is operated under the direction of the LLNL Fire Chief. The minimum staff level at Fire Station No. 2 is four personnel. LLNL Fire Station No. 2's equipment consists of two large (1,250 and 1,000 gallons per minute) pumpers (the smaller of which is four-wheel drive), one four-wheel-drive pumper (325 gallons per minute), and one ambulance.

The average Site 300 fire station response time onsite is 4.5 minutes. One vehicle and four personnel respond from the Site 300 fire station. In addition, a vehicle from the Livermore Site responds as a "cover" in case an additional fire breaks out. The response time to the Site 300 main gate from the Livermore Site is approximately 15 minutes. Table B.4.4.1–1 provides the number of onsite emergency calls to which the Site 300 Fire Department responded in 1999, 2000, and 2001.

At Site 300, the ambulance transports patients to a medical facility that offers care commensurate with the severity of the injury (based on evaluation using emergency medical service protocols). These facilities include the Sutter Hospital in the city of Tracy or the nearest trauma center.

The LLNL Fire Safety Division maintains mutual aid agreements with several agencies, including the city of Tracy and the California Department of Forestry that could serve Site 300.

The city of Tracy Fire Department and the Site 300 fire station typically do not request aid from each other. The Site 300 fire station has not historically responded to calls within the Tracy Rural County Fire Protection District's jurisdiction. Conversely, the Tracy Rural County Fire Protection District typically receives one call annually from Site 300. The State of California

Department of Forestry and the Site 300 fire station respond to an average of less than three of each other's calls per year (LLNL 2003b).

B.4.4.2 *Police and Security Services*

Police and security services at LLNL are provided by the Protective Force Division of the Safeguards and Security Department. It is the function of the Protective Force Division to provide protection of LLNL personnel and assets (including RHWM staff and facilities). This protection is provided through several elements, including access control, fixed access and surveillance points, random vehicle and foot patrols, response elements, and special response team elements.

The Protective Force Division provides emergency response service to the Livermore Site and Site 300 and has contingency plans to cover credible emergencies, including work stoppages, bomb threats, natural disasters, site-wide evacuations, callout procedures, satellite command center activation procedures, executive protection, alarm response procedures, and civil disorders.

LLNL participates in emergency response agreements with the city of Livermore Police Department, the Alameda County Sheriff's Department, the San Joaquin County Sheriffs Department, the State of California Highway Patrol (CHP), and the Federal Bureau of Investigation (FBI). Offsite agencies generally provide first alarm response to LLNL offsite leased properties (LLNL 2002bz).

The city of Livermore Police Department is rarely requested to respond to calls at the Livermore Site through its emergency response agreement. The Alameda County Sheriff's Department responds to an average of six calls at the Livermore Site per year, which is less than 1 percent of the agency's total annual calls. Site 300 is within Patrol District 8 of the San Joaquin County Sheriff's Department. LLNL did not request assistance from the Sheriff's Department within the past year. The CHP responds to calls from the LLNL Safeguards and Security Department during large-scale demonstrations that have the potential to block Vasco Road and Greenville Road. The CHP responds to calls for crowd control from the LLNL Safeguards and Security Department on an average of once per year. There is occasional interaction with the FBI for criminal and security investigations (LLNL 2002bz).

B.4.4.3 *School Services*

In 2001–2002, student enrollment totaled 606,967 in the region (Table B.4.4.3–1). The local school district is the Livermore Valley Joint Unified School District and includes schools from kindergarten through high school. The local school district serves over 10,000 students from a 240-square mile area that includes the city of Livermore. There is no available information on the number of children of LLNL employees that attend district schools.

TABLE B.4.4.3–1.—*Education in the Region of Influence*

	Alameda	San Joaquin	Contra Costa	Stanislaus	ROI
School Enrollment	217,591	127,354	161,742	100,280	606,967

Source: California Department of Education 2003.

B.4.4.4 *Nonhazardous and Nonradioactive Solid Waste Disposal*

Nonhazardous solid waste generated at the Livermore Site is transported to the Altamont Landfill for disposal. The landfill is estimated to have sufficient capacity to receive waste until the year 2038 (Hurst 2003). The current total daily permitted throughput at the Altamont Landfill is 11,150 tons per day (SWIS 2002).

During 2002, approximately 5,650 metric tons of solid sanitary waste were collected and transported to the Altamont Landfill from the Livermore Site (LLNL 2003bd). Construction wastes make up approximately two-thirds of this total generation, and the remaining one-third consists of plastics, glass, other organics, and other wastes. This waste is stored in 222 onsite containers with average volume capacities of 4 cubic yards each. Waste from 178 of the containers is collected and disposed of daily at the Altamont Landfill by LLNL workers. Waste from the other 31 containers is collected and disposed of twice weekly (remaining containers less frequently) by the same method. In addition, approximately 63.5 tons of landscape clippings (chips, mulch, street sweepings) are composted each month (SWIS 2002, LLNL 2003bd). There are no plans to expand the Livermore Site nonhazardous solid waste storage facilities or to modify nonhazardous waste disposal methods.

In 2002, LLNL diverted almost 60 percent of the 15,300 metric tons of its nonhazardous waste for recycling and reuse. A portion of the nonhazardous waste generated annually is sold for recycling or reuse. Additionally, soil is reused at the Livermore Site and at the landfill for daily cover (LLNL 2002cc). Approximately 560 tons of landscape clippings were composted in 2002 (LLNL 2003bd).

Site 300 wastes are transported to the city of Tracy Material Recovery and Solid Waste Transfer station prior to final disposal. Site 300 represents approximately 3 percent of the LLNL total.

B.4.5 Prehistoric and Historic Cultural Resources

Livermore Site

Records searches conducted prior to and for the 1992 LLNL EIS/EIR did not reveal the presence of prehistoric resources on the Livermore Site (LLNL 1992a). Field surveys conducted by Holman & Associates in the undeveloped western and northern perimeter areas, including a 500-foot wide buffer and undeveloped area survey conducted in 1991, did not reveal the presence of prehistoric resources (LLNL 1992a). Because most of the Livermore Site is developed, the likelihood of finding unrecorded and undisturbed prehistoric sites is low; however, there is still the possibility that undisturbed prehistoric sites lay buried under the modern landscaping.

The Livermore Site has a number of buildings associated with historic events or significant LLNL achievements. Some of the buildings and facilities, or groups of them at the Livermore Site, may be eligible for listing in the National Register of Historic Places (NRHP). To facilitate

evaluation of the properties, an historic context is being developed and analysis of specific individual properties is in progress (LLNL 2002bj). To date, DOE and the State Historic Preservation Officer (SHPO) have evaluated and concurred that 50 buildings are not eligible for listing on the NRHP. The negative or not eligible determinations include the following buildings: 177, 222, 251, 317, 328A, 412, 431, 490, 592, 593, 1253, 1477, 1478, 1482, 1601, 1602, 1631, 1734, 1877, 2512, 2527, 2529, 2530, 2629, 2685, 2687, 2626, 2801, 2802, 2808, 3629, 3703, 3751, 3777, 3903, 3904, 3905, 3907, 3982, 4107, 4180, 4302, 4377, 4378, 4383, 4384, 4387, 4388, 4440, 4442, 8011, and 8806 (LLNL 2003ca).

Site 300

Site 300 has been surveyed for both prehistoric and historic cultural resources and a number of potentially significant prehistoric and historic sites have been identified (LLNL 1992a). The resources include rock shelters and other areas used for the making of stone tools, and the historic Town Site of Carnegie. No formal subsurface testing program has occurred and formal NRHP eligibility determinations are incomplete. Further investigation and delineation of the known resources has resulted in the formation of four archaeological sensitivity areas (LLNL 2002bj). Projects in Sensitive Areas II, III, and IV require that the LLNL archaeologist be contacted. Projects in Sensitive Area I do not require this. Development or ground disturbing activities have not been permitted in or within 300 feet of the delineated areas unless the activity was approved or monitored by LLNL archaeologists (LLNL 2002bj). The EWSF and Building 883 are located in Sensitive Area I. The EWTF is located in Sensitive Area II and requires a LLNL archaeologist be contacted on any projects, including permit modifications.

B.4.6 Aesthetics and Scenic Resources

The Landscape Architecture Master Plan for LLNL provides guidance for development at LLNL (LLNL 2002d). Because there are no strict standards at LLNL for matching exterior building color or style, the landscape architecture planning process is the only means of creating cohesiveness in image. The Landscape Architecture Master Plan is intended to ensure that all site improvements are architecturally compatible with their immediate surroundings and that other aesthetic qualities, such as temperature, wind, and glare are enhanced.

The Livermore Site is within Alameda County. In addition, the western 1,100 feet of the Livermore Site is within the city of Livermore. Most of Site 300 is within San Joaquin County, with a small portion in Alameda County. Because LLNL is a Federal facility owned by DOE, the surrounding cities and counties have no planning jurisdiction for the site. Nevertheless, LLNL does consider local planning policies, to the extent practicable, in its land decisions as a good neighbor policy.

B.4.6.1 *Visual Character of the Project Area*

Regional Character

The Livermore Valley of eastern Alameda County, where the Livermore Site is located, is ringed by hills and mountains that define the regional view shed and provide open space around the development on the valley floor. The terrain in the vicinity of the sites ranges from relatively flat land to gently rolling hills. The hills east and south of the Livermore Site gradually become steeper as they trend eastward to form the Altamont Hills of the Diablo Range. Wind turbines

north and south of the Altamont Pass punctuate the eastern horizon and have become part of the eastern valley landscape identity.

Site 300 is located in the Altamont Hills of the Diablo Range. This area is largely grasslands and low shrubs in areas ranging in topography from gently rolling hills to steeply sloping ridges and drainages. View sheds in the area around Site 300 are severely constrained by topography.

Livermore Site

The Livermore Site has a campus-like or business park-like setting with buildings, internal roadways, pathways, and open space. Portions of the site along the western and northern boundaries remain largely undeveloped and serve as security buffer zones. A row of eucalyptus and poplar trees surrounds much of the developed portion of the Livermore Site and screens most ground-level views of the facility. Onsite buildings range in height from 10 feet to approximately 110 feet. A 9-foot chain-link and barbed-wire security fence surrounds the Livermore Site. The most prominent buildings in the public view shed are the administrative building off of East Avenue in the southwest corner of the site and the NIF in the northeast corner. Both of these buildings are visible from locations along adjacent roads.

The area surrounding the Livermore Site is a mixture of rural and pastoral uses and urban development. SNL/CA is located immediately south of the Livermore Site. Rural residences and grazing land are the primary visual features to the east. The area west of the Livermore Site is occupied by detached residences giving the area a suburban character. A small area of commercial use occupies lands immediately southwest of LLNL. The commercial area is surrounded by a mixture of vineyards and residential uses, although residential development is currently underway and the visual character of the area is shifting from pastoral to suburban. The area north of the Livermore Site to I-580 is industrial, primarily one- and two-story industrial buildings, business parks, and the Union Pacific railroad line that traverses the area. This area is visually similar with the research, business, and industrial character of the Livermore Site.

Site 300

The main gate and GSA of Site 300, including a number of buildings, roads, and infrastructure, are foreground and middle-ground features in view from Corral Hollow Road, which forms the southern boundary of Site 300. Vegetative screening and topography partially obscure many of the features associated with the GSA. The majority of Site 300 is obscured from view by topography.

The surrounding area is primarily undeveloped open space or rural, with some exceptions. Fireworks America is adjacent to and northeast of Site 300. Although the sign at the entrance to the facility is visible from Corral Hollow Road, structures associated with this facility are obscured by topography. The SRI International Testing Facility is approximately 0.6 mile south of Site 300 and is not visible from Corral Hollow Road.

Carnegie State Vehicular Recreation Area, located south of the western portion of Site 300, is used for off-road vehicle use. The park includes dirt trails on the surrounding hillsides and a ranger station, picnic areas, and several contoured riding areas in the valley floor adjacent to Corral Hollow Road. These features are all visible from Corral Hollow Road. The high degree of

modification is substantially out of character with the surrounding open space and rural features of the area.

B.4.6.2 *Sensitive Views in the Surrounding Area*

Locations of visual sensitivity are defined in general terms as areas where high concentrations of people may be present or areas that are readily accessible to large numbers of people. No visually sensitive locations are defined on the Livermore Site or Site 300. The visual sensitivity of areas surrounding the Livermore Site and Site 300 are described below.

Livermore Site

Sensitive views around the Livermore Site include residential areas and scenic routes or visual amenities designated by the city of Livermore or Alameda County.

The Livermore Site is not visible from several designated scenic resource areas (e.g., Wente and Concannon wineries, Tesla historical town site, Altamont Pass Road, Cross Road, and Mines Road) and is only minimally visible from several other designated scenic resource areas as a result of distance or intermittent topography. The Livermore Site is relatively distant from I-580 (approximately 1.5 miles) and views are obstructed by vegetation and development. Only the tallest onsite building on the Livermore Site is intermittently visible from this highway. The Livermore Site is not visible from most of Flynn Road but does occupy the middle-ground views from the western end of Flynn Road. As a result of distance, the facilities are visually indistinct and are consistent with surrounding development. The view of the Livermore Site from Tesla Road is almost completely obstructed by intervening topography.

The Livermore Site is prominently visible from residences near and motorists traveling along Vasco Road. Vegetation that surrounds the Livermore Site obstructs or partially screens most views of the facilities from this area. The buffer zone also provides visual separation between the Livermore Site and surrounding viewers.

The Livermore Site is also visible from residences and vineyards to the southwest, and to motorists traveling north on Vasco Road. Security buffer area and vegetation provide partial screening of the Livermore Site from this view. In addition, residential and vineyard development in this area is currently taking place and will further screen views of the facilities.

The Livermore Site is prominent in views from most of Greenville Road. Although Greenville Road follows the eastern boundary of the Livermore Site, views from this portion of the road are heavily screened by vegetation. Views from Greenville Road south of the Livermore Site are more panoramic due to the elevated viewing perspective, but are partially screened by the rolling topography. The Livermore Site is visually distinct in the foreground and middle ground, but is visually consistent with the overall pattern of development in the view shed.

The Livermore Site is prominent in views from the western portions of Patterson Pass Road from Vasco Road to Flynn Road. Views from Patterson Pass Road adjacent to the Livermore Site, similar to those described for Vasco Road, are largely screened by vegetation and are separated from viewers by a security buffer area. Views toward the west from the lower reaches of Patterson Pass Road are similarly obstructed by vegetation. Views of the facilities from the higher reaches of Patterson Pass Road are obstructed by topography.

Site 300

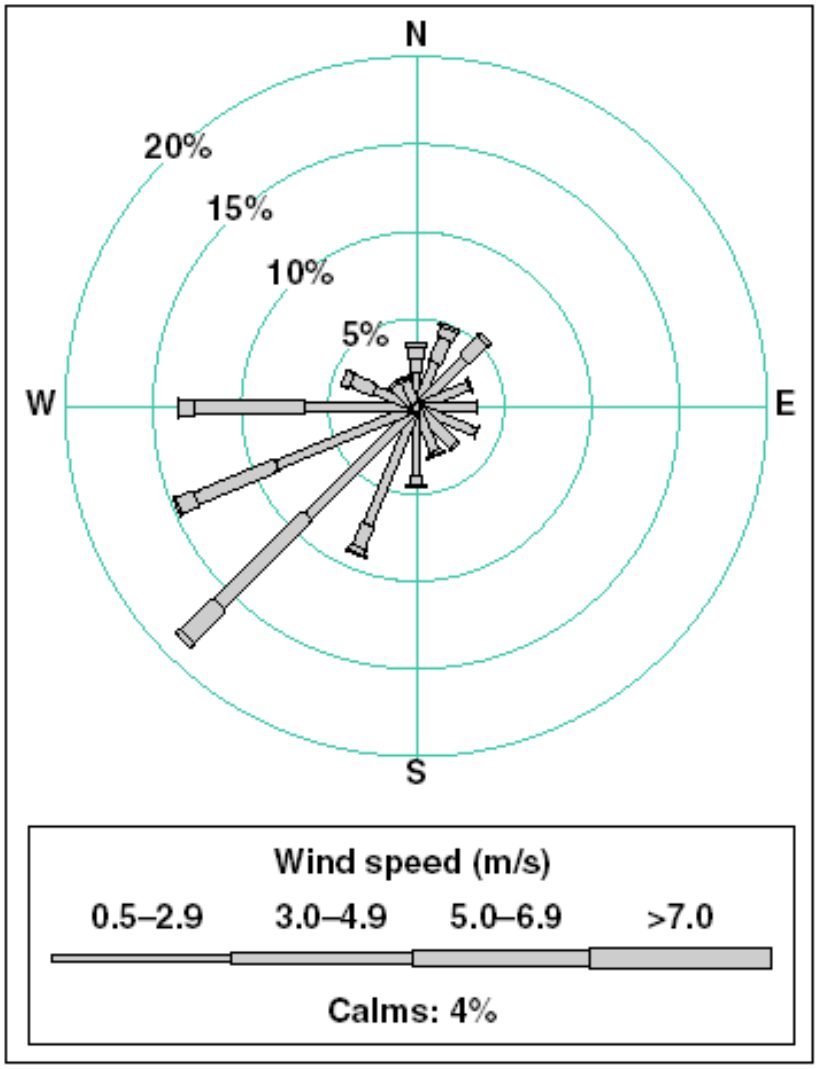
Sensitive views around Site 300 include the Carnegie State Vehicular Recreation Area and scenic routes designated by Alameda County or San Joaquin County.

Site 300 is not within the view shed of any of designated scenic corridors except for a very short section of Tesla Road at the eastern end of Alameda County. Tesla Road becomes Corral Hollow Road in San Joaquin County. Corral Hollow Road follows the southern boundary of Site 300 and affords views of the site, but is not designated as a scenic corridor. Corral Hollow Road, which is adjacent to and south of Site 300, is the nearest public roadway with a view of the site. The view of Site 300 from Corral Hollow Road is of parking areas and several single-story structures in the GSA. The remainder of the view of Site 300 from Corral Hollow Road consists of rolling hillsides and a few scattered small structures on the hilltops. Other than the GSA, the facilities of Site 300 are not apparent in landscape views from publicly accessible viewpoints; however, a 3-foot-high wire fence surrounding Site 300 is visible from Corral Hollow Road, along the site's southern boundary.

Site 300 can be seen from the Carnegie State Vehicular Recreation Area, which lies directly south. One single-story structure (Building 899) and its surrounding light posts are visible from the recreation area. From the picnic area near the park entrance, the view of Site 300 consists primarily of undeveloped hillsides.

B.4.7 Meteorology

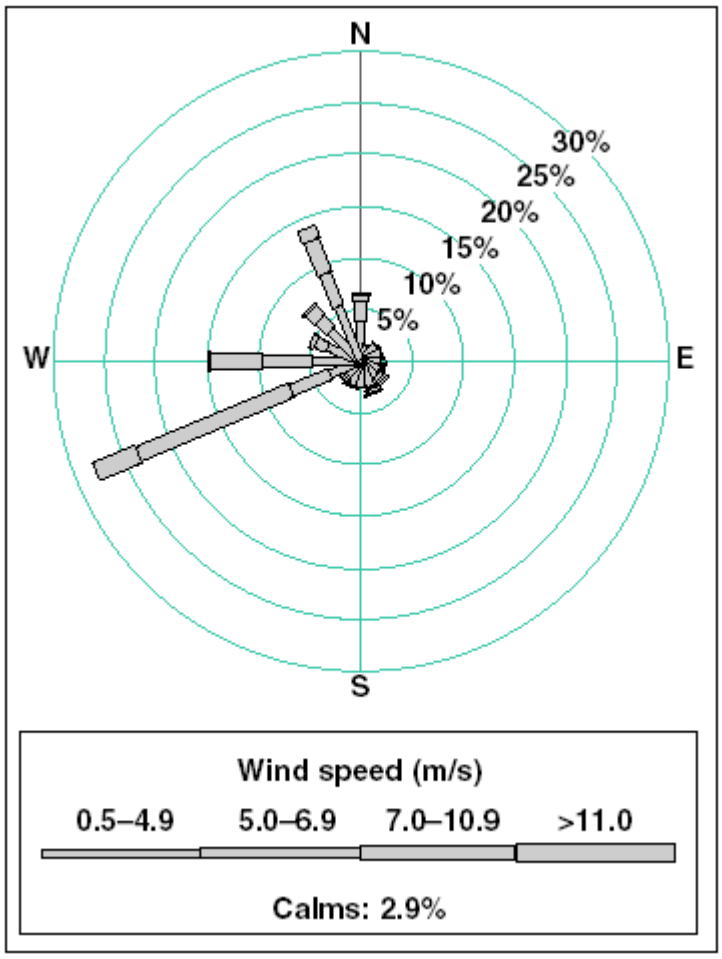
Meteorological data (including wind speed, wind direction, rainfall, humidity, solar radiation, and air temperature) are continuously gathered at both the Livermore Site and Site 300. Mild, rainy winters and warm, dry summers characterize the climate. The mean annual temperature for the Livermore Site in 2001 was 58.5°F. The mean annual temperature for Site 300 in 2001 was 59°F. Temperatures range from 23°F during some predawn winter mornings to 104°F during some summer afternoons. Both rainfall and wind exhibit strong seasonal patterns. These wind patterns tend to be dominated by the thermal draw of the warm San Joaquin Valley that results in wind blowing from the cool ocean toward the warm valley, increasing in intensity as the valley heats up. The wind blows from the northeast primarily during the winter storm season. Most precipitation occurs between October and April, with very little rainfall during the warmer months. Annual wind data for the Livermore Site are given in Figure B.4.7–1. These data show that about 50 percent of the wind comes from the southwest to westerly direction. This prevailing pattern occurs primarily during the summer. During the winter, the wind often blows from the northeast. Based on a 10-year record, the highest and lowest annual rainfalls were 21 and 7.2 inches, respectively and the average annual rainfall was 14 inches. In 2001, the Livermore Site received 13.4 inches of rain.



Source: LLNL 2002bx, LLNL 2002ci.

FIGURE B.4.7–1.—*Wind Rose Showing the Frequency of Occurrence for Wind Speed and Direction at the Livermore Site, 2001*

The meteorological conditions at Site 300, while generally similar to those at the Livermore Site, are modified by higher elevation and more pronounced topological relief. The complex topography of the site significantly influences local wind and temperature patterns. Annual wind data are presented in Figure B.4.7–2. The data show that winds are more consistently from one wind direction, the west-southwest, and reach greater speeds than at the Livermore Site. Rainfall for 2001 was 9.7 inches at Site 300. As in the case for the Livermore Site, precipitation is seasonal, with most rainfall occurring between October and April.



Source: LLNL 2002bx, LLNL 2002ci.

FIGURE B.4.7–2.—*Wind Rose Showing the Frequency of Occurrence for Wind Speed and Direction at Site 300, 2001*

B.4.8 Geological Resources and Hazards

This section provides a summary of the affected physical environment, including discussions of the local and regional geological setting, stratigraphy, soils, structural geology, and geographic hazards (including seismicity) for both the Livermore Site and Site 300 relative to the RHWM facilities.

B.4.8.1 *Livermore Site Geological Setting Overview*

The Livermore Valley is an east-west trending synclinal structure composed primarily of gently deformed alluvial deposits overlying complexly deformed Cenozoic and Mesozoic rocks. Most of the faults in the region are right-lateral strike-slip faults associated with the San Andreas Fault system. The Livermore Valley is bordered by the Calaveras Fault to the west, the Greenville Fault to the east, the Tassajara Hills and Mount Diablo to the north, and the Diablo Range to the south.

The oldest rock units exposed in the Livermore area consist of the highly deformed sedimentary, igneous, and metamorphic rocks of the Jurassic-Cretaceous Franciscan Assemblage. These rocks are structurally overlain by the Cretaceous Great Valley Sequence, consisting of alternating beds of sandstone, siltstone, and shale. Both of these units are intricately folded and faulted in the mountains surrounding the Livermore Valley.

Stratigraphy—Radioactive and Hazardous Waste Management Facilities

The sediments beneath the Livermore Site are late Tertiary and Quaternary alluvial sediments known as the Livermore Formation. The maximum thickness of the Livermore Formation is thought to be approximately 4,000 feet. This formation has been divided into Upper and Lower Members. The Upper Member of the Livermore Formation is characterized by massive gravel beds mixed with sand, silt, and clay. The Lower Member of the Livermore Formation is dominated by greenish- to bluish-grey silt and clay, with lenses of gravel and sand (DOE 2001a).

Structure—Radioactive and Hazardous Waste Management Facilities

The Livermore Site is located near the boundary between the North American and Pacific tectonic plates, and the area is characterized by the San Andreas Fault system that trends northwest. The Diablo Range, which includes the Altamont Hills, is part of the northwest-trending Coast Ranges, and parallels three major faults in the area: the San Andreas Fault system, the Sur-Nacimiento Fault, and the Coast Range thrust fault system (the Sur-Nacimiento Fault and the Coast Range thrust). These faults can generally be considered to define three different lithologic blocks. The westernmost block is the Salinian Block, consists primarily of metamorphic and granitic rock. To the east of the Salinian Block is the Franciscan Assemblage, lying between the San Andreas and the Coast Range thrust fault zones. It is composed of marine sedimentary and volcanic rocks. The next block positioned above the Coast Range thrust fault zone consists of late Mesozoic through late Tertiary marine sedimentary rocks overlying complex ancient oceanic and continental crust rocks. This block lies primarily along the eastern margin of the Coast Range Province. Structural relationships along the Coast Range thrust are complex due to later reactivation of the thrust by high-angle normal and strike-slip faults.

The Hayward Fault, which is part of the San Andreas Fault system (see Figure B.4.8.1–1), forms the western boundary of the East Bay Hills and is located about 17 miles west of the Livermore Site. Another branch of the San Andreas Fault system, the Calaveras Fault zone, trends northwest through the San Ramon Valley, which borders the Livermore Valley to the west. A major structural feature north of the Livermore Valley is the Mount Diablo Complex. This complex consists of folded and thrust-faulted rock in the vicinity of Mount Diablo and the surrounding hills. This complex is bordered on the northeastern edge by the Green Valley-Clayton Fault system. The Suisun Bay is to the north and the Livermore Valley to the southeast flank of the Diablo Complex. The two regional northwest-southeast trending fault zones located closest to the Livermore Site waste management facilities are the Greenville Fault zone and the Tesla-Las Positas Fault zones.

None of the Livermore Site waste management facilities, including the DWTF, are located within 200 feet of an active fault. The north branch of the Las Positas Fault is the closest fault to Livermore Site waste management facilities. The Las Positas Fault is approximately 2,700 feet south of the DWTF. The DWTF is approximately 3,500 feet west of the nearest potentially active fault strands in the Greenville Fault zone (LLNL 2002da).

Soils—Radioactive and Hazardous Waste Management Facilities

The soils beneath the Livermore Site are formed primarily upon sediments deposited by local streams. Four soils cover most of the Livermore Site vicinity. In order of decreasing extent these soils are Rincon loam (Areas 612 and 514 and Buildings 280 and 233 CSU), Zamora silty clay loam, San Ysidio loam, Yollo gravelly loam, and Rincon clay loam (DWTF). These soils are primarily Alfisols, or moderately developed soils, and grade into Mollisols, which are grassland soils (LLNL 2001af).

Seismicity—Radioactive and Hazardous Waste Management Facilities

Three principal components of the San Andreas Fault system in the San Francisco Bay Area, the San Andreas, Hayward, and Calaveras faults, have produced the majority of significant historical earthquakes in the Bay Area. These three faults also accommodate the majority of slip along the Pacific and North American plate boundary and they would likely continue to generate moderate to large earthquakes more frequently than other faults in the region. The potential for local, damaging earthquakes was highlighted by the January 1980 Livermore earthquake sequence on the Greenville fault, which produced two earthquakes of magnitudes 5.5 and 5.6 on the Richter Scale. The earthquake caused structural and nonstructural damage to the LLNL facilities. In most cases, earthquakes in the Livermore Valley region have occurred on strike-slip faults, generally indicating north-south-oriented compression. The fault segment nearest LLNL may be capable of generating a magnitude 6 to 6.5 earthquake (LLNL 2002da). A recent U.S. Geological Survey study of the likelihood of major earthquakes in the San Francisco Bay Area has determined that there is a 62 percent probability of one or more earthquakes with a magnitude of 6.7 or greater occurring with 30 years (USGS 2003). The study concluded that the probability of these earthquakes occurring along the Calaveras, Greenville, and Mt. Diablo Thrust faults within the next 30 years was 11 percent, 3 percent, and 3 percent, respectively. The study calculated that there was a 50 percent chance of the Livermore area exceeding a ground shaking of Modified Mercalli (MM) intensity VII to VIII.

The existing waste management facilities were built to the seismic criteria required at the time of their construction. Any structural modifications to these buildings are done in accordance to the Uniform Building Code (UBC) standards in place at the time of modification. All new construction at the Livermore Site is in accordance with the criteria specified in DOE O 6430.1A and current UBC standards. LLNL follows the criteria of the Seismic Safety Program of the *Health and Safety Manual*.

Buildings 612, 614, and 625 have been seismically reviewed and have received a performance rating of "Good," which indicates that during a major seismic disturbance some structural and nonstructural damage and falling hazards may result, but that these would not significantly jeopardize life.

Building 693, built in 1987, was constructed to meet the 1985 UBC seismic standards, which were the standards in effect at that time. Building 280 meets the 1994 and all previous UBC seismic standards. Building 695 and Building 693 Annex have been designed to meet 1994 UBC seismic standards.

B.4.8.2 *Site 300 Geologic Setting Overview*

Site 300 occupies approximately 7,000 acres of steep ridges that decrease in elevation toward the southeast. The lowest elevation onsite, where Corral Hollow Creek follows the southern Site 300 southern boundary, is approximately 500 feet above mean sea level. The principal faults in the vicinity of Site 300 are the Corral Hollow-Carnegie, Black Butte, and Midway faults. These faults are discussed in detail in Appendix H. The active Carnegie Fault of the Corral Hollow-Carnegie Fault zone crosses the southern portion of the site. The Elk Ravine Fault, a complex structure composed of pre-Holocene strike-slip faults, reverse faults, normal faults, and local folds, crosses Site 300 from the northwest corner to the southeast corner (Dibblee 1980d). Site 300 soils have developed on marine shales and sandstones, uplifted river terraces, and fluvial deposits. They are classified as loamy Entisols. Entisols are young soils that have little or no horizon development. Clay-rich soils, known as Vertisols, are also present and have been mapped as the Alo-Vaquero Complex. Vertisols are mineral soils characterized by high clay content that display shrink/swell capability. The remaining soil types identified at Site 300 occur only in limited areas. These units are mixtures of soils described and are not readily separable, including grassland Mollisols, or are poorly developed Inceptisols (USDA 1966, 1990).

Stratigraphy—Site 300 Radioactive and Hazardous Waste Management Facilities

The Building 883 area is underlain by unconsolidated Quaternary alluvial and terrace deposits associated with old and present-day stream channels of Corral Hollow Creek. These deposits consist of brown clay, silt, sand, and gravel lenses. Quaternary alluvial deposits predominate in the near Building 883. The Quaternary terrace remnants represent deposits of ancestral Corral Hollow drainage systems. The units are essentially flat-lying in the area and unconformably overlie the late Miocene Neroly and Cierbo Formations. In general, the Neroly Formation in the GSA and vicinity is composed of poorly consolidated, blue-weathering volcaniclastic sandstone and siltstone with interbedded claystone and rare conglomerate. Neroly Formation beds dip generally from 80° to 18° southwesterly.

All three regional stratigraphic members that comprise the Neroly Formation have been encountered in wells drilled in the area: upper blue sandstone member, middle claystone member, and lower blue sandstone. The uppermost, locally recognized, stratigraphic member of the Neroly Formation, upper siltstone and claystone, is not present in the Building 883 area. Its absence may reflect either nondeposition or erosion prior to deposition of the latest overlying Tertiary deposits. The blue-gray sandstone underlies areas east and west of Site 300 and is exposed to the east.

Structure—Site 300 Radioactive and Hazardous Waste Management Facilities

The EWTF located near the center of Site 300 is underlain by interbedded sandstones, claystones, and conglomerates that comprise the lower portions of the late Miocene Neroly formation. This formation underlies most of Site 300. Groundwater underlies the EWTF at depths that vary from 80 to 130 feet (LLNL 1997i).

The nearest fault mapped in the vicinity of the EWTF is the Elk Ravine Fault that passes about 1,000 feet to the northeast. Repeated studies of various strands of this fault have shown no evidence of Holocene activity (LLNL 1997i).

The EWTF is located in the south central portion of Site 300. Available geological mapping studies indicate that the storage magazines are excavated into Quaternary terrace gravels and underlain by dense, semilithified clays, silts, and silty sands correlated with the Pliocene nonmarine sequence of Dibblee. The Neroly Formation underlies the area at greater depths and probably is host to the regional water table (LLNL 1997i).

The nearest mapped fault to the EWTF is the unnamed fault identified in 1982 during early geologic mapping studies. In the northeastern portion of Site 300, this fault appears to offset the contact between the Neroly Formation and the Pliocene nonmarine sequence about 50 feet vertically. No detailed studies are available (LLNL 1997i).

The principal faults mapped in the vicinity of Building 883 include the Corral Hollow-Carnegie Fault system. The Carnegie Fault trends northwest-southeast in the southwest part of Site 300 and merges with the Corral Hollow Fault southwest of the Building 883. This fault system is considered to be active. Within the area, a reverse fault with approximately 8 feet of apparent slip is exposed in the cut slope north of Building 874. Other faults are postulated in the subsurface of the area based on cross sections constructed using seismic data, geophysical logs, and lithologic logs. Fault interpretations are also supported by locally steep gradients on potentiometric surface maps and pump test information. Insufficient information is available at this time to determine the orientation and extent of these faults in the subsurface or of the fault exposed north of Building 874. Nine abundant joints and fractures are present in the Neroly Formation in the GSA and vicinity. Mineral coatings of manganese and iron oxides have been found on fractures in drill core indicating the fractures are a natural phenomenon and not the result of drilling activities. Most fractures observed in drill core occur subparallel to bedding planes in brittle claystone and siltstone and as subvertical joints in resistant, locally cemented sandstone beds. These observations suggest that the more brittle, finer-grained strata may be more responsive to stress. Fossil plants and leaves, typically coated with manganese oxide and lesser iron oxide, may also weaken bedding planes. At deep monitor well W-25N-04, fractures may transport most, if not all, groundwater produced.

Soils—Site 300 Radioactive and Hazardous Waste Management Facilities

Within the Building 883 area, soils consist primarily of the Alo Vaquero complex with the northeast and northwest portion of the area covered by the Wisflat-Arburua-San Timoteo complex. The Alo-Vaquero complex is comprised of clay to silty clay, which is calcareous below 10 inches, typically grading to shale and sandstone at 20 to 40 inches. These soils are well-drained with relatively low permeability and low water-holding capacity. Runoff from Alo-Vaquero soils is medium to rapid, and erosion hazards are moderate to severe. Excessive shrinking and swelling of these soils may occur. The Wisflat-Arburua-San Timoteo complex soils consist of well- to very well-drained sandy to clayey loam with moderate to moderately high permeability and low to very low water-holding capacity. Runoff from these soils is high, and the erosion hazard is severe.

Seismicity—Site 300 Radioactive and Hazardous Waste Management Facilities

Site 300 is located near the eastern edge of the Coast Range Province, which is characterized by northwest trending, strike-slip faults of the San Andreas Fault system. The boundary between the Coast Ranges and the San Joaquin Valley lies immediately east of Site 300 and is characterized by east-northeast compression, resulting in reverse and thrust faulting and folding. The principal faults in the vicinity of Site 300 are the Corral Hollow-Carnegie, Black Butte, and Midway faults. These faults are further described in Appendix H. The active Carnegie Fault of the Corral Hollow-Carnegie Fault zone crosses the southern portion of the site. No significant recorded earthquakes have occurred on any of the local faults.

B.4.9 Ecology

B.4.9.1 *Vegetation*

The Livermore Site RHWM facilities cover less than 5 percent of the 821-acre site. The vegetation at this site was initially altered in the 1800s when livestock grazing began on a large scale in the Central Valley and surrounding areas of California.

The plant communities at the Livermore Site were further degraded and destroyed when the U.S. Navy acquired the land in 1942 and covered the site with concrete runways, roads, and buildings. In addition, Arroyo Las Positas, which flowed through the site, was channelized and now traverses part of the eastern boundary and flows through the northern part of the site.

A survey was conducted in June 2002, which confirmed that site conditions and species composition have changed relatively little during the past 10 years. The developed areas at the Livermore Site, including areas near Buildings 233 CSU and 280, DWTF, and Areas 514 and 612, are planted with ornamental vegetation and lawns. There are also small areas of disturbed ground with early successional plant species. The undeveloped land in the security zone (located north of DWTF) is the introduced grassland plant community dominated by nonnative grasses such as wild oat, brome grasses, foxtail barley, curly dock, and wild radish years (Jones and Stokes 2002a).

Plant species along Arroyo Las Positas (located north of the DWTF) were observed to be essentially those found during a 1997 survey. Common species in the annual grassland along the upper channel bank of the arroyo include wild oats, brome grasses, alkali mallow, and yellow star-thistle (Jones and Stokes 2002a, 2002c).

Site 300 covers approximately 7,000 acres of land in eastern Alameda County and western San Joaquin County. The northern portion is characterized by rolling hills while the southern part consists of steep, deep canyons. The site was acquired in 1953 and, since then, no grazing or farming has taken place. A relatively small part (approximately 5 percent) has been developed for all LLNL activities (less than one percent are waste management-related); the remainder is undisturbed, except for controlled burning. Controlled burning takes place every year on approximately 2,000 acres of land, including areas surrounding the EWTF. Approximately 620 acres of formerly designated California red-legged frog habitat is located in the southwestern half of Site 300. Both the EWSF and Building 883 are located in this area. A 385-acre area including formerly designated as Alameda whipsnake critical habitat is located in the

southwestern quarter of Site 300. None of the Site 300 waste management facilities are located in the area (Jones and Stokes 2001, USFWS 2002a).

Several site-wide vegetation surveys have been conducted at Site 300. These surveys have identified a total of 406 plant species at this site (Jones and Stokes 2002a).

B.4.9.2 *Fish and Wildlife*

A total of 4 species of fish, 6 species of amphibians and reptiles, 52 species of birds, and 10 species of mammals were reported observed at the Livermore Site during the biological survey for the 1992 LLNL EIS/EIR or in subsequent documentation (LLNL 1992a, USFWS 1998, LLNL 2003bz).

Wildlife includes species that live in the undeveloped grassland and species that live in the developed areas or along the arroyo (north of DWTF). Representative species observed in the undeveloped grassland areas include the fence lizard, the black-tailed hare, the California ground squirrel, the red fox, and the western meadowlark. Nesting birds include the American crow, American robin, house finch, mockingbird, and house sparrow. These species nest in the planted trees onsite (in the vicinity of all waste management facilities). A raven's nest was observed among some pipes at the Livermore Site.

Recent studies have provided new information about raptor activity at the Livermore Site. In 1996, the red-shouldered hawk, not previously known to occur on LLNL property, nested at the Livermore Site (LLNL 1997e). In 1999, 3 pairs of nesting white-tailed kites, a state-protected bird of prey, successfully fledged 18 young at the Livermore Site. The kites were marked with aluminum leg bands to initiate long-term studies of the species in a semi-urban edge habitat (DOE 2001a, LLNL 2001v).

Site 300, with large areas of undisturbed vegetation, interspersion of various plant community types, and availability of water at springs, provides habitat for a diversity of wildlife. A total of 20 amphibian and reptile species have been observed at Site 300. The scarcity of permanent water limits the potential of Site 300 to support more than a few species of amphibians. Aquatic habitat is available at the sewage lagoon (located east of Building 883) and some of the drainages contain aquatic vegetation supported by underground springs and seeps. Two species of salamanders were observed: the California slender salamander and the California tiger salamander. The latter species was observed during 1986 biological surveys, but not during 1991 surveys. Frog and toad species known to occur onsite are the western toad, Pacific treefrog, and California red-legged frog.

Conditions are far more favorable for reptiles than for amphibians at Site 300. Grassland provides ideal habitat for racers and gopher snakes. Rock sites provide suitable habitat for such species as the western fence lizard, western skink, common kingsnake, and the western rattlesnake. Seeps and springs provide excellent habitat for the northern alligator lizard. Side-blotched lizards and California horned lizards frequent areas with more open vegetation and sandy soils.

A total of 90 bird species have been observed at Site 300 in 2002 (LLNL 2003by). Although grasslands normally support a limited resident bird population, the Site 300 interspersion of several different plant community types and an abundance of seeds and insects provide good habitat for a variety of birds. The western meadowlark, horned lark, and savannah sparrow were the most common small birds seen throughout the open grassland areas. Vegetation at springs and seeps provides nesting habitat for the red-winged blackbird. These permanent water sources attract a greater number of birds than normally found in the adjacent grasslands. For example, mourning dove, cliff and barn swallow, and California quail all require daily water. Oak woodland and a few cottonwood provide nesting habitat for the western kingbird, northern oriole, loggerhead shrike, and American goldfinch. Coastal sage scrub supports scrub jay, Anna's hummingbird, rufous-crowned sparrow, and white-crowned sparrow. Ecotones (boundary areas between two habitats) of sage scrub and grassland provide ideal habitat for mourning dove, California quail, lazuli bunting, and lark sparrow. Rocky outcrops and cliffs provide breeding sites for white-throated swift, cliff swallow, Say's phoebe, and rock wren. Site 300 supports a population of nesting raptors. A report is in progress to provide the current status of foraging and nesting activities of such raptors as the great horned owl, barn owl, golden eagle, prairie falcon, red-tailed hawk, northern harrier, and short-eared owl.

A total of 30 mammal species have previously been observed onsite. Mammals were recorded during threatened and endangered species surveys that included ground surveys over the entire site, night spotlighting, establishment of scent stations in 1986 and 1991, and small-mammal trapping in 1986 (LLNL 1992a). An inventory was recently conducted on small mammals at Site 300, and 10 small mammal species were identified (Jones and Stokes 2002b).

Productive and diverse grasslands on Site 300 support an abundance of rodents and lagomorphs (rabbits and hares). Conditions are ideal for California ground squirrels in the northern portion of Site 300 where the terrain is less rugged. Other common rodents include the house mouse, deer mouse, brush mouse, western harvest mouse, California vole, Heermann's kangaroo rat, San Joaquin pocket mouse, California pocket mouse, and valley pocket gopher (Jones and Stokes 2002b). Lagomorphs such as black-tailed hares and desert cottontails are also widespread and abundant, with the latter tending to occupy areas with more cover.

B.4.9.3 *Threatened and Endangered Species*

Detailed studies for threatened, endangered, and other species of concern (referred to as sensitive species in this section) were conducted at the Livermore Site and Site 300. Other species of concern refer to Federal candidate species and State of California species of special concern. The biological assessment currently under regulatory agency informal consultation includes a list of potential sensitive species that may occur at the sites. As a result of recent surveys and previous consultations, six federally listed species and two state-listed species have been identified at or near Site 300.

No sensitive plants, invertebrates, reptiles, or mammals were observed during the 1992 or recent biological surveys at the Livermore Site (LLNL 1992a, USFWS 2002a). The California red-legged frog, a federally listed threatened species and a State species of special concern occurs at the Livermore Site.

Although the U.S. Fish and Wildlife Service (USFWS) established critical habitat for the species in March 2001 (66 FR 14626), the critical habitat was later rescinded by a court order. At the Livermore Site, formerly designated critical habitat for the California red-legged frog is present in the North Buffer Zone, just north of the DWTF (LLNL 2002cc). It is possible that the USFWS will later re-establish the critical habitat.

Although the California tiger salamander, a federally proposed threatened species and state species of special concern, is not presently found at the Livermore Site, it has been observed in land near the installation (LLNL 1992a, LLNL 2002cc). The DWTF and Areas 514 and 612 are located adjacent to formerly designated critical habitat for the California red-legged frog.

The loggerhead shrike, a Federal species of concern and a State species of special concern, has recently been reported nesting in developed areas at SNL/CA (NNSA 2003a).

The only federally protected plant species known to occur at Site 300 is the large-flowered fiddleneck (a federally listed and state-listed endangered species). A portion of Site 300 has been designated as critical habitat for the plant (Jones and Stokes 2002c). None of the RHWM facilities are located in this area.

B.4.9.4 *Wetlands*

Wetlands, although very limited at the Livermore Site, do occur along Arroyo Las Positas at the northern perimeter of the site, adjacent to the DWTF. In 1992, 0.36 acre was determined to qualify as jurisdiction wetland. The wetland was dominated by salt grass, and cattails occurred on one-third of the wetland (LLNL 1992a, Jones and Stokes 2002c).

Since 1992, wetlands along Arroyo Las Positas have increased due to the release of water associated with environmental restoration activities at the Livermore Site. In 1997, an additional wetland delineation study was performed along Arroyo Las Positas. That study determined that the size of jurisdictional wetlands had expanded to approximately 1.96 acres and involved three different wetland plant communities. Approximately 1.22 acres of ruderal wetland was identified dominated by tall flatsedge, bristly ox-tongue, bearded sprangletop, Bermuda grass, and barnyard grass (Jones and Stokes 2002c).

Approximately 0.65 acre of freshwater marsh was delineated dominated by cattails and bullrushes. Finally 0.09 acre of riparian scrub was observed dominated by willows and a small stand of cottonwoods (Jones and Stokes 2002c).

A study for the EIS for previous site-wide operations delineated 6.76 acres of wetlands at Site 300 (LLNL 1992a). In August 2001, another wetland delineation study was conducted identifying 46 wetlands and determining that the total size of wetlands had increased to 8.61 acres. Approximately 4.39 acres were found to meet criteria for jurisdictional wetlands. These wetlands are small in nature and include freshwater seeps, runoff from some of the buildings, vernal pools, and seasonal ponds (Jones and Stokes 2002c). Many of the wetlands occur at springs in the bottom of deep canyons in the southern half of the site. RHWM facilities are associated with wetlands at either the Livermore Site or Site 300.

B.4.10 Air Quality

Radiological air quality is discussed below. The section provides radionuclide emission estimates as well as dose calculations for maximally exposed receptors and the populace. Dose estimates are also compared to EPA standards designed to protect members of the public.

Section B.4.10.2 details LLNL's air pollutant sources and emissions. While both LLNL sites are discussed, focus is weighted more heavily on the Livermore Site because it is significantly larger in terms of the number of sources, permitted equipment, emission rates, and employee traffic.

B.4.10.1 *Radiological Air Emissions*

LLNL uses and manages a variety of radioisotopes, including uranium, TRUs, biomedical tracers, tritium, and mixed-fission products and waste, for research purposes. The major radionuclide released to the atmosphere from the Livermore Site is tritium. In addition to effluent sampling for tritium, a number of facilities at the Livermore Site (including the DWTF and Building 514) have air effluent samplers to detect the release of uranium and TRU aerosols. LLNL also monitors diffuse, or nonpoint, sources to fulfill the National Emission Standard For Hazardous Air Pollutants (NESHAP) requirements. Summary data from several point and diffuse sources can be found below. Assessment of air effluent emissions and resulting dose to the public is performed by monitoring emissions and/or evaluating potential emissions. Radiological emissions from LLNL RHWM facilities, LLNL operational facilities, and other sources and subsequent exposure to members of the public are considered minor (LLNL 2002bb).

For the Livermore Site, the dose calculated for the site-wide maximally exposed individual (MEI) from diffuse emissions in 2001 totaled 0.011 millirem. The dose due to point sources was 0.0056 millirem. When combined, the total annual dose was 0.017 millirem, 66 percent from diffuse and 34 percent from point sources. The total dose to the Site 300 site-wide MEI from operations in 2001 was 0.054 millirem. Point source emissions from firing table explosives experiments accounted for 0.050 millirem, or 93 percent, of this total, while 0.0037 millirem, or about 7 percent, was contributed by diffuse sources containing low levels of depleted uranium, representing resuspension by wind of soil throughout the site.

Tritium accounted for more than three-quarters of the Livermore Site's calculated dose, while at Site 300, practically the entire calculated dose was due to the isotopes uranium-238, uranium-235, and uranium-234 in depleted uranium. LLNL doses from air immersion and ground irradiation are negligible for both tritium and uranium.

Table B.4.10.1–1 shows the facilities or sources (four of the eight are RHWM facilities) that accounted for more than 90 percent of the doses to the site-wide MEI for the Livermore Site and Site 300 in the year 2001. Although LLNL has nearly 200 sources releasing radioactive material to the air, most are very minor; nearly the entire radiological dose to the public comes from fewer than a dozen sources. The trends in dose to the site-wide MEI from emissions at the Livermore Site and Site 300 over the last 12 years are shown in Table B.4.10.1–2. The general pattern, particularly over the last decade, shows year-to-year fluctuations around a quite low dose level, staying at or below about 1 percent of the Federal standard.

The site-wide MEI dose estimates are intentionally conservative, predicting potential doses that are generally higher than would actually be experienced by any member of the public.

Common Radiological Effect Terminology

Dose: the energy imparted to matter by ionizing radiation; the unit of absorbed dose is the rad, equal to 0.01 joules per kilogram for irradiated material in any medium.

Diffuse source: any unconfined area (e.g., entire building or yard, ground, large tank, or evaporator).

Effective dose equivalent (EDE): an estimate of the total risk of potential effects from radiation exposure, it is the summation of the products of the dose equivalent and weighting factor for each tissue. The weighting factor is the decimal fraction of the risk arising from irradiation of a selected tissue to the total risk when the whole body is irradiated uniformly to the same dose equivalent. These factors permit dose equivalents from non-uniform exposure of the body to be expressed in terms of an effective dose equivalent (EDE) that is numerically equal to the dose from a uniform exposure of the whole body that entails the same risk as the internal exposure (ICRP 1990). The EDE includes the committed EDE from internal deposition of radionuclides and the EDE caused by penetrating radiation from sources external to the body, and is expressed in units of rem (or sievert).

Maximally exposed individual (MEI): a hypothetical member of the public at a fixed location who, over an entire year, receives the maximum EDE (summed over all pathways) from a given source of radionuclide releases to air. Generally, the MEI is different for each source at a site.

Point source: any confined and discrete conveyance (e.g., pipe, ditch, well, or stack).

Rem: a unit of radiation dose equivalent and EDE describing the effectiveness of a type of radiation to produce biological effects; coined from the phrase "roentgen equivalent man," and the product of the absorbed dose (rad), a quality factor (Q), a distribution factor, and other necessary modifying factors. One rem equals 0.01 sievert.

Sievert (Sv): the international unit of radiation dose equivalent and EDE, that is the product of the absorbed dose (gray), quality factor (Q), distribution factor, and other necessary modifying factors. 1 Sv equals 100 rem.

Site-Wide Maximally Exposed Individual (MEI): a hypothetical person for each LLNL location (Livermore Site and Site 300) who receives, at the location of a given publicly accessible facility (such as a church, school, business, or residence), the greatest LLNL-induced EDE (summed over all pathways) from all sources of radionuclide releases to air at a site. Doses at this receptor location caused by each emission source are summed, and yield a larger value than for the location of any other similar public facility. This individual is assumed to continuously reside at this location 24 hours per day, 365 days per year.

B.4.10.2 *Nonradiological Air Emissions*

All LLNL activities with the potential to produce air pollutant emissions are evaluated to determine the need for air permits and assess continued compliance. Sources that have been determined to be exempt from permit requirements are monitored to substantiate that each source operates in agreement with exemption specifications (e.g., throughput remains within the limits of a specified exempt quantity).

In 2002, LLNL operated 199 air emission sources for the Livermore Site and 44 air emission sources for Site 300. Air emission source permits are listed in the RCRA Part B Permit and include waste operations in Building 612, Building 514 and the EWTF. A general listing of air permits is provided in Table B.4.10.2–1.

TABLE B.4.10.2–1.—*Summary of Air Permits Active in 2002*

Category	Permitted Units	
	Livermore Site	**Site 300**
Coating, printing, and adhesives	Paint spray booths Adhesives operations Optic coating operations Printing press operations Silk-screening operations Silk-screen washers	Paint spray booth
Combustion	Boilers Emergency generators Diesel air-compressor engines	Boilers Emergency generators
Explosives testing	Fire test cells and firing tanks	Contained Firing Facility
Gasoline dispensing	Gasoline dispensing operation	Gasoline dispensing operation
Machining	Metal machining and finishing operations	-
Ovens	Ovens	Drying ovens
Remediation	Groundwater air strippers/dryers	Groundwater air strippers Soil vapor extraction units
Materials handling	Drum crusher Paper-pulverizer system	Woodworking cyclone (exhaust system control device)
Solvent cleaning	Cold cleaners Manual wipe-cleaning operations	-
Miscellaneous	Oil and water separator Sewer diversion system Storage tanks with VOCs in excess of 1.0% Semiconductor operations Material-handling equipment	Explosive waste treatment units
Total Permitted Units	**199**	**44**

Source: LLNL 2003l.
RHWM = radioactive and hazardous waste management; VOC = volatile organic compound.

Site-wide criteria pollutant emission rates for LLNL are provided in Table B.4.10.2–2. The Livermore Site currently emits approximately 90 kilograms per day of criteria air pollutants from both permitted and exempt sources. The largest sources of criteria pollutants from the Livermore Site are surface coating operations, internal combustion engines, solvent operations, and oil and natural gas-fired boilers. The largest sources at Site 300 are internal combustion engines, boilers, a gasoline-dispensing operation, open burning of brush for fire hazard management, paint spray booths, drying ovens, and soil vapor extraction operations (LLNL 2002cc).

Finally, a separate Federal listing of approximately 200 compounds is evaluated to confirm applicability under NESHAP. Emission rates at both LLNL sites are less than one-half of the thresholds of 7 tons per year for a single hazardous air pollutant (HAP) or 15 tons per year for a combination of HAPs (LLNL 2002e).

TABLE B.4.10.2–2.—*Criteria Air Pollutant Emission Rates*

	Estimated Releases (kilograms per day) [a]									
	Livermore Site					Site 300				
Pollutant	**1998**	**1999**	**2000**	**2001**	**2002**	**1998**	**1999**	**2000**	**2001**	**2002**
Precursor organic compounds	25	24	20	19	16	0.90	1.2	0.4	0.1	0.23
Nitrogen oxides	56	81	54	52	67	2.1	3.2	2.3	0.9	1.1
Carbon monoxide [b]	11	24	14	14	17	0.48	0.71	0.5	1.1	1.0
Particulates (PM_{10})	5.7	8.6	5.5	5.5	6.1	0.53	0.33	0.2	0.3	0.09
Oxides of sulfur	0.72	0.98	0.6	0.6	2.8	0.15	0.28	0.2	0.1	0.07

Source: LLNL 2002cc, LLNL 2001v, LLNL 2000g, LLNL 1999c, LLNL 2003l.
[a] One kilogram equals 2.2 pounds.
[b] In 1999, the emission factor used to calculate carbon monoxide was 0.035 pounds per 1,000 cubic feet for large boilers and 0.021 pounds per cubic foot for small boilers. In previous years the emission factor used was 0.017 pounds per cubic foot for both large and small boilers. This resulted in a significant change in carbon monoxide emissions reported for 1999.
PM_{10} = particulate matter less than 10 microns diameter.

Based on previous assessments, the Bay Area Air Quality Management District and the San Joaquin Valley Unified Air Pollutant Control District have ranked LLNL as a low-risk facility for nonradiological air emissions.

B.4.11 Water Resources and Hydrology

Surface Water

Surface drainage and natural surface infiltration at the Livermore Site are generally good, but drainage decreases locally with increasing clay content in surface soils. Surface flow may occur intermittently from October to April, during the valley's wet season. The two major intermittent streams associated with the Livermore Site are the Arroyo Seco and Arroyo Las Positas; the latter is located north and adjacent to the DWTF. When surface flow occurs in these channels, water infiltrates into the underlying alluvium and eventually percolates to the aquifers.

Arroyo Seco cuts across the southwestern corner of the site, flowing to the northeast; discharge to this stream is primarily storm runoff. Arroyo Las Positas is an intermittent stream that drains from the hills directly east of the Livermore Site. This channel enters the Livermore Site from the east, is diverted along a storm ditch around the northern edge of the site, and exits the site at the northwest corner.

Nearly all surface water runoff at the Livermore Site is discharged into Arroyo Las Positas; only surface runoff along the southern boundary and storm drains in the southwest corner of the Livermore Site drain into Arroyo Seco.

Surface water at Site 300 consists of seasonal runoff, springs, and natural and manmade ponds. There are no perennial streams at or near Site 300. The canyons that dissect the hills and ridges at Site 300 drain into intermittent streams. Naturally occurring springs show both the presence of flowing water or wet soils where the water table at that point is close to the surface, and the presence of distinct hydrophytic vegetation (cattails, willow). There are at least 23 springs at Site 300, 19 that are perennial and 4 that are intermittent. Most of the springs have very low flow rates and are recognized only by small marshy areas, pools of water, or vegetation.

Numerous artificial surface water bodies are present at Site 300. Several areas of surface water discharge are present onsite near cooling towers or other process runoff areas. These artificial runoff areas have the same characteristics as natural springs because they contain running water and support hydrophytic vegetation (LLNL 2002k).

Surface Water-Radioactive and Hazardous Waste Management Facilities

For waste management areas that are not completely enclosed, accumulated precipitation must be removed from the secondary containment systems as required to prevent overflow. (Note: Puddles of rainwater that do not exceed a depth of a half-inch do not interfere with operations, do not compromise secondary containment capacity, are not removed, and are allowed to evaporate.) In general, the accumulated liquids are managed based on volume accumulated and analytical results when samples are required to be collected. The accumulation points (i.e., sumps and trenches) are typically visually inspected to determine if liquids are present. If liquids are observed or detected, the source (e.g., precipitation) of the liquids is determined. If analytical results are within the discharge limitations, the accumulated liquids are discharged. If the analytical data indicate that the accumulated liquid does not meet sanitary sewer discharge criteria, the liquids are removed using a wet-dry vacuum, portable pump, or similar collection device and transferred into appropriate containers. The contaminated liquids are then managed as a waste.

In one area of the Area 612 yard, gravity drain lines are used to drain the accumulated rainwater directly into the sanitary sewer. A normally closed and locked isolation valve is located on the drain line to prevent unauthorized discharges.

Discharges to the Sanitary Sewer

Prior to any discharge to the sanitary sewer, wastewater must be tested and found to meet or fall below internal discharge limits. Further treatment of the wastewater is conducted as necessary to meet discharge requirements. Once the wastewater meets these requirements, the RHWM then discharges the wastewater through the discharge ports at the Area 612 facility or the DWTF, which are kept locked and to which only selected personnel have custody of the key. A record of the discharges is kept.

Groundwater

Within the Livermore Valley, uppermost saturated sediments are commonly unconfined. Interbeds and interlenses of low-conductivity sediments within the saturated zone act as local aquitards, which tend to confine the deeper water-bearing zones. The two most important formations that contain groundwater are Quaternary alluvial deposits and the Plio-Pleistocene Livermore Formation. The Livermore Formation is generally of lower permeability than the overlying deposits, but it commonly contains significant water-bearing zones.

In general, groundwater flows toward the east-west longitudinal axis of the Livermore Valley and then in a westward direction to the gravel pit mines and the municipal water supply wells near Livermore and Pleasanton. Vertical movement of water between the lower member of the Livermore Formation and the overlying alluvial sediments is restricted by permeability differences and by internal stratification within these sedimentary units. At the Livermore Site, the upper 15 to 60 feet of the lower member of the Livermore Formation is known to act as an

aquitard. Under the Livermore Site, the contact between distinctively colored units in the lower member of the Livermore Formation generally dips to the west and is found between approximately 25 and 400 feet below ground surface.

The Livermore Valley has been divided into several groundwater subbasins. The Livermore Site is located within the Spring and Mocho I subbasins. Groundwater leaves the Spring-Mocho I sub-basin through surface discharge at the Las Positas Spring located near Interstate Highway 580 and State Highway 84 (1.5 miles northwest of LLNL) and via westward subsurface flow into the Mocho II subbasin. The Las Positas Fault Zone forms the southern boundary of the Spring-Mocho I subbasin. South of the Livermore Site, the water levels on the south side of the Las Positas Fault Zone have been more than 80 feet higher than those on the north side of the fault. This water level differential indicates that the Las Positas Fault Zone forms a significant barrier to groundwater flow.

Groundwater ranges from excellent to poor quality and has been used for industrial, agricultural, and domestic purposes. A Federal Facility Agreement for the Livermore Site was signed in November 1988 prohibits LLNL from using the underlying groundwater for drinking water. The LLNL area groundwater locally recharges by percolation through the valley alluvium and by infiltration via Arroyo Seco and Arroyo Las Positas as well as from unlined drainage ditches. A recharge basin (located south of the Livermore Site) is a significant source of groundwater recharge. The basin receives treated groundwater from the southwest portion of the Livermore Site. A manmade drainage retention basin (located near the center of the Livermore Site) has been lined to prevent the infiltration of stormwater and treated groundwater from proposed groundwater extraction well locations.

The depth to the water table beneath the Livermore Site currently ranges from approximately 30 feet to 135 feet. Periodic water table changes and mounds have been observed due to groundwater recharge near the Arroyo Seco, the Arroyo Las Positas, and the central drainage retention basin.

Water level fluctuations in monitoring wells near the Area 612 facility, the DWTF complex, and the Building 280 facility have been observed since 1985 and 1997. Some seasonal fluctuations can be observed. A rather steep water table gradient is observed near the DWTF complex. This steep gradient may be due to the abundance of low-permeability sediments in this area and to local recharge adjacent to the Arroyo Las Positas.

At Site 300, two regional aquifers or major water-bearing zones have been identified: an upper water table aquifer in the sandstones and conglomerates of the Neroly Formation and a deeper confined aquifer located in Neroly sandstones just above the Neroly/Cierbo contact. Both aquifers have permeable zones layered with lower permeability claystones, siltstones, or tuffs. Many of the sandstones are fine-grained and silty and contain fractures. Groundwater flow is both intergranular and fracture flow. In addition to the two regional aquifers, several perched aquifers have been identified, some of which give rise to springs. Extensive perched aquifers are present beneath the northwestern portion of the site and in the southeastern portion of the site. In addition, shallow Quaternary alluvium and undifferentiated Tertiary nonmarine sediments are locally water bearing such as the GSA. These local aquifers are generally unconfined or water table aquifers.

Investigation and remediation of contaminated groundwater beneath the Livermore Site and Site 300 is ongoing. Volatile organic compounds (VOCs) and other contaminants of concern are present in groundwater. Areas of past releases of contaminants to the environment, some dating from the 1940s, have been identified and groundwater contamination is being treated. Concentrations of contaminants have been significantly reduced as a result of extracting and treating millions of gallons of water.

A total of 862 solid waste management units at LLNL are identified and delineated in the EPA RCRA Facility Assessment, Visual Site Inspection Report. Investigation and resolution of groundwater contamination at the Livermore Site is being addressed according to the schedules and details specified in the Federal Facility Agreement. Investigation and resolution of groundwater contamination at Site 300 is being addressed as eight operable units. None of the storage or treatment units in this appendix are expected to impact the groundwater under the Livermore Site.

A wide range of analytes is monitored to assess the impact, if any, of current LLNL operations on local groundwater resources. Because surveillance monitoring is geared to detecting substances at very low concentrations in groundwater, it can detect contamination before it significantly impacts groundwater resources. Wells at the Livermore Site, in the Livermore Valley, and at Site 300 in the Altamont Hills are included in LLNL's surveillance monitoring plan. Initial releases of hazardous materials occurred at the Livermore Site in the mid-to-late 1940s when the site was the Livermore Naval Air Station. There is also evidence that localized spills, leaking tanks and impoundments, and landfills contributed VOCs, fuel hydrocarbons, lead, chromium, and tritium to the groundwater and unsaturated sediment in the post-Navy era. Historically, the surveillance and compliance monitoring programs have detected relatively elevated concentrations of various metals, nitrate, perchlorate, and depleted uranium (uranium-238) in groundwater at Site 300. Subsequent *Comprehensive Environmental Resources, Compensation, and Liability Act* (CERCLA) studies have linked several of these contaminants, including uranium-238, to past operations, while other contaminants are the objects of continuing study. Present-day administrative, engineering, and maintenance controls at both LLNL sites are specifically tailored to prevent accidental releases of chemicals to the environment.

Floodplains

All waste management units are located outside the predicted 100-year floodplain areas. The 100-year floodplains are adjacent to Arroyo Seco and Arroyo Las Positas, which are approximately 52 feet from the nearest waste management unit. LLNL stormwater is channeled through storm drains designed to accommodate a 10-year flow. At RHWM facilities, rainwater is collected, sampled, and disposed of according to the chemical analysis. Open ditches are used in underdeveloped areas of the Livermore Site. The Arroyo Seco crosses the Livermore Site at the southwest corner. The Arroyo Las Positas originally crossed the northeast section of the Livermore Site. However, in 1965, as part of an erosion control program, the Arroyo Las Positas was channeled north to the northeast corner of the Livermore Site, and then west along the north perimeter to an outlet near the northwest corner. This outlet, which also constitutes the main pathway for the Livermore Site surface drainage (storm and irrigation), runs north to the Western Pacific tracks, then west where it joins Arroyo Seco.

There are no floodplains on Site 300 as the 100-year base flood event is contained within all channels.

B.4.12 Noise

The noise generated at LLNL is typical of an R&D facility. Ambient noise sources include onsite vehicular traffic and stationary noise sources such as generators, cooling systems, transformers, engines, pumps, fans, etc. Construction activities also contribute to ambient background noise levels.

EPA guidelines for environmental noise protection recommend an average day-night sound level of 55 A-weighted decibels (dB[A]) as sufficient to protect the public from the effects of broadband environmental noise in typically quiet outdoor and residential areas. Land-use compatibility guidelines adopted by the Federal Aviation Administration (FAA) and the Federal Interagency Committee on Urban Noise indicate that yearly day-night average sound levels less than 65 dB(A) are compatible with residential land uses, and levels up to 75 dB(A) are compatible with residential uses if suitable noise reduction features are incorporated into structures (14 CFR Part 150).

LLNL is not subject to environmental noise regulation by state or local agencies. Alameda County has noise standards for the unincorporated areas of the county, which are applicable to areas northeast, east, south (beyond SNL/CA), and southeast of the Livermore Site. The standards correlate types of land use with minutes of exposure to various dB(A) levels by time of day. Noise sources associated with construction are exempt from the noise standards, provided the construction activities do not take place before 7 a.m. or after 7 p.m., Monday through Friday, or before 8 a.m. or after 5 p.m., Saturday or Sunday. Table B.4.12–1 presents the Alameda County noise level standards.

TABLE B.4.12–1.—*Alameda County Noise Level Standards*

Cumulative Number of Minutes in any 1-Hour Time Period	Noise Level Standard (dB[A])			
	7 a.m. to 10 p.m.		10 p.m. to 7 a.m.	
	Noise Sensitive[a]	Commercial	Noise Sensitive[a]	Commercial
30	50	65	45	60
15	55	70	50	65
5	60	75	55	70
1	65	80	60	75
0	70	85	65	80

Source: NNSA 2003a.
[a] Noise-sensitive land uses include residences, schools, hospitals, churches, and public libraries.
dB(A) = A-weighted decibels.

The city of Livermore follows the Noise element of the Livermore General Plan. These guidelines are applicable to areas within the city that are west and northwest of the Livermore Site.

LLNL is subject to occupational noise exposure standards established in a Hearing Conservation Program that incorporates the requirements identified in DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," and 29 CFR 1910.95, "Occupational Noise Exposure." The program also incorporates the threshold limit values established by the American Conference of Governmental Industrial Hygienists. Under the Hearing Conservation Program, hearing protection is provided to workers to attenuate exposure to an 8-hour time-weighted average of no more than 85 dB(A).

A field survey was conducted in January 2003 to characterize typical daily maximum noise levels in the vicinity of the Livermore Site. Measurements were taken for 1-hour periods using standard sound-level meters during the heart of the morning and evening commute. The monitors were placed at eight locations surrounding and just outside the Livermore Site perimeter and in regions of maximum activity (intersections and site entrance and exit locations), shown in Figure B.4.12–1. Results of the survey, shown in Table B.4.12–2, found that, as expected, vehicular traffic was the dominant noise source at most monitored locations. Rail operations and light aircraft overflights were minor contributors. The only recognizable noise sources from site activities within the site were some heavy equipment backup warning beepers, which were detectable during low traffic intervals at the monitoring sites on Patterson Pass Road. All levels were within the acceptable range established by the city of Livermore and county of Alameda.

The noise generated at Site 300 is typical of an R&D facility with two special considerations: a live firing range and occasional open detonation events (including at the EWTF). Ambient noise sources include onsite vehicular traffic and stationary noise sources such as generators, cooling systems, transformers, engines, pumps, and fans. Construction activities also contribute to ambient background noise levels. Like the Livermore Site, Site 300 is not subject to environmental noise regulation by state or local agencies. Because Site 300 is part of LLNL operations, the occupational noise protection procedures are the same for identifying, handling, protecting, reducing, and controlling noise. The potential for a noise pulse event exists as the EWTF conducts open burns and open detonation to treat explosive wastes. Table B.1.2–1 provides quantity limits at the EWTF.

A less extensive field survey, consisting of five perimeter locations and 10- to 15-minute collection periods, was conducted in the vicinity of Site 300 in 1991, to document weekday ambient noise levels. The study showed that the ambient noise levels along Corral Hollow Road/Tesla Road ranging from 56 to 66 dB(A) equivalent-continuous sound level (L_{eq}), which is typical of traffic noises associated with suburban-street to near-freeway traffic (Table B.4.12.–3).

At the time of the survey, no noticeable noise was being generated at the Site 300 firing range or the Carnegie State Vehicular Recreational Area. Higher ambient noise levels would be expected at the monitoring sites along Corral Hollow Road/Tesla Road during weekend periods when the Carnegie State Vehicular Recreational Area has the greatest off-highway vehicle activity. This survey was performed in 1991.

B.4.13 Minerals

The potential stone and aggregate resources of the eastern Livermore Valley and western San Joaquin County were assessed in 1987 and 1988. Zones have been established that identify sand, gravel, and stone source areas. The Livermore Site and Site 300 are located in a Mineral Resource Zone 1. Zone 1 is defined as an area where adequate information indicates that no significant mineral deposits are present or that the likelihood of their presence is rare. Within the eastern Livermore Valley, several deposits have been identified as recoverable and marketable resources (LLNL 1992a). According to a report developed by the California Department of Conservation, Division of Mines and Geology, an estimated 3.8 billion tons of aggregate reserves are available within the southern San Francisco Bay region, and the total aggregate reserves available within the Livermore Valley area amount to 676 million tons; however, much of the area is currently developed for other land uses (TtNUS 2003).

Several occurrences of other potentially economically valuable mineral deposits are within a 10-mile radius of the Livermore Site. These include deposits of manganese, chromium, clay, gemstones, pyrite, dimension stone, sand and gravel, and natural gas.

Petroleum and Natural Gas Production

The Livermore oil field just east (10 miles) of the Livermore Site was discovered in 1967 and, to date, is the only oil field in the Livermore-San Ramon Valley area. The Livermore oil field was originally operated by the Hershey Corporation and consisted of 10 producing wells. These wells are located northeast of Livermore Site. Production is primarily from Miocene Cierbo Formation sandstones at depths of 900 to 2,000 feet. In 1992, the Livermore oil field was operated by the American Exploration Corporation. Of the original 10 wells, 5 were producing an average of 7 barrels of oil per day, 1 well was plugged and abandoned, 3 wells were shut in, and 1 well was used for saltwater injection. Reserves were thought to be approximately 132,000 barrels and production was declining (LLNL 1992a). In 2002, the XL Operating Company operated the Livermore oil field. In February 2002, only three wells were producing. No oil or gas exploration is currently being conducted or proposed for the Livermore Valley or in the hills to the east toward Site 300 (CADC 2002).

While Alameda County has no active natural gas wells, the closest field is located approximately 7 miles southwest of the city of Livermore. Contra Costa and San Joaquin counties have 26 and 63 producing gas wells, respectively. The closest gas field is located approximately 15 miles east of the Livermore Site, near the city of Tracy (CADC 2002).

B.4.14 Traffic and Transportation

This section describes current regional and local transportation activities, including descriptions of any highway, rail, air, or marine transportation infrastructure that DOE uses to support waste movements at LLNL.

LLNL's transportation system consists of paved and unpaved roads, pedestrian malls, paved service areas, and paved parking areas. The Livermore Site has 20 miles of roads and Site 300 has 25 miles of paved roads. Site 300 also has approximately 85 miles of unpaved fire trails.

Onsite vehicular traffic is comprised of light trucks, gasoline and electric carts, medium-duty trucks, forklifts, cranes, and other equipment. Delivery trucks are generally routed only to shipping and receiving facilities. Vehicles owned by organizations performing work (such as construction) for the Livermore Site are permitted around the site when necessary for the performance of the work. At Site 300, private vehicles are restricted to the entrance area.

Entrances to the Livermore Site are situated along Vasco Road, East Avenue, and Greenville Road. The primary routes to East Avenue are Vasco Road and Greenville Road. All regional traffic to and from the Livermore Site is via I-580, exiting onto Vasco Road or Greenville Road. The Site 300 entrance is situated on Corral Hollow Road.

The regional transportation network includes the San Francisco Bay Area. Traffic congestion is a growing concern in the Bay Area. The major transportation arteries near LLNL are I-580 and I-680. Major road projects are underway, including an upgrade to the I-580/I-680 interchange in Pleasanton and the addition of high-occupancy-vehicle (HOV) lanes to I-680 south of Pleasanton. Daily traffic volumes average 30,000 vehicles per day between I-580 and Las Positas Road, 26,200 vehicles per day between Las Positas Road and Patterson Pass Road, and 16,600 vehicles per day between Patterson Pass Road and East Avenue along Vasco Road border of the Livermore Site. Based on the Parking Master Plan and Parking Policy, in 2002, LLNL had 7,500 to 8,500 commuter vehicles (15,000 to 17,000 trips) each business day (LLNL 2002bv).

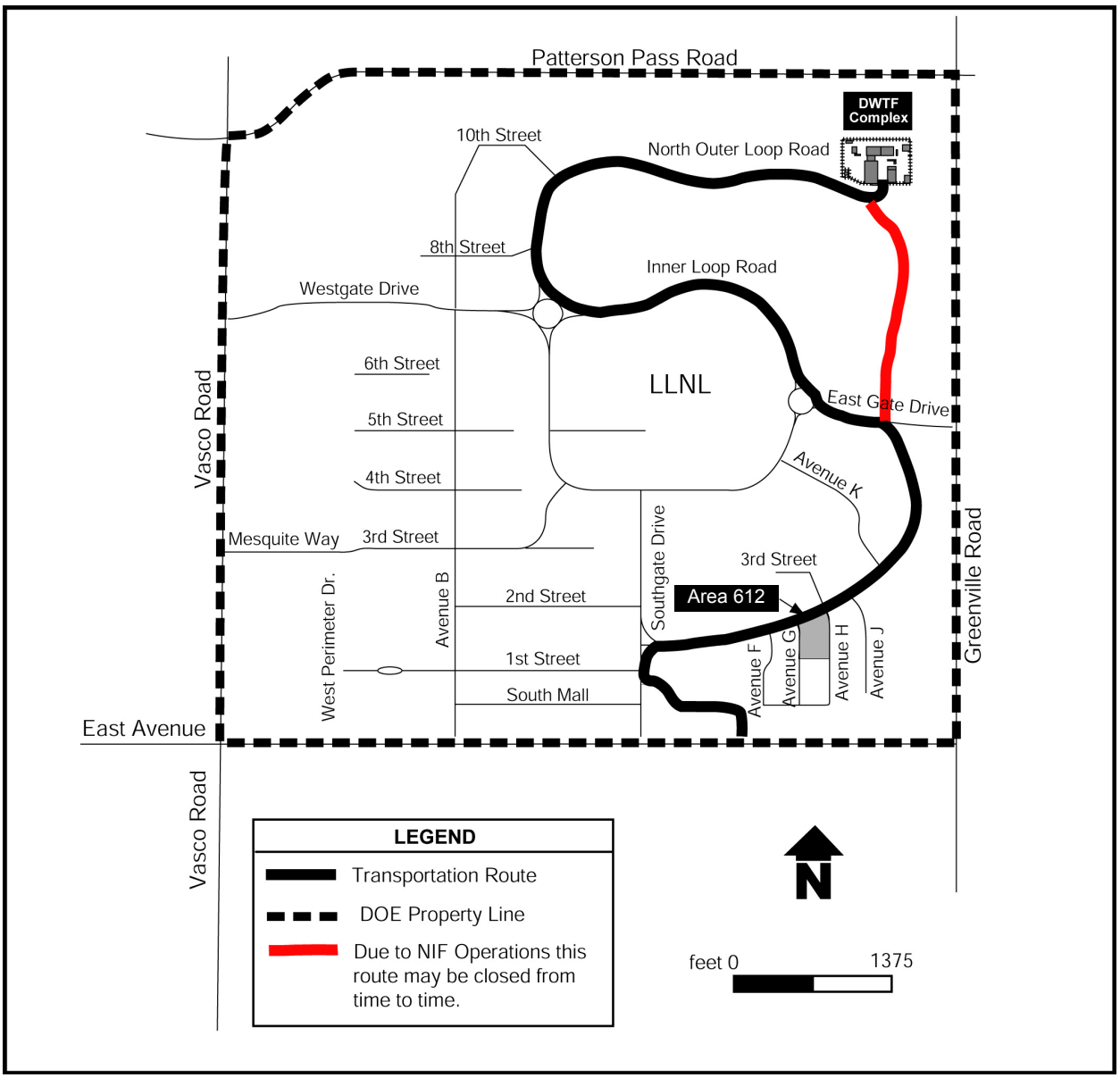
In 2003, LLNL and SNL/CA closed East Avenue as a public street between South Vasco Road and Greenville Road. The closure was prompted by the need for heightened security at the Nation's government facilities. The East Avenue segment is now under administrative control with security checkpoints at both ends of the segment. A truck inspection station is being built west of the Greenville Road intersection.

The East Avenue Gate is used for material and waste shipments. The public closure of East Avenue has not changed the existing transportation route. Figure B.4.14–1 shows the expected onsite waste transportation routes to Area 612 and the DWTF.

The closest airport to the Livermore Site is the Livermore Municipal Airport. This airport is not used for commercial passenger traffic; however, in the past, DOE personnel have flown into this airport using a small government jet. Other small airports in the area are in the cities of Tracy and Byron.

The Livermore Site is served by three international airports for commercial passenger and airfreight services. These airports are San Francisco (approximately 50 miles west), Oakland (approximately 33 miles west), and San Jose (approximately 32 miles southwest).

For Site 300, Tesla Road is an east-west arterial highway located one mile south of the Livermore Site. It is later called Corral Hollow Road at the boundary between Alameda County and San Joaquin County near the western end of Site 300. The access for Site 300 is located on Corral Hollow Road, about 9.3 miles east of Greenville Road. Between Site 300 and Greenville Road, the daily traffic on Tesla Road averages approximately 4,500 vehicles per day. In this area, Tesla Road is a winding two-lane roadway with no paved shoulders; the terrain is rolling. The Livermore Site does not receive any direct traffic by rail although some employees do commute by train, stopping at Vasco Road, approximately 1.5 miles north of the site. LLNL receives no direct traffic by ship.



Source: Original.

FIGURE B.4.14–1.—*Waste Transportation Route on Livermore Site*

Prevailing speeds are about 40 miles per hour. To the east of the Site 300 access, Corral Hollow Road continues as a two-lane winding roadway 6.8 miles to an interchange with I-580 south of the city of Tracy.

B.4.14.1 *Material Shipments*

From 270 to 300 shipments arrive at LLNL per year from offsite vendors (Table B.4.14.1–1). The shipment sizes vary with the frequency and urgency of the need for a particular shipment.

TABLE B.4.14.1–1.—*LLNL Current Annual Material Transportation Activities*

Activity	No. of Shipments
Material (annual shipments of radioactive, chemical, and explosives)	390-467 shipments[a]
Waste (annual shipments includes hazardous and radioactive)	59-88 shipments[b]
Annual sanitary waste shipments	359-518 shipments[c] (7 to 10 per week)

Source: TtNUS 2003.
[a] Based on 2002 data.
[b] Based on 1993 to 2002 generation rates and 2000 to 2002 shipment reports data.
[c] Estimate based on 4,666 metric tons (FY2001) and an average 9 to 13 metric tons per truck.

The Central Stores, Building 411, is located in the southeast quadrant of the Livermore Site. This 69,505-gross-square-foot building is managed by the Procurement and Material Department and handles all onsite receiving and temporary storage and offsite shipment of materials to Site 300. Material deliveries (nonhazardous, hazardous, and radioactive) are received here and sorted and are forwarded to the requesting program. Only standard (nonhazardous) supply items are placed in the storage area in Building 411, and program representatives can obtain needed material from Central Stores.

For Site 300, no central storage facility is currently in operation. Materials are shipped from the Livermore Site directly to the user facility at Site 300.

B.4.14.2 *Hazardous Waste Shipments*

In Calendar Year (CY) 2002, a total of 113 hazardous waste shipments were made. Table B.4.14.2–1 breaks down the CY2002 shipments by treatment and disposal facilities. The shipment sizes vary with the urgency and required treatment/disposal options for a particular shipment. Most offsite shipments of hazardous waste are loaded at Area 612 and the DWTF complex. For Site 300, offsite waste shipments originate from Building 883.

TABLE B.4.14.2–1.—*Combined Livermore Site and Site 300 Hazardous Waste Shipments[a] in CY2002*

Treatment/Disposal Site	State	Number of shipments	Waste Types
Safety-Kleen Inc.	CA	34	RCRA hazardous, state-regulated, and nonregulated waste
Altamont Landfill	CA	14	Asbestos and nonregulated waste
Lawrence Livermore National Laboratory[b]	CA	9	RCRA hazardous, state-regulated, and nonregulated waste
Envirosafe Services of Idaho, Inc.	ID	8	Hazardous and TSCA (PCB-related) wastes
Heritage Environmental Services, LLC	AZ	7	RCRA hazardous and nonregulated waste
Twenty First Century EMI	NV	6	RCRA hazardous and nonregulated waste
ENSCO West Inc.	CA	5	RCRA hazardous and nonregulated
Sub Total		83	waste
Other sites[c] (including Site 300[d])	Various	36	Various, including explosive wastes
Total		**119**	

Source: LLNL 2003ax.

[a] Hazardous waste shipments include RCRA hazardous waste, state-regulated, TSCA waste, wastes shipped for recycle, and nonregulated wastes (wastes not specifically regulated by RCRA; TSCA or the State of California that may contain materials of concern and are treated and disposed as if the wastes were regulated. [e.g., wastes containing PCBs less than 50 parts per million]).

[b] Site 300 routinely ships wastes to the Livermore Site.

[c] LLNL uses nearly 50 commercial treatment, storage, and disposal facilities (TSDFs). Due to the wide-range of wastes, including recyclable materials, a large number of TSDFs is needed. These TSDFs include incinerators, liquid treatment facilities, landfills, and recyclers. Capabilities at these TSDFs include fuel blending, solvent recovery, mercury processing, asbestos disposal, battery reclamation, and other special waste handlers including radioactive waste TSDFs.

[d] The Livermore Site ships explosive-related waste to Site 300 for treatment.

Note: Site 300 ships hazardous, radioactive, and mixed wastes to Livermore Site for storage, treatment, and preparation for final offsite disposal, as appropriate.

B.4.14.3 *All Other Waste Shipments*

A summary of all other waste shipments is presented in Table B.4.14.2–1.

B.4.15 Materials and Waste Management

B.4.15.1 *Materials*

LLNL maintains an inventory of radioactive, chemical, and explosive materials used in laboratory R&D in a wide variety of scientific, engineering, and weapon-related fields.

To safely control these materials, LLNL employs an integrated safety management system (ISMS) to manage the use of hazardous materials. The ISMS process includes project planning, hazard assessment, identification, and implementation of measures to perform work in a safe manner.

LLNL tracks and manages hazardous materials from receipt through transfer, storage, use, and final disposition (this may include disposal; however, for example, empty gas cylinders are returned to the vendor for reuse). Different inventory systems are used for radioactive, chemical, and explosive materials, which track materials for inventory and waste control.

Radioactive Material

Radioactive material has the property of spontaneously emitting alpha, beta, or gamma rays during the disintegration of an atom's nucleus. Radioactive material is found in nature or can be man-made. All radioactive material, used in activities at LLNL and present in quantities sufficient to be deemed hazardous, is controlled to protect LLNL workers, the public, and the environment. LLNL manages special nuclear material, source material, other nuclear material, and miscellaneous radioactive material.

Special nuclear material includes plutonium or highly enriched uranium (HEU). The majority of the plutonium and HEU is in the form of metal sealed in containers. The inventory consists mostly of heat sources, components (a part or piece of a larger system), targets, and calibration sources. LLNL does not produce plutonium.

Source material includes uranium and thorium. LLNL's inventory of natural, low enriched, or depleted uranium is either stored in specially designed containers or in large, sealed assemblies to minimize the probability of a release. The majority of the source material inventory at LLNL is in the form of metal sealed in containers. The inventory consists mostly of targets, shielding, components, and calibration sources. LLNL does not produce these materials.

Other nuclear material includes americium, californium, tritium, and lithium. These materials are used at LLNL for national defense research purposes. LLNL does not produce these materials.

Miscellaneous radioactive materials include strontium, cobalt, and cesium. These materials are used at LLNL for both nondefense and defense research purposes. LLNL does not produce or process these materials.

Table B.4.15.1–1 is a listing of facility inventories (or administrative limits) for radioactive materials at LLNL. Administrative limits for RHWM facilities are in Table B.4.15.1–2.

TABLE B.4.15.1–1.— *Facilities Managing Radionuclides at LLNL*

Building Number	Radionuclide	Approximate[a] Quantity	Status
Building 131 Highbay	Natural thorium Uranium-238 Natural uranium Depleted uranium 4 sealed sources	0.5 kg 115 kg 12 kg 7,700 kg	Inventory maintained below Category 3 quantities.
Building 151	15-Cat 3 radionuclides	Varies	Inventory maintained below Category 3 quantities.
Building 231	Natural thorium Natural uranium Depleted uranium Rhenium	0.5 kg 9.5 kg 3,000 kg 60 kg	Radiological Facility
Building 235	10-Cat 3 radionuclides	Varies	Low Hazard Radiological Facility
Building 239	Plutonium, fuel-grade equivalent Highly Enriched Uranium Depleted Uranium Tritium	6 kg 25 kg 500 kg 0.02 kg	Varies, resident inventory maintained below Category 3 levels.
Building 241	Depleted Uranium 5-Cat 3 radionuclides	2,650 kg Varies	Low Hazard Radiological Facility

TABLE B.4.15.1–1.— ***Facilities Managing Radionuclides at LLNL (continued)***

Building Number	Radionuclide	Approximate[a] Quantity	Status
Building 251	42-Cat 2 radionuclides	Varies	Inventory maintained as Category 2.
Building 261/262	16-Cat 3 radionuclides Thorium Natural uranium Depleted uranium	Varies 100 lb 100 lb 300 lb	Inventory maintained below Category 3 quantities. Metal
Building 322	Depleted uranium	30 kg	Radiological Facility
Building 327	Depleted uranium Natural uranium 10-Cat 3 radionuclides	95 kg 0.13 kg	Inventory maintained below Category 3 quantities. Sealed Sources.
Building 331[b]	Tritium	30 g	Inventory is distributed between two segments. Small quantities of other radionuclides may be present, but the facility will remain a Category 3 Facility.
Building 332	Plutonium (fuel grade-equivalent) Enriched uranium Depleted or natural uranium	700 kg 500 kg 3,000 kg	Category 2 Facility
Building 334[b]	Fuel-grade plutonium Weapons-grade plutonium Highly enriched uranium Depleted uranium Tritium	18 kg 18 kg 100 kg 500 kg 0.0001 kg	Inventory maintained below Category 2 quantities.
Building 361	Phosphorus-32 Sulphur-35 Carbon-14 Tritium	0.027 Ci 0.008 Ci 0.13 Ci 0.29 Ci	Radiological Facility
Building 364	Cesium-137	3.43×10^{-3} Ci Sealed Source	Radiological Facility

Source: LLNL 1999b, LLNL 1999c, LLNL 2000d, LLNL 2000l, LLNL 2001e, LLNL 2001ag, LLNL 2001h, LLNL 2001x, LLNL 2001f, LLNL 2002k, LLNL 2002an.

[a] Inventories are snapshots in time. The information is provided to give the reader a degree of scale and is not (unless otherwise stated) a limit.

[b] Materials in Building 331 and 334 are within the Superblock Administrative Limits for plutonium and uranium.

Ci = curie; kg = kilogram; lb = pound.

TABLE B.4.15.1–2.—*Area Limits*[a] *for Radioactive and Hazardous Waste Management Facilities*

Facility	Facility Radionuclide Inventory (largest) Limit	Summary Information
Area 612 segments 1 and 2	560 PE-Ci each segment	Hazard Category 2 (Two separate segments)
Building 695/B696S	56 PE-Ci	Hazard Category 3
DWTF (Building 696 RWSA)	560 PE-Ci	Hazard Category 2
Area 514	Varies but is managed to remain below Category 3 threshold using the sum-of the ratios method described in DOE Standard 1027-92 Change Notice 1.	Radiological
TRU waste characterization segment (planned)	56 PE-Ci	Hazard Category 3
TRUPACT II loading segment (planned)	56 PE-Ci	Hazard Category 3

Source: LLNL 1999j, LLNL 2003s.
[a] These area limits are not NEPA site-wide EIS limits.
Ci = curie; PE = plutonium equivalent.

Chemicals

Because of the wide variety of research activities performed at LLNL, the amounts and concentrations of chemicals maintained at LLNL vary at any given time and from facility to facility. Most research operations use small quantities of a wide variety of chemicals; however, in some operations, chemicals are used in large quantities. In general, the following chemical types are used and stored at LLNL: corrosives (acids and bases); toxics (poisonous chemicals); flammables and combustibles (solids, liquids, and gases); reactives (materials that are inherently readily capable of detonation or becoming flammable at normal temperatures and pressures); asphyxiates (physical asphyxiates are materials capable of physically displacing the volume of air in a given space; chemical asphyxiates are materials that are poisonous when breathed); and carcinogens (materials capable of inducing cancer).

In 2001, more than 166,000 chemical containers, ranging from 55-gallon drums to gram-quantity vials, were in use or stored at LLNL (LLNL 2002cc). Table B.4.15.1–3 presents a list for FY2001 – FY2002 of hazardous chemicals at the Livermore Site. The values are estimated maximum values for a single facility or average values over several facilities. Table B.4.15.1–4 presents a list of FY2001 – FY2002 of hazardous chemicals at Site 300. Table B.4.15.1–5 presents a list of hazardous chemicals at waste management facilities.

TABLE B.4.15.1–4.—*Site 300 Hazardous Chemicals Quantities by Location in FY2002 (continued)*

Material	Maximum/ Average Quantity[a]	Location
STIK-IT Asphalt Base Seal	560/5 gal	843 and misc. locations site-wide
Stoddard solvent/paint thinner	200/60 gal	827, 843, 872, 873, 876, and misc. site locations
Sulfur hexafluoride	19,500/7,700 ft^3	801, 801, 812, 850, 851
Sulfuric Acid	845/60 lb	875

Source: LLNL 2002m.
Note: Some buildings are part of a complex and employ small ancillary storage facilities. The above list does not denote these facilities. Locations vary year to year. The listing of facilities is not intended to limit inventories. Physical space and administrative controls including safety documentation limit inventories. This table is provided to give the reader an understanding of the types of chemicals, general quantities, and variety of locations.
[a] Maximum/Average Quantity: Maximum is defined as a maximum quantity at one of the facilities in a given year. Average is defined as the average quantity found at multiple facilities.
ft^3 = cubic feet; gal = gallons; lb = pounds.

Table B.4.15.1–5.—*Hazardous Chemicals at Selected Waste Management Facilities*

Facility	Materials[a]	Chemical Hazard Classification
DWTF	Sulfuric acid – 2,786 kg Sodium hydroxide (50% solution) – 1,737 kg Hydrogen peroxide (50% solution) – 1,665 kg Ferric sulfate (50% solution) – 1,709 kg Granulated activated carbon – unlimited Chloroform – 67.7 lb Hydrogen peroxide – 39.3 lb Perchloric acid – 35 lb Carbon disulfide – 34.9 lb Other chemical reagents – minor quantities	Low hazard
RHWM (Rollup)	Acetone – 30,400 lb Styrene – 23,000 lb Petroleum oils – 19,270 lb Methanol – 3,383 lb Other chemical reagents – minor to large quantities	Low hazard

Source: LLNL 1999j, LLNL 2000t, LLNL 2003s.
Note: This table is provided to give the reader an understanding of the types of chemicals and general quantities.
[a] All wastes have been removed prior to the expected closure.
kg = kilograms; lb = pounds.

B.4.15.2 *Waste Management*

This section describes the waste generation at LLNL. For a discussion of the regulatory setting, waste management practices, and treatment/storage facilities at LLNL, see Section B.1. The waste generation rates (CY1993 to FY2002) presented in this section represent actual data based upon DOE records.

The waste categories routinely generated onsite under normal operations include radioactive waste (including LLW, MLLW, and TRU); hazardous waste, which includes RCRA hazardous (chemical and explosives) waste, California toxic waste, TSCA waste (primarily asbestos and PCBs), and biohazardous (medical) waste; and nonhazardous solid waste and process wastewater. Additionally, LLNL generates nonroutine wastes and expects to generate wastes

from new operations. Each of these categories is discussed separately below. Figure B.4.15.2–1 shows locations of the DWTF and other RHWM facilities.

Normal (Routine) Operations

The affected environment considered under this analysis is limited to those facilities that generate waste under normal (routine) operations at LLNL. Normal operations encompass all current operations that are required to maintain R&D at LLNL facilities.

New Operations

Several new operations are currently under construction or in the operational planning stages at LLNL. However, they are considered outside the scope of the current affected environment description for this analysis because they have not yet reached operational status. New operations are defined as programmatically planned projects with defined implementation schedules that will take place in the future. Two facilities, the NIF and the BSL-3 Laboratory, are examples of these new operations.

Special (Nonroutine) Operations

Special (nonroutine) operations generate nonroutine wastes and are limited-duration projects, such as construction, that are considered separately from facility operations. These efforts can make a large contribution to the overall waste generation activities at LLNL. Three areas are considered special operations: construction, D&D, and environmental restoration. Typically, the projects are well-defined so as to allow waste management activities to directly support the project.

Facility maintenance and infrastructure support operations will continue with refurbishment, renovation, and removal of outdated facilities. The LLNL *FY2004 Ten Year Comprehensive Site Plan* and the *LLNL EIS Facilities and Initiatives Report* identify the specific structures under consideration over the next 10 years (DOE 2003b, LLNL 2002y). These programs will potentially generate large volumes of TSCA waste, primarily asbestos and building debris that will increase LLNL's disposal needs.

For several years, excess facility management activities have been underway to remove legacy facilities, material, and equipment from the Livermore Site. This effort has removed over 260,000 square feet (DOE 2002d). One hundred sixty-one buildings, accounting for 700,000 gross square feet (an estimated 46,000 tons of construction debris), are potentially scheduled for removal. Future space reduction at LLNL will focus on buildings that are beyond their useful lives. These buildings will become vacant after new buildings are built. Twenty-three buildings, accounting for 53,500 gross square feet, are in poor condition and are categorized as beyond their useful life (DOE 2002d).

Building debris estimates associated with D&D projects are included in the assessments of the waste generated from special operations (potentially 40,000 tons of debris). However, separate NEPA review may be required in the future depending on the scale and extent of the work involved.

The analysis presented in this document considers environmental restoration activities as nonroutine operations due, in part, to the fluctuation in year-to-year waste quantities. To comply with CERCLA groundwater remedial actions at the Livermore Site, the Environmental Restoration Division (ERD) has designed, constructed, and operated 5 fixed groundwater treatment facilities and associated pipeline networks and wells, 20 portable groundwater treatment units, 2 catalytic dehalogenation units, and 3 soil vapor extraction facilities. In 2001, the ERD operated 4 fixed, 19 portable, 2 catalytic reductive dehalogenation, and 2 soil vapor treatment units. The ERD also installed an electro-osmosis system to improve its ability to remove contaminants from fine-grained sediments.

At Site 300, the ERD has designed, constructed, and operated 3 soil vapor extraction facilities and 11 groundwater extraction and treatment facilities. In addition, the ERD has capped and closed four landfills and the high explosives rinse water lagoons and burn pits, excavated and closed numerous wastewater disposal sumps, and removed contaminated waste and soil to prevent further impacts to groundwater at Site 300.

Radioactive Waste

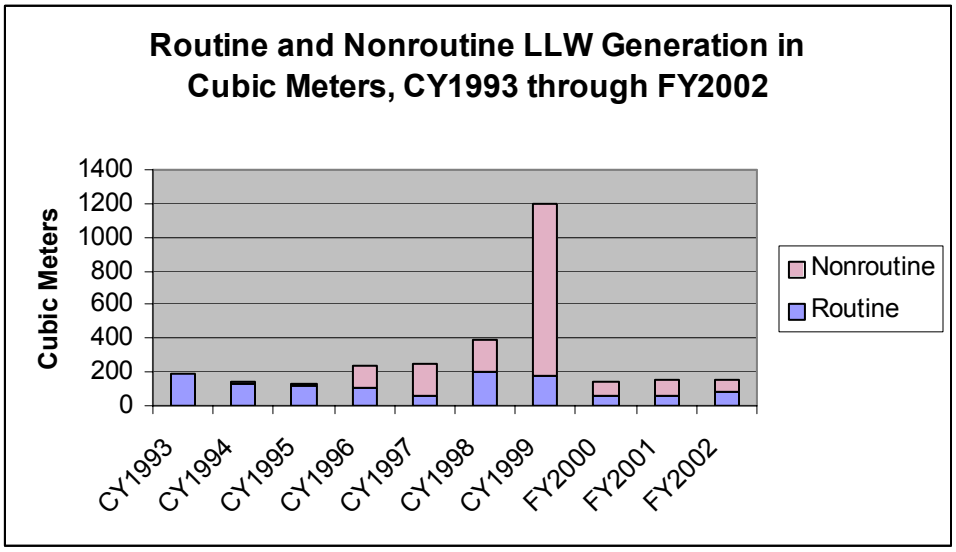
Radioactive waste generated at LLNL includes LLW, MLLW, TRU waste, and TRU-mixed waste. LLNL does not manage or generate high-level waste (a highly radioactive material that results from reprocessing of spent fuel). LLW, MLLW, and TRU wastes are produced primarily in laboratory experiments. Mixed wastes are discussed separately below.

DOE O 435.1 permits onsite storage of LLW and TRU wastes until appropriate disposal becomes available. Currently, there are no regulatory restrictions on the length of time this waste may be stored onsite, provided that disposal or offsite storage options are being pursued and the waste is stored in accordance with all applicable regulations. LLNL maintains the capability to treat solid radioactive wastes onsite. LLNL has treated liquid radioactive wastes at the Treatment Area 514 Tank Farm (LLNL 2002ca). The DWTF is replacing Area 514. LLNL disposes of solid LLW offsite at the Nevada Test Site. Available storage space for LLW and TRU waste is limited by exposure considerations (i.e., radiation exposure to personnel) at a given storage location. However, radioactive wastes, unlike RCRA-regulated wastes, can be stored at various locations onsite provided that the waste is properly packaged, labeled, and monitored. Waste management facilities handling radioactive wastes are listed in Table B.1.1–2.

As part of the effort to minimize the total quantity of radioactive waste that is generated at LLNL, facilities that generate this type of waste are designated as Radioactive Materials Management Areas (RMMAs). An RMMA is an area where the reasonable potential exists for contamination due to the presence of unconfined or unencapsulated radioactive material or an area that is exposed to sources of radioactive particles (such as neutrons and protons) capable of causing activation. Managers of facilities must document the locations of all RMMAs. Procedures to minimize the generation of radioactive wastes are then developed.

Historic and Current Radioactive Waste Generation

Radioactive waste has historically been generated from R&D activities that used radioactive materials. Figure B.4.15.2–2, summarizes historic routine and nonroutine LLW quantities (cubic meters) generated onsite from CY1993 through FY2002. From CY1993 to FY2000, annual TRU waste generation ranged from 0 to 12 cubic meters.



Source: DOE 2002s.

FIGURE B.4.15.2–2.—*Routine and Nonroutine LLW Generation in Cubic Meters*

In 2000, LLNL's reporting cycle and quantities changed from calendar year to fiscal year and tons to cubic meters. Table B.4.15.2–1 summarizes current radioactive waste quantities generated onsite from FY2001 and FY2002.

TABLE B.4.15.2–1.— *Radioactive Waste Generated in FY2001 and FY2002 (in cubic meters)*

Radioactive Waste Generated	2001	2002
LLW	74	159
TRU waste	0	1
Total Radioactive	74	160

Source: DOE 2002s.
LLW = low-level waste; TRU = transuranic.

Legacy waste is considered to be waste material in storage pending disposal. LLNL is in the process of disposing of this waste as treatment and disposal capacity becomes available. For the most part, legacy waste is either radioactive or classified. As of mid-2003, total LLW and TRU waste inventory was 1,900 metric tons. Table B.4.15.2–2 provides specific radioactive waste quantities by type.

TABLE B.4.15.2–2.—*Radioactive Legacy Waste Quantities in Storage by Type at LLNL RHWM Facilities*

Waste Type	Quantity in Cubic Meters
LLW	1,600
LLW-certified (ready for shipment)	170
TRU waste	89
Total inventory[a]	1,900

Source: LLNL 2003v.
[a] Radioactive waste inventory from Buildings 514, 612, 693, 233 CSU, and 883.
LLW = low-level waste; TRU = transuranic.

LLNL maintains the capability to treat radioactive wastes onsite. In 2002, Treatment Area 514 treated 220 cubic meters of LLW, including 63 cubic meters sewered after treatment (meets approved discharge limits). Additionally, at other facilities, LLNL treated 540 cubic meters of LLW. No TRU waste was treated in 2002.

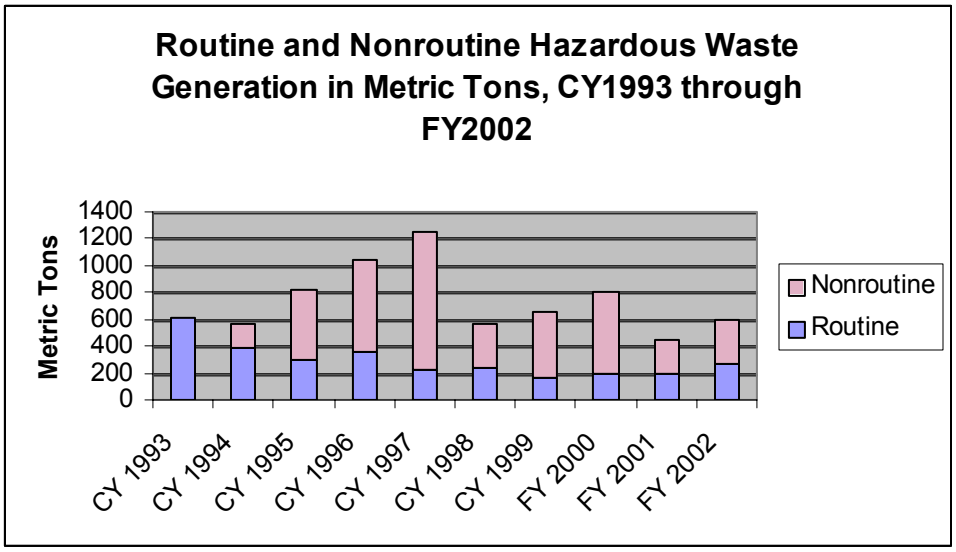
Hazardous Waste

Hazardous waste refers specifically to nonradioactive waste, including RCRA chemical and explosives waste, California toxic hazardous waste, biohazardous (medical) waste, and TSCA waste (primarily asbestos and PCBs). Almost all buildings at LLNL generate hazardous wastes, ranging from common household items such as fluorescent light bulbs, batteries, and lead-based paint to solvents, metals, cyanides, toxic organics, pesticides, asbestos, and PCBs.

RCRA permits onsite management of hazardous waste at the point of generation or in designated waste accumulation areas and permits storage in permitted storage facilities. There are regulatory restrictions on the length of time that waste may be stored onsite, and waste must be stored in accordance with all applicable regulations. LLNL maintains the capability to store and treat certain hazardous wastes onsite. LLNL treats explosive wastes at Site 300. Hazardous wastes are shipped through licensed commercial transporters to various permitted treatment, storage, and disposal facilities offsite. Hazardous waste management facilities are listed in Table B.1.1–2.

Historic and Current Hazardous Waste Generation

The hazardous waste generated at LLNL is predominantly chemical laboratory trash generated from experiments, testing, other R&D activities, and infrastructure fabrication and maintenance. Figure B.4.15.2–3 illustrates the quantities of routine and nonroutine hazardous waste generated for all operations from CY1993 through FY2002. In 2000, LLNL's reporting cycle and quantities changed from calendar year to fiscal year and tons to metric tons. In FY2001 and FY2002, LLNL generated 460 and 600 metric tons of hazardous waste, respectively (DOE 2002s).



Source: DOE 2002s.

FIGURE B.4.15.2–3.—*Routine and Nonroutine Hazardous Waste Generation in Metric Tons*

All hazardous waste is managed within appropriate time limits and quantity limits. No backlogged inventory of hazardous waste exists at LLNL (for discussion regarding legacy mixed wastes see mixed waste section). LLNL maintains the capability to treat hazardous wastes onsite. In 2002, LLNL treated 140 cubic meters of hazardous waste.

Explosive Waste

The explosive waste generated at Site 300 ranges from high explosives and analytical chemicals to wastewater contaminated with explosives. In 2002, 6,000 pounds of explosive waste were stored at the EWSF. Waste high explosives are treated at the EWTF, a facility used for thermal treatment of these wastes. In 2002, the EWTF treated 2,700 pounds. The treatment process involved 64 burns and 19 detonations.

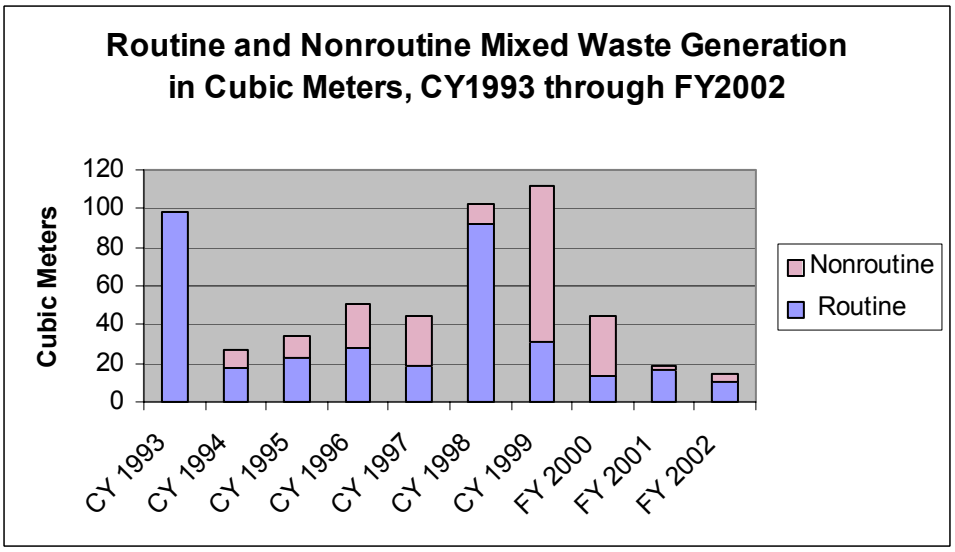
Mixed Wastes

Mixed waste generated at LLNL includes MLLW, TSCA-mixed, and mixed TRU (see Table B.4.15.2–3). MLLW and mixed TRU are produced primarily in laboratory experiments and component tests. Figure B.4.15.2–4 illustrates the quantities of mixed waste generated from CY1993 through FY2002. TSCA-mixed wastes are produced primarily during D&D- and environmental restoration-related activities.

TABLE B.4.15.2–3.— *Mixed Waste Generated in FY2001 and FY2002 (in cubic meters)*

Radioactive Waste Generated	2001	2002
MLLW	23	63
Mixed TRU waste	0	0
Mixed TSCA	0	0
Mixed Total Radioactive	23	65

Source: DOE 2002s.
MLLW = mixed low-level waste; TRU = transuranic; TSCA = *Toxic Substances Control Act*.



Source: DOE 2002s.

FIGURE B.4.15.2–4.—*Routine and Nonroutine Mixed Waste Generation in Cubic Meters*

LLNL does not maintain the capability to dispose of solid mixed wastes onsite. LLNL treats liquid mixed wastes at the Treatment Area 514 Tank Farm (LLNL 2002p) and DWTF. LLNL treats and disposes of MLLW offsite under the Federal Facility Compliance Order issued jointly to the University of California and the DOE (LLNL 2002cc). LLNL is continuing to work with the DOE to maintain compliance with the *Federal Facilities Compliance Act* Site Treatment Plan (STP) for LLNL that was signed in February 1997. All milestones for 2001 were completed on time. Reports and certification letters were submitted to the DOE as required. An agreement was reached with the DTSC to extend all FY2002 and FY2003 milestones to allow LLNL to concentrate resources on characterizing and disposing of TRU waste. LLNL continued to pursue the use of commercial treatment and disposal facilities that are permitted to accept mixed waste.

These facilities provide LLNL greater flexibility in pursuing the goals and milestones set forth in the STP.

Mixed legacy waste is considered to be waste material in storage pending disposal. LLNL is in the process of disposing of this waste as treatment and disposal capacity becomes available. For the most part, mixed legacy waste is land disposal restricted. As of mid-2003, total MLLW and mixed TRU waste inventory was 530 cubic meters. Table B.4.15.2–4 provides specific radioactive waste quantities by type.

LLNL maintains the capability to treat mixed wastes onsite. In 2002, Treatment Area 514 treated 140 cubic meters of MLLW, including 38 cubic meters sewered after treatment (meets approved discharge limits). Additionally, at other facilities, LLNL treated 43 cubic meters of MLLW. No mixed TRU waste was treated in 2002.

TABLE B.4.15.2–4.—*Mixed Waste Quantities in Storage (FY2002) by Type at LLNL RHWM Facilities*

Waste Type	Quantity in Cubic Meters
MLLW	510
TRU mixed waste	17
Total inventory[a]	530

Source: LLNL 2003v.
[a] Radioactive waste inventory from Buildings 514, 612, 693, 233 CSU, and 883.
MLLW = mixed low-level waste; TRU = transuranic.

Biohazardous Wastes

Biohazardous wastes include bioagents and medical wastes. Bioagents include toxins, toxin fragments, and biohazardous materials.

The Livermore Site is considered a large-quantity generator because 200 pounds of medical waste is normally generated each year. Medical wastes consist of biohazardous waste and sharps (e.g., needles, blades, and glass slides) waste. Medical wastes generated at LLNL are managed as a separate waste stream in accordance with the *California Health and Safety Code*, Division 20, Chapter 6.1. In 2000 and 2001, several hundred kilograms of biohazardous waste were generated, treated, and disposed of at an approved offsite facility.

Other biohazardous wastes generated (including bioagents and toxins) are carefully segregated and disposed of based on hazards. For example, radioactive biohazardous or biological waste is disposed of as radioactively contaminated waste at an approved offsite facility.

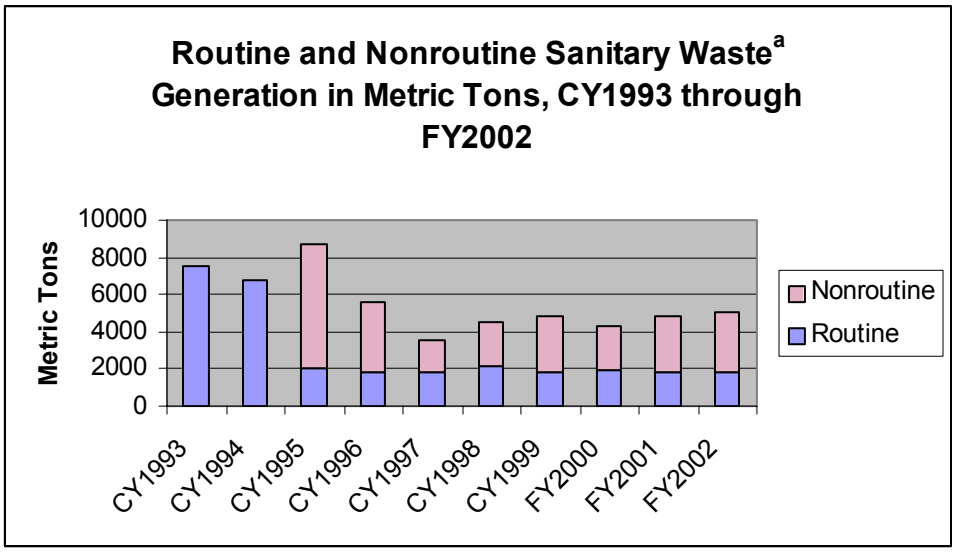
LLNL's Site 300 is considered a small-quantity generator of medical waste, which means that less than 200 pounds of medical waste is generated per month. Therefore, Site 300 is not subject to medical waste generator and treatment permit fees and is not subject to annual inspections by San Joaquin County. Site 300 does, however, submit a minimal annual fee for a Limited Quantity Hauling Exemption, which allows registered LLNL haulers to transport medical waste generated at Site 300 to the Livermore Site for waste consolidation prior to offsite shipment.

Other Wastes

Sanitary Solid Waste

Routine sanitary solid waste consists predominantly of office and laboratory nonhazardous trash. Nonroutine sanitary solid waste consists predominately of nonhazardous building debris generated from major construction and D&D activities. All solid waste from the Livermore Site is currently disposed of at the Altamont Landfill in Livermore, California or diverted for recycling (see Appendix O). The Altamont Landfill has a remaining capacity of approximately 15 million cubic yards (over 10 years) (CIWMB 2002). There are two active landfills in San Joaquin County that have over 10 years of capacity. Figure B.4.15.2–5 summarizes historic sanitary solid waste quantities generated onsite from CY1993 through FY2002 showing portions of routine and nonroutine generated each year with the exception of CY1993 and CY1994. In

FY2001 and FY2002, LLNL generated 1,900 and 1,800 metric tons of routine sanitary waste each year and 3,000 and 3,300 metric tons of nonroutine sanitary waste, respectively (DOE 2002s).



Source: DOE 2002s.
[a] Nonroutine quantities included in routine total for CY1993 and CY1994.

FIGURE B.4.15.2–5.—*Sanitary Waste Generation in Metric Tons*

Environmental Restoration Wastes

Environmental investigations and cleanup activities at LLNL began in 1981. The Livermore Site became a CERCLA site in 1987 when it was placed on the National Priorities List (NPL). Site 300 was placed on the NPL in 1990. LLNL continues to perform environmental restoration activities in accordance with CERCLA provisions and approved plans.

Current activities at the Livermore Site include 29 treatment facilities: 27 are groundwater treatment facilities and 2 are vapor treatment facilities (VTFs). A total of 84 groundwater extraction wells operated at 27 separate locations at an average flow rate of 2,540 liters per minute. A total of two vapor extraction wells operated at two separate locations at an average flow rate of 670 cubic meters per minute. Table B.4.15.2–5 presents the treatment area and VOCs removed from groundwater and soil at the Livermore Site.

TABLE B.4.15.2–5.—*Volatile Organic Compounds Removed from Groundwater and Soil at the Livermore Site*

		2002		Cumulative Total	
Treatment Area	**Startup Date**	**Water Treated (million liters)**	**VOCs Removed (kilograms)**	**Water Treated (million liters)**	**VOCs Removed (kilograms)**
TFA	1989	251.4	5.7	3,658	154
TFB	1990	130.2	6.1	787	54.2
TFC	1993	107.9	7.1	595	53.9
TFD	1994	281.3	68.4	1,505	500
TFE	1996	110.5	17.5	544	139
TFG	1996	12.1	0.7	70.4	3.7
TF406	1996	40.5	1.0	211	7.7
TF518	1998	4.9	0.6	37.1	4.3
TF5475	1998	0.72	0.7	2.3	4.8
		Soil Vapor Treated (thousand cubic meters)	**VOCs Removed (kilograms)**	**Soil Vapor Treated (thousand cubic meters)**	**VOCs Removed (kilograms)**
VTF518	1995	0	0	425	153
VTF5475	1999	143.5	37.7	659	306

Source: LLNL 2003l.
VOCs = volatile organic compounds.

Table B.4.15.2–6 summarizes FY2002 and cumulative totals of volumes and masses of contaminants removed from groundwater and soil vapor at Site 300.

Other environmental restoration wastes (soil, personal protection equipment, samples) are rolled into radioactive and hazardous waste categories previously discussed.

Industrial Wastewater

Industrial wastewater is water that contains constituents at concentrations too high to allow discharge to the sanitary sewer, but does not meet the criteria to be designated as hazardous waste. Several thousand gallons of wastewater are held pending analysis each day. Only a small portion would be considered industrial wastewater (<1 percent).

At Site 300, Buildings 806, 807, 809, 825, and 826 process nonhazardous wastewater through several steps (e.g., filters) into Class II surface impoundments (LLNL 2002cc).

Sanitary (Domestic) Wastewater

Liquid effluents with contaminants below limits specified by the city of Livermore are released to the city of Livermore sewer system. In FY2002, LLNL generated approximately 240,000 gallons per day (LLNL 2003l). The sewer system capacity is approximately 1,685,000 gallons per day (DOE 2002d). In FY2001 and FY2002, Site 300 (GSA) generated approximately 2,100 gallons per day (LLNL 2002cc). Site 300 remote facilities use septic systems.

TABLE B.4.15.2–6.—*Volatile Organic Compounds Removed from Groundwater and Soil Vapor at Site 300*

Treatment Area	Startup Date	2002 Water Treated (million liters)	2002 VOCs Removed (kilograms)	Cumulative Total Water Treated (million liters)	Cumulative Total VOCs Removed (kilograms)
GSA-Eastern GWTF	1991	78.7	0.17	806.6	6.19
GSA-Central GWTF	1993	4.19	0.59	29.16	10.66
Building 834	1995	0.11	0.81	0.93	31.84
High Explosives Process Area	1999	4.5	0.012	10.5	0.058
Building 832	1999	1.90	0.12	5.68	0.44
Building 854	1999	3.67	0.78	12.25	6.14
Pit 6	1998	N/A	N/A	0.268	0.0014
		Soil Vapor Treated (thousand cubic meters)	**VOCs Removed (kilograms)**	**Soil Vapor Treated (thousand cubic meters)**	**VOCs Removed (kilograms)**
GSA-Central	1994	293.58	1.54	1987.18	66.16
Building 834	1998	406.18	5.19	1657.56	108.26
Building 832	1999	96.2	0.28	282.5	1.39

Source: LLNL 2003l.
GSA = General Services Area; GWTF = groundwater treatment facility; N/A = not applicable; VOCs = volatile organic compounds.

B.4.16 Utilities and Energy

Utilities and energy systems at LLNL consist of water, sanitary sewer systems, electrical transmission and distribution, and communication systems that support operations at the site.

The water supply system currently provides 1.36 million gallons per day of water for fire protection, industrial support of LLNL's research programs, and sanitary use (Table B.4.16–1). The Livermore Site is supplied by the San Francisco Water District through the Hetch Hetchy Aqueduct. When needed, water is also supplied by the Alameda County Flood Control and Water Conservation District. LLNL also maintains the drinking water distribution system at SNL/CA.

The sewer system discharged approximately 300,000 gallons per day of industrial and domestic wastewater (Table B.4.16–1). The site operates a wastewater management control system whereby potentially contaminated laboratory wastewater is routed to retention tanks for analysis and proper disposal. The system provides an additional mechanism for preventing any release of regulated materials from reaching offsite.

All utility and energy systems are currently operating within existing capacity. The Safety and Environmental Protection Directorate uses less than 5 percent of the current usage presented in Table B.4.16–1 (TtNUS 2003).

TABLE B.4.16–1.—*LLNL Utility and Energy Systems*[a]

Utility System	Total LLNL Usage	RHWM	Current Capacity
5ESS telecomm. switch	18,973 (voice lines)	505	20,384
Telecomm. dist. system:			
Copper trunk cables (B256 to 13 nodes)	20,330 (pairs)	540	46,800
Fiber trunk cables	1,468	39	2,368
Copper distribution (Nodes to buildings)	96,950	2,580	115,158
Network speed to desktop	10 Mbps	10 Mbps	10 Mbps
Electricity	57 MW	1.5 MW	125 MW
Natural gas	20,832 TPD	554 TPD	24,500 TPD
Domestic water	1.36M gal/day	0.04 gal/day	2.88M gal/day
Low conductivity cooling water	36.5 MW	1 MW	70.2 MW
Demineralized water	27,700 gal/day	N/A	50,400 gal/day
Sanitary sewer	300,000 gal/day	8,000 gal/day	1,685,000 gal/day
Compressed air	2,400 SCFM	72 SCFM	4,090 SCFM

Source: DOE 2002d.
[a] For the purpose of simplicity, the most recent published site comprehensive plan was used as the primary reference.
gal/day = gallons per day; Mbps = megabits per second; MW = megawatts; N/A = not applicable; SCFM = standard cubic feet per minute; TPD = therms per day.

B.4.17 Worker Safety and Human Health

This section summarizes the occupational protection programs responsible for ensuring that hazardous material management and waste management activities are performed in a manner protective of ES&H relative to the permitted waste management units.

B.4.17.1 *Worker Health and Safety*

LLNL employs ISMS to control hazards associated with site operations, including hazards related to the management and use of hazardous materials. The ISMS process includes project planning, hazard assessment, identification and feedback, and continuous improvement planning. LLNL also follows specific management processes to ensure that adequate security and accountability requirements are met for radioactive and high-hazard materials. Inventory controls are implemented to ensure that material quantities are maintained at mission-essential levels.

Hazardous materials used at LLNL include radioactive material, chemicals, and explosive materials. Hazardous materials are managed at LLNL in a way that ensures cradle-to-grave accountability. The inventory systems for radioactive, chemical, and explosive materials provide the tracking mechanisms for inventory and waste control. Materials remain in appropriate storage areas until they are identified as waste and transferred to the waste management organization for disposal.

Radioactive Material

LLNL maintains an inventory of radioactive material used in laboratory research and radiation monitoring activities. All radioactive material used by LLNL is obtained from offsite vendors. Individual sources at LLNL generally have small quantities of radioactive material and most are sealed. Management of radioactive material at LLNL incorporates the principle of as low as

reasonably achievable (ALARA). Specific activities at LLNL associated with radioactive materials are conducted in accordance with the LLNL ES&H Manual (LLNL 2000i), which incorporates the requirements of 10 CFR 835, *Occupational Radiation Protection,* and addresses all activities associated with radioactive materials management, including personnel training, inventory control and monitoring, safety assessments, and handling.

LLNL worker doses have typically been well below DOE worker exposure limits. LLNL set administrative exposure guidelines at a fraction of the exposure limits to help enforce doses that are ALARA. Table B.4.17.1–1 presents average individual doses and LLNL collective doses from 1997 through 2001.

TABLE B.4.17.1–1.—*LLNL Radiation Exposure Data (1997 through 2001)*

Year	Collective Dose (TEDE) (person-rem)	Number with Measurable Dose	Average Measurable Dose (TEDE) (rem)
1997	22.1	191	0.116
1998	6.9	107	0.064
1999	14.9	137	0.109
2000	12.7	145	0.086
2001	18.4	153	0.120
Average	17.3	173	0.1
Estimate RHWM worker	0.52	5	3×10^{-3}

Source: DOE 2001c.
Note: Data for individual divisions within LLNL (for example ES&H Security Directorate) are NR. Organization numbers for LLNL personnel sometimes change due to work changes or corporate reorganizations. During any 3-month period, monitored personnel may change organizations one or more times.
rem = roentgen equivalent-man; RHWM = radioactive and hazardous waste management; TEDE = Total Effective Dose Equivalent.

Chemical Materials

Specific activities at LLNL associated with chemical materials are conducted in accordance with the LLNL ES&H Manual. The manual provides requirements for the proper management of hazardous materials, responsible organizations, and inventory control.

LLNL maintains a centralized chemical inventory database, ChemTrack, for tracking hazardous chemicals in primary containers (primary means those containers shipped by the manufacturer). The ChemTrack system requires bar coding of chemical containers as they enter LLNL to allow container tracking and access to online chemical inventory data. The bar coded chemical containers are tracked to provide location and usage information from arrival at LLNL through disposal of the container by the waste management program. The LLNL links the bar-coded chemical containers to a location and a chemical custodian (may be more than one person), the Material Safety Data Sheets (MSDS) (if available), related chemical properties, hazard data, and regulatory information.

Explosive Materials

Site 300 uses explosives in various R&D and test applications. Explosive quantities used per activity range from milligrams to several kilograms. Overall, the quantities of explosive material maintained onsite are restricted by the approved explosive capacity of various storage areas. The HEAF located at the Livermore Site uses explosives in various activities in small quantities.

An explosives safety program is used to manage explosives at LLNL. It provides guidance for evaluating and safely conducting explosives operations. The LLNL explosives safety committee

provides continual review, interpretation, and necessary revision to the explosives safety program. As part of the explosive material management strategy, LLNL uses an explosives inventory system to track and manage explosive inventories. The explosives inventory system database maintains information on material composition, characteristics, and shipping requirements; life cycle cost information; plan of use; security and hazard classifications; and compatibility codes. When an explosive material is entered into the explosives inventory system database upon delivery or receipt, the system performs a safety check to ensure that the intended storage location can accept the type and quantity of material received. The explosives inventory system database will flag any storage capacity overages and incompatible explosive items.

B.4.17.2 *Occupational Health and Safety*

A worker protection program is in place at LLNL to protect the health of all workers. To prevent occupational illnesses and injuries and to preserve the health of all workers involved in site-related activities (construction and operations), DOE-approved health and safety programs have been implemented. Table B.4.17.2–1 presents LLNL injury rates over a 3-year period from 1999 through 2001, in terms of total reportable cases rate, lost work day cases rate, and lost work days rate. The total reportable case value includes work-related death, illness, or injury that resulted in loss of consciousness, restriction from work or motion, or transfer to another job or that required medical treatment beyond first aid. The data for lost work days represent the number of workdays beyond the day of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

As shown in Table B.4.17.2–1, these health and safety programs have resulted in lower incidences of injury and illness than those that occur in the general industry, construction, and manufacturing workforces.

TABLE B.4.17.2–1.— *Injury and Illness Data (1999 through 2001) Based on 200,000 Work Hours (100 workers)*[a]

Calendar Year	Total Reportable Cases Rate	Lost Work Day Cases Rate	Lost Work Days Rate
1999	3.8 (6.3)[a]	1.1 (3.1)[a]	13.7 (1.9)[a]
2000	3.5 (6.5)[a]	0.9 (3.3)[a]	23.1 (2.0)[a]
2001[b]	3.7	1.1	14.1
3-Year Average	3.7 (6.5)[c]	1.0 (3.2)[c]	17.0 (2.0)[c]

Source: DOE 2002l.
[a] State of California injury and illness data is for all industries including state and local government are given in parentheses.
[b] State of California injury and illness data is for 2001 were not available at the time of the Draft LLNL SW/SPEIS.
[c] Three-year average for State of California data covers 1998 through 2000 timeframe.

B.4.17.3 *Human Health*

LLNL operates under several RCRA Part B permits and must comply with Title 22 of the *California Code of Regulations*, Article 66264.600. Several health risk assessments (HRA) were conducted, pursuant to 22 CCR 66264.601(c). For completeness, LLNL included all permitted waste facility operations in these HRAs, entitled *Health Risk Assessment for Hazardous and Mixed Waste Management Units at LLNL* (LLNL 1997q, LLNL 2003r). Specifically, the HRAs addressed those facilities that can produce atmospheric emissions and that have potential health effects. The RCRA Part B permit includes detailed descriptions of the waste generated at LLNL and the existing waste management units.

The HRAs were prepared in accordance with procedures and guidelines set forth by the DTSC and the BAAQMD. They addressed the risk associated with both the hazardous and radioactive

properties of chemicals handled at LLNL's permitted waste management units. By following these procedures, the HRAs presented a health-conservative analysis of a hypothetical MEI potentially receiving a reasonable maximum exposure. The HRAs were developed using modeling of throughput capacities for the LLNL waste management units that reflected maximum annual quantities, which were approximately five times the normal quantities.

Potential carcinogenic risks and noncarcinogenic hazards resulting from the emission of the waste chemicals of concern were characterized largely based on the California Environmental Protection Agency's *Preliminary Endangerment Assessment Guidance Manual* and *Air Toxics "Hot Spots" Program Risk Assessment Guidelines* (California EPA 1993, 1994). The contribution to carcinogenic risk from emissions of radionuclides to air was based on NESHAP dose calculations required by Federal regulation. In all cases, risk and hazard were evaluated at the maximum anticipated operating levels, so that the risk and hazard estimates represented upper-bound values. The contribution to risk from emissions of radionuclides to air was obtained by multiplying the NESHAP calculated dose by the International Commission on Radiological Protection risk factor of 0.05 (lifetime excess cancer mortality risk) per Sievert. The HRAs concluded that the combined excess, offsite cancer risk from the existing RHWM facility radioactive and nonradioactive materials is less than 1×10^{-6}, using the highest calculated risk values from each type of material (LLNL 2000aa, 2003r).

In summary, the HRAs found that the risk and the hazard due to the continued operation of the existing facilities, even at maximum throughput conditions, would be below levels of concern described in the regulatory literature. With increased use, DWTF will treat the same waste streams that are treated in the existing facilities; however, DWTF will have improved air emissions control equipment and will treat some additional new waste streams. The DOE has assessed the environmental impacts associated with the construction and operation of the DWTF in an environmental assessment (DOE/EA-1150) (LLNL 1996c). Based on this assessment, the DOE issued a Finding of No Significant Impact on June 12, 1996. The latest HRA (LLNL 2003r) was prepared in support of the revised permit application, following a revised protocol approved by the DTSC and BAAQMD. The scope of the latest HRA addressed the configuration of existing facilities and full operation of the DWTF.

B.5 ENVIRONMENTAL CONSEQUENCES

This section provides information on the methods of analysis applied in this appendix and the results of analyses for LLNL waste management facilities. The appendix begins with an introduction and a summary of the impact assessment methodologies that have been applied. It continues with descriptions of the impacts of the No Action, Proposed Action, and the Reduced Operation Alternatives. For each alternative, impacts are presented by resource area (for example, infrastructure, land use, geology, and soils) or topic area (for example, waste generation, transportation, environmental justice).

Where possible, impacts of the No Action Alternative, Proposed Action, and Reduced Operation Alternative the analyses use estimates of impacts with specific parameters. However, in certain resource areas a conservative estimate of possible impacts of the alternative, were indirectly related to estimates of impacts based on a projected increase or decrease of a given parameter (for example, relating biological resource impacts to changes in square footage).

The NNSA Proposed Action is to continue to operate and enhance LLNL RHWM facilities. The NNSA developed No Action Alternative, Proposed Action, and Reduced Operation Alternative

to accomplish this action and to assess environmental impacts of waste management activities at LLNL. For clarity and brevity, the descriptions of the No Action Alternative, Proposed Action, and Reduced Operation Alternative in the text and LLNL activity descriptions, by facility, are provided Sections B.3.1, B.3.2, and B.3.3. Section B.6 focuses on CEQA considerations that characterize the variation of activities across alternatives. All of the activities discussed in this appendix were used in evaluating the impacts of each alternative presented of the LLNL SW/SPEIS.

B.5.1 No Action Alternative

Under the No Action Alternative, ongoing LLNL waste management programs and activities would continue operating at planned levels as reflected in current DOE/NNSA management plans (e.g., recent Class 1 and Class 2 Permit Modification submittals). The DWTF operations would increase to incorporate permit modifications. Planned waste generation levels would increase over today's generation levels (e.g., the NIF contributions). This would also include any recent activities that have already been approved by the DOE/NNSA and have existing NEPA documentation. When these planned operations are implemented in the future, they could result in increased activity above present levels. Thus, the No Action Alternative forecasts, over 10 years, the level of activity for LLNL waste management operations that would implement current management plans (e.g., RCRA Closure of Building 514) for assigned programs. For a complete list of No Action Alternative activities see Section B.3.1.

The following sections discuss these resource areas in relation to the existing conditions.

B.5.1.1 *Land Use and Applicable Plans*

Implementing the No Action Alternative would not affect the existing land-use patterns or applicable plans at LLNL waste management facilities.

No changes to land use or applicable plans would occur at LLNL under the No Action Alternative. The extent of NNSA land available for use by LLNL would remain the same. Buildings 233 CSU, 280, 513, and 514 would undergo a RCRA closure. After RCRA closure, Building 514 would be removed. A one-time shipment (755 gallons) of TRU waste and mixed TRU waste from Lawrence Berkley National Laboratory would occur. Shipments of waste TRU and TRU mixed waste to WIPP would begin. LLNL waste operations would remain consistent with industrial park uses and would have no foreseeable effects on established land-use patterns or requirements.

Under this alternative, the DWTF would increase operations and the following operations would be transferred to Building 695:

- Building 513 Solidification Unit
- Building 513 Shredding Unit
- Area 514-1 Cold Vapor Evaporation Unit
- Area 514-1 Portable Blending Unit (Waste Blending Unit)
- Area 514-1 Tank Blending Unit

- Area 514-1 Centrifugation Unit
- Area 514-1 Carbon Adsorption Unit (Gas Adsorption Unit)

As these changes would occur to an existing building specifically designed for these operations, there would be no changes or impacts to land use.

The completion of 75 Class 1 and up to 10 Class 2 permit modification requests over the next 10 years would be consistent with existing RHWM facilities and would have no foreseeable effects on established land-use patterns or requirements.

B.5.1.2 *Socioeconomic Characteristics and Environmental Justice*

The implementation of the No Action Alternative would result in no changes to the economic and demographic characteristics, as discussed below.

The No Action Alternative would not likely result in any noticeable change in the existing economic base because LLNL (including the waste management workforce) employment levels and associated activities would increase by only 3 percent over current levels. Additionally, the No Action Alternative would have no effect on the amount of expenditures for goods and services in the local and regional economy. Overall expenditures and employment should remain relatively constant.

The No Action Alternative would not likely result in any noticeable change in existing demographic characteristics. Overall expenditures and employment at LLNL should remain relatively constant through 2014, which in turn would tend to maintain demographic characteristics within the region.

The No Action Alternative would have no discernible adverse impacts to land and visual resources, water resources, biological and ecological resources, cultural resources, air quality, infrastructure, transportation, waste generation, noise, or socioeconomics. Thus, no disproportionately high and adverse impacts to minority or low-income communities are anticipated.

As presented in Section B.5.1.16, LLNL operations would have minimal potential to adversely affect human health for offsite residents or onsite workers. Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

Based on the analyses of all the resource and topic areas, impacts that would result during the course of normal operations would not pose disproportionately high and adverse health or environmental impacts on minority and low-income populations.

B.5.1.3 *Community Services*

The implementation of the No Action Alternative would result in no changes to the community services, as discussed below.

The No Action Alternative would not likely result in any noticeable change in community services. Overall expenditures and employment at LLNL (including the RHWM workforce)

should remain relatively constant through 2014, which, in turn, would tend to maintain levels of service. Contributory effects from other industrial and economic sectors within the region should reduce or mask LLNL's current proportional impact.

Nonhazardous solid waste generated at the Livermore Site would continue to be transported to the Altamont Landfill for disposal. The landfill is estimated to have sufficient capacity to receive waste until the year 2038 (Hurst 2003). The current total daily permitted throughput is 11,150 tons (SWIS 2002). Under the No Action Alternative, approximately 4,800 metric tons per year of solid sanitary waste would be collected and transported to the Altamont Landfill.

B.5.1.4 *Prehistoric and Historic Cultural Resources*

Under the No Action Alternative, no waste management facility construction would occur. Some maintenance activities that require ground disturbance could result in the discovery of buried archaeological resources. If any such activities occurred in Sensitive Areas II, III, or IV at Site 300, the LLNL archaeologist would be contacted prior to conducting the maintenance activity to determine how to proceed in compliance with the Programmatic Agreement (Appendix G). Previous notification to the archaeologist would not be required for maintenance activities at the Livermore Site. If any resources are discovered during the activities at the Livermore Site or Site 300, the LLNL archaeologist would be notified and work would stop within the immediate vicinity until the archaeologist has assessed the discovery.

Buildings 233 CSU, 280, 513, and 514 would undergo RCRA closure under this alternative. These buildings have not been evaluated for eligibility to the National Register. Per the Programmatic Agreement, these buildings would undergo evaluation for eligibility prior to initiation of closure activities. If a building is evaluated as eligible, then a determination of the effect to the building from the closure activities would be made by NNSA. If it is determined that an adverse effect would occur, then measures would be developed to avoid, reduce, or mitigate the effect to the building.

The DWTF and Area 612 Complex, located at the Livermore Site, would be modified under the No Action Alternative. At Site 300, the EWTF, EWSF, and Building 883 would be modified. None of these buildings or facilities has been evaluated for eligibility to the National Register. Prior to modification activities taking place, these buildings would undergo the same process of evaluating eligibility, determining effect, and developing measures to avoid, reduce, or mitigate adverse effect as discussed above for buildings undergoing RCRA closure.

Under this alternative, 75 Class I permit modifications and up to 10 Class II permit modifications would be completed. If any of the modifications would result in ground disturbing activity or modifications to eligible or potentially eligible buildings or structures, then the permit modification would require review by the LLNL archaeologist. This is more likely for the Class II permit modifications.

B.5.1.5 *Aesthetics and Scenic Resources*

The No Action Alternative would not adversely change the overall appearance of the existing landscape, obscure views, increase the visibility of LLNL structures, or otherwise detract from the scenic views from LLNL or from areas adjacent to the site. Modifications to the DWTF, RCRA closures, and other activities, including TRU waste shipments, would have no impact to visual resources.

B.5.1.6 *Agriculture*

No changes to potential agriculture resources would occur at LLNL under the No Action Alternative. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.1.7 *Geologic Resources and Hazards*

No impacts to general geology and geologic resources are anticipated. Impacts from geological hazards (seismicity, slope failure) are evaluated below. Risks from contaminated soils are also discussed.

Seismology

Strong earthquake ground motion is responsible for producing almost all damaging effects of earthquakes, except for surface-fault rupture. Ground shaking generally causes the most widespread effects, not only because it occurs at considerable distances from the earthquake source, but also because it may trigger secondary effects from ground failure and water inundation. Potential sources for future ground motion at the LLNL include the major regional faults (see Section B.4).

Seismic hazard analyses have been performed for LLNL. Existing facilities continue to be upgraded or replaced to the extent possible. Larger earthquakes on more distant faults such as the San Andreas do not significantly affect the hazard estimation for LLNL.

Structure

At the Livermore Site, there is little potential for slope instability because the site is situated on flat topography. At Site 300, the areas around the waste management facilities include hillsides. The hillsides surrounding this area consist of moderately to weakly consolidated sand and gravel, and colluvial and alluvial terrace deposits. The hills have evidence of mass movement. There is an increased chance of slope failure during wet years at the hillsides in the vicinity of the RHWM facilities. Slope failure at these locations would have no effect on LLNL RHWM facilities.

Soils

Implementation of the No Action Alternative involving the full operation of the DWTF would not result in impacts since no new facilities would be required. Since no new waste management facilities are proposed, no impacts to the soils due to erosion would occur. Clean RCRA closures of existing RHWM facilities would remove the potential for site contamination.

B.5.1.8 *Ecology*

Under the No Action Alternative increased use of the DWTF as described in the permit, permit modifications, and the transition plan would not affect any of the biological resources. With the exception of the RCRA closures of Buildings 233 CSU, 280, 513, and 514, this alternative would not entail any changes to the physical environment. The RCRA closures of Buildings 233 CSU, 280, 513, and 514 (including demolition) would remove structures from the site; however, the changes in the existing environment would result in no change to biological resources.

No indirect impacts would occur because no runoff materials would impact sensitive habitats; runoff is collected and analyzed and disposed of appropriately.

B.5.1.9 *Air Quality*

B.5.1.9.1 *Radiological Air Emissions*

The No Action Alternative would continue to have several RHWM facilities as radiological point source and diffuse source emissions. Based on a projected site-wide increase of radioactive waste generation, radiological emissions are estimated to increase proportionally above the existing conditions. Comparison of the No Action Alternative to the existing conditions show that LLNL projects radiological emissions dose to the MEI would remain less than one millirem per year. Radiological emissions would be within all applicable standards.

B.5.1.9.2 *Nonradiological Air Emissions*

Under the No Action Alternative, LLNL would continue to have eight RHWM nonexempt emission sources. Based on a projected site-wide staff increase of 3 percent, traffic emissions are estimated to increase 3 percent above the existing conditions. Comparison of the No Action Alternative air toxic emissions with Bay Area air toxic emissions shows that LLNL projects toxic emissions are less than one percent of those for the Bay Area. D & D activities (including RCRA closures) at LLNL could have short-term adverse impacts due to emissions of criteria air pollutants from construction worker traffic, construction equipment, and fugitive dust from earth-moving activities. The fugitive dust from these activities could exceed particulate matter under 10 microns in diameter (PM_{10}) concentration standards if no dust control measures were implemented. However, engineered controls, such as the application of water or chemical dust suppressants and seeding of soil piles and exposed soils, would minimize fugitive dust. It is expected that PM_{10} concentrations would be within all applicable standards.

The estimated number of daily commuter vehicles to LLNL during FY2002 was 7,500 to 8,500 (RHWM commuters represented 150 commuters). Under the No Action Alternative, a 3 percent increase in daily commuter traffic would occur. Increases of carbon monoxide and nitrogen oxides, an ozone precursor, would occur with the increase in commuter traffic. However, the EPA model considers that future vehicles will have lower emission rates and more stringent inspection and maintenance programs; actual emissions would be less than the model baseline.

In addition, the BAAQMD's vehicle buyback program designed to remove older vehicles from the road will continue and contribute to the reduction in commuter vehicle emissions. In addition, the total carbon monoxide emissions for the No Action Alternative were found to be less than 1 percent of the maintenance area's emissions of carbon monoxide. As a result, the NNSA has concluded that no conformity determination is required for the No Action Alternative.

B.5.1.10 *Water*

Under the No Action Alternative, LLNL would continue to monitor groundwater quality at numerous locations throughout the Livermore Site and Site 300. Past measurements indicate that some contaminants at various sites have periodically exceeded the maximum contaminant levels (MCLs) in Federal drinking water standards (40 CFR Part 141). However, in accordance with CERCLA provisions and plans, restoration activities would continue to decrease concentrations at these sites over time (LLNL 2002cc).

LLNL RHWM facilities do not use groundwater for any portion of their water supply; therefore, no effects to groundwater quantity would be anticipated under the No Action Alternative.

During storm events at LLNL waste management facilities, including the DWTF, stormwater runoff is collected, sampled, and managed through the sewer system as appropriate. Rain collects from roofs and other hard surfaces within the complexes. Contact with waste containers and equipment is minimized to the extent practical.

Because LLNL manages hazardous materials throughout both sites, including wastes, it is important to know the current LLNL stormwater runoff monitoring program includes visually monitoring all facility discharge locations onsite annually and during storm events and sampling of 10 Livermore Site and 7 Site 300 locations. These samples are the best available indicators of what contaminant(s) could reasonably be transported offsite. No regulatory limits have been set for pollutants in stormwater runoff. During the most recent sampling, no pollutants were detected at levels that would be a cause for concern. No effects to stormwater compliance would be anticipated under this alternative.

Under the No Action Alternative, only minor net changes in building and parking lot areas would be anticipated. Annual variations in LLNL surface runoff would occur with variations in rainfall quantity and intensity and declining capability are a potential concern. However, no overall impact to surface water quantity from activities under the No Action Alternative would be anticipated.

B.5.1.11 *Noise*

Under the No Action Alternative, ongoing waste management activities at LLNL would continue at planned levels as reflected in current DOE management plans. In some cases, these planned levels would include increases over today's operating levels. This would include any activities that have been approved by the DOE and have existing NEPA documentation.

The No Action Alternative would include the background noise levels presented for the affected environment in Section B.4.10 and noise from the following additional activities would change:

- Increased use of the DWTF
- RCRA closures of Buildings 233 CSU, 280, 513, and 514

The acoustical environment in and around LLNL could be affected during implementation of these proposed activities.

Full operation of the DWTF under this alternative would have a negligible effect on background noise levels. The DWTF is only one facility of over 500 buildings at LLNL. With the planned consolidation of operations at the DWTF, noise levels would likely experience a slight decrease. Local worker and waste transportation traffic would contribute to the ambient noise in the area. However, the addition of 5 RHWM commuters to the Livermore Site with nearly 10,000 commuters would be negligible.

RCRA closure activities would generate noise produced by heavy construction equipment, trucks, and power and percussion tools. In addition, increased traffic is expected to increase

onsite and offsite along regional transportation routes used to bring equipment and workers to the site. The noise levels would be representative of levels at large-scale building sites.

Relatively high and continuous levels of noise in the range of 93 to 108 dB(A) would be produced by heavy equipment operations during the initial stages of the RCRA closure. However, after that time, heavy equipment noise would become more sporadic and brief in duration. The noise from trucks, power tools, and percussion would be sustained through most of the activities. As closure activities reach their conclusion, sound levels would decrease to levels typical of daily facility operations (55 to 65 dB[A]). The D&D work noise levels would contribute to the ambient background noise levels for the duration of construction, after which ambient background noise levels would return to preclosure levels.

Table B.5.1.11–1 presents peak attenuated noise levels expected during construction of these facilities. At a distance of approximately 1,700 feet from the source, peak attenuated noise levels from most construction equipment are within the background range of typically quiet outdoors and residential areas.

TABLE B.5.1.11–1.—*Peak Attenuated Noise Levels (dB[A]) Expected from Operation of Construction Equipment*

Source	Peak Noise Level	Distance from Source						
		50 ft	100 ft	200 ft	400 ft	1000 ft	1,700 ft	2,500 ft
Heavy Trucks	95	84 - 89	78 - 83	72 - 77	66 - 71	58 - 63	54 - 59	50 - 55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80 - 89	74 - 82	68 - 77	60 - 71	54 - 63	50 - 59	46 - 55
Bulldozer	107	87 - 102	81 - 96	75 - 90	69 - 84	61 - 76	57 - 72	53 - 68
Generator	96	76	70	64	58	50	46	42
Crane	104	75 - 88	69 - 82	63 - 76	55 - 70	49 - 62	45 - 48	41 - 54
Loader	104	73 - 86	67 - 80	61 - 74	55 - 68	47 - 60	43 - 56	39 - 52
Grader	108	88 - 91	82 - 85	76 - 79	70 - 73	62 - 65	58 - 61	54 - 57
Dragline	105	85	79	73	67	59	55	51
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

Source: Golden et al. 1979.
dB(A) = A-weighted decibels; ft = feet.

Closure activities could affect the occupational health of workers, but measures are in effect to ensure that hearing damage to workers does not occur. These measures include regulations contained within *Worker Protection Management for DOE Federal and Contractor Employees* (DOE O 440.1A) and *Occupational Noise Exposure* (29 CFR Part 1910.95).

Worker protection against effects of noise exposure is provided when the sound levels exceed those established by the Occupational Safety and Health Administration. When workers are subjected to sound exceeding those limits, feasible administrative or engineered controls are used. If such controls fail to reduce sound levels to within the levels of the table, personal protective equipment (e.g., ear plugs) is provided and used to reduce sound levels to within the levels of the table.

B.5.1.12 *Minerals*

No changes to mineral resources would occur at LLNL under the No Action Alternative. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.1.13 *Traffic and Transportation*

No additional impacts to transportation would occur under the No Action Alternative. While the number of shipments would increase, the amount of material and waste per shipment would be well below (25 percent) the vehicle capacity. Waste shipments would range from 158 to 238 per year (see Table B.5.1.13–1). The addition of 5 new commuters to a site with 10,000 commuters would be negligible.

TABLE B.5.1.13–1.—*LLNL Annual Material Transportation Activities*

Activity	Existing Conditions	No Action Alternative
Material (annual shipments radioactive, chemical, and explosives)	390-467 shipments[a]/yr	455-535 shipments/yr
Waste (annual shipments includes hazardous and radioactive)	59-88 shipments[b]/yr	158-238 shipments/yr
Annual sanitary waste shipments	359-518 shipments[c]/yr (7 to 10 per week)	370-534 shipments/yr
Site-related traffic— total daily traffic (RHWM staff)	9,772 commuters (150 commuters)	10,081 commuters (160 commuters)

Source: LLNL 1992a, DOE 1999a, TtNUS 2003.
[a] Existing conditions take into account 1996-2003 data and 1992 EIS/EIR.
[b] Based on CY2002 data (range is provided to bound impact) and generation fates 1993-2001.
[c] Estimate based on 4,666 metric tons (FY2001) and an average 9 to 13 metric tons per truck.

B.5.1.14 *Materials and Waste Management*

Materials

The No Action Alternative would not cause any major changes in the types of materials used at the waste management facilities or throughout LLNL. Chemical usage at LLNL would increase, consistent with a 3 percent increase in LLNL operations. Continued application of pollution prevention and waste minimization techniques to future operations would offset a portion of the projected increase. Average maximum quantities would likely remain constant as material storage space remains constant; however, average quantities would be expected to increase to meet demand (Tables B.5.1.14–1 and B.5.1.14–2 provide estimates of chemical usage at the Livermore Site and Site 300, respectively. As these facilities engage in their missions, other chemicals could be added or quantities increased. Such changes would be reviewed against LLNL health and safety procedures and policies). Under the No Action Alternative, chemical material projections used for analysis would not exceed existing chemical material management capacities. No substantial or critical material shortages would occur. As reported in the 1999 Supplement Analysis, quantities of chemicals at LLNL declined by over 50 percent (DOE 1999a).

Similar increases in overall quantities of radioactive materials and explosive materials based on current administrative limits are expected. Under the No Action Alternative, radioactive material and explosive material requirements would not exceed existing material management capacities.

Waste Management

Implementation of the No Action Alternative would not cause any major changes in the types of waste streams generated onsite. Although increasing, waste generation levels over the next 10 years at LLNL would remain essentially consistent with recent generation quantities. Any increase would be consistent with increases from new operations and normal fluctuations experienced over the past 10 years with LLNL operations. Waste minimization and pollution prevention techniques would be expected to offset a portion of the projected increases. Onsite waste handling capacities are 4 to 5 times expected waste volumes. Waste projections used for analysis would not exceed existing offsite waste management disposal capacities.

For projection purposes, the CY1993 – FY2002 routine waste generation data were considered a reasonable range for existing facilities; an average was used. The amount of waste generated would reflect proportional increases in LLNL activity levels over the next 10 years. New operations wastes would be derived from mission-related work. A margin was added in order to differentiate the No Action Alternative from the existing conditions and bound any operational increases. The waste quantities projected would represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.1–2 presents estimated annual (routine) waste generation quantities by waste category.

Waste generation levels for special (nonroutine) program waste, such as for unused chemicals or laboratory closeout, are derived separately from CY1993 – FY2002 nonroutine waste generation. The amount of waste generated is anticipated to reflect proportional increases or decreases in LLNL activity levels over the next 10 years. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.1–2 presents estimated annual (nonroutine) waste generation quantities by waste category.

All Other Wastes

LLNL operations also involve the four additional waste management activity areas discussed below.

Biohazardous (includes Medical Waste Management Act) Waste

In 2001 and 2002, several hundred kilograms of biohazardous waste were generated, treated, and disposed of at an approved offsite facility. Under the No Action Alternative, biohazardous waste generation would range from 0 to 1 metric ton (most years would be 0.1 to 0.3 metric tons). The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Construction and D&D

The construction of the 100,000 to 200,000 square feet of new facilities at LLNL (no new RHWM facilities) would generate 200 to 400 metric tons of construction debris.

In the past during D&D, LLNL would potentially generate hazardous waste including TSCA waste and radioactive waste including mixed. However, the planned D&D work under the No Action Alternative would directly affect the quantity of sanitary/solid waste and TSCA waste requiring disposal (including RCRA closures of Building 233 CSU, 280, 513, and 514). In the case of RCRA closure at the Building 514 complex, the potential for generating a mixed waste is possible. LLNL would generate building debris, primarily concrete, wood, metal, and other building materials. LLNL would generate TSCA waste, primarily PCBs and asbestos, that would be removed from transformers and buildings. Assuming that up to 700,000 square feet of facilities site-wide would be removed, D&D activities would generate 4,200 metric tons of debris over 10 years. It is estimated that only 350 metric tons would be LLW, MLLW, and hazardous wastes. Much of the debris would be diverted (recycled, reclaimed, reused) based on historical data.

Under the No Action Alternative, routine and nonroutine maintenance and repair projects would occur over the next 10 years. Assuming LLNL would require 2 to 5 percent annual reinvestment and maintenance wastes are proportional to all wastes, routine and nonroutine maintenance and repair projects would generate 90 to 200 metric tons per year of debris.

Environmental Restoration Waste

Site-wide environmental restoration waste generation trends at LLNL would generally remain a function of treatment units, the number of wells, and the number of hours of operation. No appreciable onsite impacts to treatment facilities would occur because existing waste handling capabilities are already in place.

Wastewater

Wastewater would increase to approximately 310,000 gallons per day. Sufficient capacity would remain.

B.5.1.15 *Utilities and Energy*

All utility and energy systems would operate within existing capacity. All waste management activities at the Livermore Site and Site 300, would continue to use less than 5 percent of all utility and energy system's annual projections for the next 10 years, as presented in Table B.5.1.15–1 (TtNUS 2003).

TABLE B.5.1.15–1.—*No Action Alternative Annual LLNL Utility and Energy Systems*

Utility System	RHWM Usage	Total LLNL Usage including RHWM	Current Capacity	Remaining Capacity (percent)
5ESS Telecomm. Switch	(voice lines)	18,973[a]	20,384	7
Telecomm. Dist. System:				
Copper Trunk Cables (B256 to 13 nodes)	(pairs)	20,330[a]	46,800	57
Fiber Trunk Cables	40	1512	2,368	36
Copper Distribution (Nodes to buildings)	2,657	99,000	115,158	14
Network Speed to Desktop	10 Mbps	10 Mbps	10 Mbps	N/A
Electricity	1.5 MW	59 MW	125 MW	47
Natural Gas	571 TPD	23,600 TPD	24,500 TPD	7
Domestic Water	0.04 gal/day	1.4 gal/day	2.88M gal/day	51
Low Conductivity Cooling Water	1 MW	37.6 MW	70.2 MW	46
Demineralized Water	N/A	28,500 gal/day	50,400 gal/day	43
Sanitary Sewer	8,240 gal/day	224,000 gal/day	1,685,000 gal/day	83
Compressed Air	74 SCFM	2,472 SCFM	4,090 SCFM	40

Source: DOE 2002d, TtNUS 2003.

[a] Assumes current capacity is sufficient to accommodate staffing increases.

gal/day = gallons per day; Mbps = megabits per second; MW = megawatts; N/A = not applicable; SCFM = standard cubic feet per minute; TPD = therms per day.

B.5.1.16 *Occupational Protection*

Table B.5.2.16–1 provides estimates of the number of TRCs and LWCs that could occur under the No Action Alternative. The projected injury rates are based on average historic LLNL injury rates over a 3-year period from 1999 through 2001 (DOE 2001c). These rates were then multiplied by the projected employment levels for each alternative to calculate the number of TRCs and LWCs under each of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The TRC value includes work-related death, illness, or injury that resulted in loss of consciousness, restriction from work or motion, transfer to another job, or required medical treatment beyond first aid. The data for LWCs represent the number of workdays beyond the day of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

The DOE expects minimal worker radiological health impacts from the LLNL activities under the No Action Alternative. The values for the No Action Alternative were calculated assuming the number of radiation workers and their average annual radiation dose would be the same as the average values for the past 3 years (Table B.5.1.16–2). Table B.5.1.16–2 presents estimated

radiation doses for the collective population of workers who would be directly involved in implementing the No Action Alternative, Proposed Action, and Reduced Operation Alternative as well as latent cancer fatalities (LCFs) likely attributable to these doses.

The estimated number of LCFs listed in Table B.5.1.16–2 for the No Action Alternative can be compared to the projected number of fatal cancers from all causes. Population statistics indicate that cancer caused 23 percent of the deaths in the U.S. in 2000. If this percentage of deaths from cancer continues, 23 percent of the U.S. population would contract a fatal cancer from all causes. Thus, in the population of 1,000 workers, 230 persons would be likely to contract fatal cancers from all causes. Under the No Action Alternative, the incremental impacts from LLNL operations would be small.

TABLE B.5.1.16–1.—*Estimated Occupational Safety Impacts to LLNL Workers for the No Action Alternative*

Worker Safety Parameters	No Action Alternative
Workforce –	10,900
Total (RHWM)	(160)
Total recordable cases of accident or injury –	400
Total (RHWM)	(5.9)
Lost workday cases –	110
Total (RHWM)	(1.6)

Source: TtNUS 2003, DOE 2002l.

TABLE B.5.1.16–2.—*Estimated Radiological Dose and Health Impacts to RHWM Workers for the No Action Alternative (Based on 3-Year Average)*

Health Impact	No Action Alternative
Collective involved worker	0.48[a]
Estimated increase in number of LCFs	2×10^{-4}

Source: DOE 2001c.

[a] Estimated level on RHWM facilities workforce represented less than 3 percent of all LLNL involved workers.

Note: Data for individual divisions within LLNL (for example SEP Directorate) are NR. Organization numbers for LLNL personnel sometimes change due to work changes or corporate reorganizations. During any 3-month period, monitored personnel may change organizations one or more times.

B.5.1.17 *Site Contamination*

Soil and groundwater contamination at LLNL occurred as the result of past operations. The cleanup of these soils and groundwater would continue and would meet the health risk-based standards corresponding to the intended future uses of the site. At this time, analyses indicate no significant risk to the general public (LLNL 2002cc).

As of 2001, LLNL operated 30 treatment facilities: 28 groundwater treatment facilities and 2 VTFs. A total of nearly 80 groundwater extraction wells operated at an average flow rate of 2,540 liters per minute. A total of two vapor extraction wells operated at an average flow rate of 670 cubic meters per minute. At present, eight CERCLA ER Operational Units (OUs) are being managed to mitigate contamination at Site 300. These OUs are the GSA, the Building 834 Complex, the High Explosive Process Area, Building 850/Pits 3 and 5, Building 854 Pit 6, Building 832 Canyon, and Site 300. As of 2001, LLNL operated 10 treatment facilities at Site 300: 3 groundwater and soil vapor extraction systems and 7 portable treatment facilities. In 2001, 19 wells that extract only groundwater, 7 wells that extract only soil vapor, and 24 wells that extract both were in operation. The state, NNSA, and LLNL would continue to discuss

remediation, investigation, monitoring, and potential cleanup activities, as necessary (LLNL 2002cc).

With the RCRA closure of Buildings 513, 514, 280, and 233 CSU; the associated treatment equipment; and the consolidation of waste management operations into DWTF, the potential for soil and groundwater contamination from any LLNL waste management operations would be reduced. Also, where hazardous materials (including wastes in SAAs and WAAs) are handled at LLNL, administrative and engineering controls are in place to minimize the potential for soil and ground contamination from any LLNL operations.

B.5.2 Proposed Action

The Proposed Action would involve continuing waste management operations, increasing DWTF use, and implementing several additional permit modifications (see Table B.3–3). Waste generation at LLNL would be expected to increase over the next 10 years (see Table B.3–2). Over the next 10 years, approximately 100 Class 1 permit modifications, 20 Class 2 permit modifications, 2 Class 3 (see Table B.3.2–1 for a range of possible permit modifications) and one permit renewal would occur. Building 696 would begin operations as a Part B-permitted facility. Closure of several RCRA waste management facilities would begin.

The following sections discuss these resource areas in relation to the No Action Alternative.

B.5.2.1 *Land Use and Applicable Plans*

Implementing the Proposed Action would not affect the existing land-use patterns or applicable plans at LLNL RHWM facilities. No changes to land use or applicable plans would occur at LLNL under the Proposed Action. The extent of DOE land available for use by LLNL would remain the same. As with the No Action Alternative, the DWTF operation would increase to meet waste volumes and increases resulting from transferring these existing capabilities and closures (Buildings 513, 514, 280, and 233 CSU):

Operating the existing Building 696 (currently radioactive waste only) as a RCRA Part B-permitted facility would remain consistent with existing operations at the DWTF complex and further consolidate existing capabilities, patterns, or requirements. Permitted treatment and storage operations would be transferred to Building 696 are described in Section B.3.2.

The completion of 100 Class 1 permit modification requests over the next 10 years in support of LLNL waste operations would remain consistent with existing RHWM facility uses and would have no foreseeable effects on established land-use patterns or requirements.

The completion of 20 Class 2 and 2 Class 3 permit modifications over the next 10 years in support of LLNL waste operations would remain consistent with existing RHWM facility uses and would have no foreseeable effects on established land use patterns or requirements.

B.5.2.2 *Socioeconomic Characteristics and Environmental Justice*

The implementation of the Proposed Action would result in small changes to the economic and demographic characteristics, as discussed below.

The Proposed Action would change the economic base by 5 percent over the No Action Alternative because LLNL (including the RHWM workforce) employment levels and associated activities would increase by 5 percent. Under the Proposed Action, the RHWM workforce would increase to 170 (less than one hundredth of one percent of the region). Additionally, the Proposed Action would have a small effect on the amount of expenditures for goods and services in the local and regional economy. The estimated annual operating budget would increase by approximately 10 percent over the No Action Alternative to $1.7 billion (see Table B.3–2). These increases (less than one hundredth of one percent of the region) would not likely result in any noticeable change with overall regional expenditures and employment remaining relatively constant.

The Proposed Action would not likely result in any noticeable change in existing demographic characteristics. Overall expenditures and employment at LLNL, while increasing slightly through 2014, would tend to maintain demographic characteristics within the region. RHWM contribution would be very small.

The Proposed Action would have no discernible adverse impacts to land and visual resources, water resources, biological and ecological resources, cultural resources, air quality, infrastructure, transportation, waste generation, noise, or socioeconomics. Thus, no disproportionately high and adverse impacts to minority or low-income communities are anticipated.

As presented in Section B.5.1.16, LLNL operations would have minimal potential to adversely affect human health for offsite residents or onsite workers. Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

Based on the analyses of all the resource and topic areas, impacts that would result during the course of normal operations would not pose disproportionately high and adverse health or environmental impacts on minority and low-income populations.

B.5.2.3 *Community Services*

The implementation of the Proposed Action would result in no changes to the community services, as discussed below.

The Proposed Action would not likely result in any noticeable change in community services. Overall expenditures and employment at LLNL (including RHWM) would increase slightly through 2014 and would tend to maintain levels of service. Contributory effects from other industrial and economic sectors within the region should reduce or mask LLNL's current proportional impact.

Nonhazardous solid waste generated at the Livermore Site would continue to be transported to the Altamont Landfill for disposal. The landfill is estimated to have sufficient capacity to receive waste until the year 2038 (Hurst 2003). The current total daily permitted throughput is 11,150 tons (SWIS 2002). Under the Proposed Action, approximately 5,100 metric tons per year of solid sanitary waste would be collected and transported to the Altamont Landfill.

B.5.2.4 *Prehistoric and Historic Cultural Resources*

Under the Proposed Action, no waste management facility construction would occur. Some maintenance activities that require ground disturbance could result in the discovery of buried archaeological resources. Because the level of operations would be increased, the amount of maintenance activity would be greater, thereby increasing the likelihood of impacting archaeological resources through these activities. If any such activities occurred in Sensitive Areas II, III, or IV at Site 300, the LLNL archaeologist would be contacted prior to conducting the maintenance activity to determine how to proceed in compliance with the Programmatic Agreement (Appendix G). Previous notification to the archaeologist would not be required for maintenance activities at the Livermore Site. If any resources are discovered during the activities at the Livermore Site or Site 300, the LLNL archaeologist would be notified and work would stop within the immediate vicinity until the archaeologist has assessed the discovery.

Buildings 233 CSU, 280, 513, and 514 would undergo RCRA closure under this alternative. These buildings have not been evaluated for eligibility to the National Register. Per the Programmatic Agreement, these buildings would undergo evaluation for eligibility prior to initiation of closure activities. If a building is evaluated as eligible, then a determination of the effect to the building from the closure activities would be made by NNSA. If it is determined that an adverse effect would occur, then measures would be developed to avoid, reduce, or mitigate the effect to the building.

The DWTF and Area 612 Complex, located at the Livermore Site, would be modified under the Proposed Action. At Site 300, the EWTF, EWSF, and Building 883 would be modified. None of these buildings or facilities has been evaluated for eligibility to the National Register. Prior to modification activities taking place, these buildings would undergo the same process of evaluating eligibility, determining effect, and developing measures to avoid, reduce, or mitigate adverse effect as discussed above for buildings undergoing RCRA closure.

Under this alternative, 100 Class I permit modifications, 20 Class II permit modifications, and 2 Class III permit modifications would be completed. If any of the modifications would result in ground disturbing activity or modifications to eligible or potentially eligible buildings or structures, then the permit modification would require review by the LLNL archaeologist. This is more likely for the Class II and III permit modifications.

B.5.2.5 *Aesthetics and Scenic Resources*

The Proposed Action would not adversely change the overall appearance of the existing landscape, obscure views, increase the visibility of LLNL structures, or otherwise detract from the scenic views from the Livermore Site or Site 300 or from areas adjacent to the sites. Modifications to the DWTF, RCRA closures, and other changes would have no impact on visual resources.

B.5.2.6 *Agriculture*

No changes to potential agriculture resources would occur at LLNL under the Proposed Action. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.2.7 *Geologic Resources and Hazards*

No impacts to general geology and geologic resources are anticipated. Impacts from geological hazards (seismicity, slope failure) are evaluated below. Risks from contaminated soils are also discussed.

Seismology

Strong earthquake ground motion is responsible for producing almost all damaging effects of earthquakes, except for surface-fault rupture. Ground shaking generally causes the most widespread effects, not only because it occurs at considerable distances from the earthquake source, but also because it may trigger secondary effects from ground failure and water inundation. Potential sources for future ground motion at the LLNL include the major regional faults (see Section B.4.8).

Seismic hazard analyses have been performed for the LLNL. Existing facilities continue to be upgraded or replaced to the extent possible. As described in the permit application, the DWTF and Area 612 were designed to higher seismic standards than the older facilities expected to undergo RCRA closure. Larger earthquakes on more distant faults such as the San Andreas do not significantly affect the hazard estimation for LLNL.

Structure

At the Livermore Site, there is little potential for slope instability because the site is situated on nearly flat topography. At Site 300, the areas around the RHWM facilities include hillsides. The hillsides surrounding this area consist of moderately to weakly consolidated sand and gravel and colluvial and alluvial terrace deposits. The hills have evidence of mass movement. There is an increased chance of slope failure during wet years at the hillsides in the vicinity of the waste management facilities; however, slope failure at these locations would have no effect on LLNL RHWM facilities.

Soils

Implementation of the Proposed Action would have no impacts because no new RHWM facilities would be constructed. Operating Building 696 under a RCRA Part B permit would have no impacts since Building 696 already operates as a radioactive waste facility within the DWTF complex. As with the No Action Alternative, relocating operations to the DWTF and the clean RCRA closures of Buildings 513, 514, 280, and 233 CSU would not disturb any clean soils and would remove the potential for site contamination.

B.5.2.8 *Ecology*

Under the Proposed Action, increasing DWTF operations as described in the permit, permit modifications, and the transition plan would not affect any of the biological resources considered in this appendix; because, with the exception of the RCRA closures, changes would not entail any changes to the physical environment. As with the No Action Alternative, the RCRA closures of Buildings 513, 514, 280, and 233 CSU (including demolition) would remove structures from the site; however, no changes in the existing environment would impact biological resources. No indirect impacts would because no runoff materials would affect sensitive habitats because runoff would be collected and analyzed and disposed of appropriately.

B.5.2.9 *Air Quality (Including Conformity Analysis)*

Radiological Air Emissions

The Proposed Action would continue to have several RHWM facilities as radiological point sources and diffuse sources of emissions. Based on a projected site-wide increase of radioactive waste generation, radiological emissions would increase proportionally above the existing conditions. Comparison of the Proposed Action to the existing conditions and the No Action Alternative shows that LLNL projects radiological emissions dose to the MEI would remain less than one millirem per year. Radiological emissions would be within all applicable standards.

Nonradiological Air Emissions

Under the Proposed Action there would continue to be eight RHWM nonexempt emission sources. Based on a projected site-wide staff increase of 5 percent, traffic emissions would increase 5 percent above the No Action Alternative. Comparing the Proposed Action air toxic emissions with Bay Area air toxic emissions shows that LLNL projects toxic emissions would be less than one percent of those for the Bay Area. D&D activities (including RCRA closures) at LLNL could have short-term adverse impacts due to emissions of criteria air pollutants from construction worker traffic, construction equipment, and fugitive dust from earth-moving activities. The fugitive dust from these activities could exceed PM_{10} concentration standards if no dust control measures were implemented. However, engineered controls, such as the application of water or chemical dust suppressants and seeding of soil piles and exposed soils, would minimize fugitive dust. It is expected that PM_{10} concentrations would be within all applicable standards.

The estimated number of daily commuter vehicles to LLNL during FY2002 was 7,500 to 8,500 (RHWM commuters represented 170 commuters). Under the Proposed Action, a 5-percent increase in daily commuter traffic would occur. Increases of carbon monoxide and nitrogen oxides, an ozone precursor, would occur with the increase in commuter traffic. However, the EPA model considers that future vehicles will have lower emission rates and more stringent inspection and maintenance programs; actual emissions would be less than the model baseline. In addition, the BAAQMD vehicle buyback program, designed to remove older vehicles from the road, will continue and contribute to the reduction in commuter vehicle emissions. In addition, the total carbon monoxide emissions for the Proposed Action were found to be less than 1 percent of the maintenance area's emissions of carbon monoxide. As a result, the NNSA has concluded that no conformity determination is required for the Proposed Action.

B.5.2.10 *Water*

Under this alternative, LLNL would continue to monitor groundwater quality at numerous locations throughout the Livermore Site and Site 300. Past measurements indicate that some contaminants at various sites have periodically exceeded the MCLs in Federal drinking water standards (40 CFR Part 141). However, concentrations at these sites (including RHWM facilities) would continue to decrease over time (LLNL 2002cc).

LLNL RHWM facilities do not use groundwater for any portion of their water supply; therefore, no effects to groundwater quantity would be anticipated under the Proposed Action.

During storm events at LLNL RHWM facilities, including the DWTF, stormwater runoff is collected, sampled, and managed through the sewer system as appropriate. The current LLNL stormwater runoff monitoring program includes visually monitoring all facility discharge locations onsite annually and during storm events and sampling 10 Livermore Site and 7 Site 300 locations. These samples are the best available indicators of what contaminant(s) could reasonably be transported offsite. No regulatory limits have been set for pollutants in stormwater runoff. During the most recent sampling, no pollutants were detected at levels that would be a cause for concern. No effects to stormwater compliance would be anticipated under the Proposed Action.

Under the Proposed Action, only minor net changes in building and parking lot areas would be anticipated. Annual variation in LLNL surface runoff would occur with variations in rainfall quantity and intensity and declining capability. However, no overall impact to surface water quantity from activities under the Proposed Action would be anticipated.

B.5.2.11 *Noise*

Under the Proposed Action, ongoing waste management activities at LLNL would increase above current levels as reflected in current NNSA management plans. This includes any activities that have been approved by the NNSA and have existing NEPA documentation but have not begun.

The Proposed Action includes the background noise levels presented for the affected environment in Section B.4.10 and noise from the following additional activities:

- Increasing DWTF operations
- RCRA closure of Buildings 513, 514, 280, and 233 CSU (same as No Action)
- Increasing traffic (workforce and shipments)

The acoustical environment in and around LLNL could be impacted during implementation of these proposed activities.

Increasing DWTF operations under this alternative would have a negligible effect on background noise levels. The DWTF is only one facility of over 500 buildings at LLNL. Local worker and waste transportation traffic would contribute to the ambient noise in the area. However the addition of 10 RHWM commuters to the Livermore Site with over 10,000 commuters would be negligible.

As with the No Action Alternative, RCRA closure activities would generate noise produced by heavy construction equipment, trucks, and power and percussion tools. In addition, traffic would increase onsite and offsite along regional transportation routes used to bring equipment and workers to the Site. The noise levels would be representative of levels at large-scale building sites.

B.5.2.12 *Minerals*

No changes to mineral resources would occur at LLNL under the Proposed Action. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.2.13 *Traffic and Transportation*

Traffic and material and waste transportation activities would increase under this alternative. Waste shipments would range from 205 to 308 per year. The overall impact of activities presented in Table B.5.2.13–1 would be minimal given the current traffic estimates for the region.

TABLE B.5.2.13–1.—*LLNL Annual Material Transportation Activities*

Activity	No Action	Proposed Action
Material (annual shipments radioactive, chemical, and explosives)	540 shipments[a]/yr	600 shipments/yr
Waste (annual shipments includes hazardous and radioactive)	240 shipments[b]/yr	310 shipments/yr
Annual sanitary waste shipments	534 shipments[c]/yr	570 shipments/yr
Site-related traffic — Total daily traffic (RHWM staff)	10,081 commuters (160 commuters)	10,772 commuters (170 commuters)

Source: LLNL 1992a, DOE 1999a, TtNUS 2003.
[a] Existing condition takes into account 1992 EIS/EIR data and 1996-2002 data.
[b] Based on CY2002 data (range is provided to bound impact) and waste generation rates 1993-2002.
[c] Estimate based on 4,666 metric tons (FY2001) and an average 9-13 metric tons per truck.

B.5.2.14 *Utilities and Energy*

All utility and energy systems would operate within existing capacity. The Safety and Environmental Protection Directorate, which manages all waste management activities at the Livermore Site and Site 300, would continue to use less than 5 percent of the utility and energy systems projections for the next 10 years as presented in Table B.5.2.14–1 (TtNUS 2003).

TABLE B.5.2.14–1.—*Proposed Action LLNL Utility and Energy Systems*

Utility System	RHWM Usage	Total LLNL Usage (including RHWM)	Current Capacity	Remaining Capacity (Percent)
5ESS Telecomm. Switch	556 (voice lines)	18,973[a]	20,384	7
Telecomm. Dist. System:				
Copper Trunk Cables (B256 to 13 nodes)	596 (pairs)	20,330[a]	46,800	57
Fiber Trunk Cables	43	1,615	2,368	32
Copper Distribution (Nodes to buildings)	284	107,000	115,158	7
Network Speed to Desktop	10 Mbps	10 Mbps	10 Mbps	NA
Electricity	1.7 MW	62.5 MW	125 MW	50
Natural Gas	611 TPD	23,000 TPD	24,500 TPD	6
Domestic Water	0.04M gal/day	1.5M gal/day	2.88M gal/day	48
Low Conductivity Cooling Water	1 MW	40.2 MW	70.2 MW	43
Demineralized Water	NA	30,500 gal/day	50,400 gal/day	40
Sanitary Sewer	9,000 gal/day	224,000 gal/day	1,685,000 gal/day	80
Compressed Air	72 SCFM	2,640 SCFM	4,090 SCFM	35

Source: TtNUS 2003, DOE 2002d.
[a] Assumes current capacity is flexible to account for staffing increases.
gal/day = gallons per day; Mbps = million bits per second; MW = megawatts; NA = not available; RHWM = radioactive and hazardous waste management; SCFM = standard cubic feet per minute; TPD = therms per day.

B.5.2.15 *Materials and Waste Management*

Materials

The Proposed Action would not cause any major changes in the types of materials used at the RHWM facilities or throughout LLNL. Chemical usage at LLNL would increase, consistent with a 5-percent increase in laboratory operations. Continued application of pollution prevention waste minimization techniques to future operations would offset a portion of the projected increase. Average maximum quantities would likely remain constant as material storage space remains constant; however, average quantities would be expected to increase to meet demand (see Tables B.5.1.14–1 and B.5.1.14–2). Under the Proposed Action, chemical material projections used for analysis would not exceed existing chemical material management capacities. No substantial or critical material shortages would occur. Increases in overall quantities of radioactive materials and explosive materials based on current administrative limits are not expected. Under the Proposed Action, radioactive material and explosive material requirements would not exceed existing material management capacities.

Waste Management

Implementation of the Proposed Action would not cause any major changes in the types of waste streams generated onsite. Waste generation levels over the next 10 years at LLNL would potentially increase above recent generation quantities. This increase would be consistent with increases from new operations and historic normal fluctuations experienced over the past 10 years with LLNL operations. These projections would be decreased should waste minimization and pollution prevention programs continue to have success. Onsite waste handling capacities are 4 to 5 times expected waste volumes. Waste projections used for analysis would not exceed existing offsite waste management disposal capacities.

For projection purposes, the CY1993 to FY2002 routine waste generation data were considered a reasonable range for existing facilities and an average was used. The amount of waste generated would reflect proportional increases in LLNL activity levels over the next 10 years. New operations wastes would be derived from mission-related work and would be additive. A margin representing a statistical standard deviation was added in order to show the maximum likely operational increases. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste category. Table B.3.2–1 presents estimated annual (routine) waste generation quantities by waste category.

Waste generation levels for special (nonroutine) program waste, such as for unused chemicals or laboratory closeout, are derived separately from CY1993 to FY2002 nonroutine waste generation. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste category. Table B.3.2–1 presents estimated annual (nonroutine) waste generation quantities by waste category.

All Other Wastes

LLNL operations also involve the four additional waste management activity areas discussed below.

Biohazardous (includes* Medical Waste Management Act*) Waste

In 2001 and 2002, several hundred kilograms of biohazardous waste were generated, treated, and disposed of at an approved offsite facility. Under the Proposed Action, biohazardous waste generation would range from 0 to 1 metric ton. The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Construction, Decontamination, and Decommissioning

The construction of the 100,000 to 200,000 square feet of new facilities at LLNL (now new RHWM facilities) would generate 200 to 400 metric tons of construction debris.

In the past during D&D, LLNL would potentially generate hazardous waste including TSCA waste and radioactive waste including mixed. The planned D&D work under the Proposed Action would more directly impact the quantity of municipal sanitary waste and TSCA waste requiring disposal (including RCRA closures of Building 513, 514, 280, and 233 CSU). In the case of RCRA closure at the Building 514 complex, the potential would exist for generating a mixed waste. LLNL would generate building debris, primarily concrete, wood, metal, and other building materials. LLNL would generate TSCA waste, primarily PCBs and asbestos that would be removed from transformers and buildings. Assuming that up to 700,000 square feet of facilities site-wide would be removed, D&D activities would generate 4,200 tons of debris over 10 years. Most of the debris would be diverted, only 350 metric tons would be hazardous, radioactive, or mixed waste. On an annualized basis, this amount is considered small.

Under the Proposed Action, routine and nonroutine maintenance and repair projects would occur over the next 10 years. Assuming LLNL would require 2 to 5 percent annual reinvestment and maintenance wastes are proportional to all wastes, routine and nonroutine maintenance and repair projects would generate 90 to 200 tons per year of debris.

Environmental Restoration Waste

Site-wide environmental restoration waste generation trends at LLNL would generally remain a function of treatment units, the number of wells, and the number of hours of operation. No appreciable onsite impacts to treatment facilities would occur because existing waste handling capabilities are already in place.

Wastewater

Wastewater would increase to approximately 330,000 gallons per day. Sufficient capacity would exist (see Section B.5.1.14).

B.5.2.16 *Occupational Protection*

Table B.5.2.16–1 provides estimates of the number of TRCs and LWCs that could occur under the Proposed Action. The projected injury rates are based on average historic LLNL injury rates over a 3-year period from 1999 through 2001 (DOE 2001c). These rates were then multiplied by the projected employment levels for each alternative to calculate the number of TRCs and LWCs under each of No Action Alternative, Proposed Action, and Reduced Operation Alternative. The TRC values include work-related death, illness, or injury that resulted in loss of consciousness,

restriction from work or motion, transfer to another job, or required medical treatment beyond first aid. The data for LWCs represent the number of workdays beyond the day of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

TABLE B.5.2.16–1.—*Estimated Occupational Safety Impacts to LLNL Workers for the Proposed Action*

Worker Safety Parameters	Proposed Action
Workforce –	11,400
Total (RHWM)	(170)
Total recordable cases of accident or injury –	420
Total (RHWM)	(7)
Lost workday cases –	110
Total (RHWM)	(2)

Source: DOE 2002l, TtNUS 2003.
RHWM = radioactive and hazardous waste management.

The NNSA expects minimal worker radiological health impacts from the LLNL activities under the Proposed Action. The values for the Proposed Action were calculated assuming the number of radiation workers and their average annual radiation dose would be the same as the average values for the past 3 years (Table B.5.2.16–1). Table B.5.2.16–1 presents estimated radiation doses for the collective population of workers who would be directly involved in implementing No Action Alternative, Proposed Action, and Reduced Operation Alternative as well as LCFs likely attributable to these doses.

The estimated number of LCFs listed in Table B.5.2.16–2 for the Proposed Action can be compared to the projected number of fatal cancers from all causes. Population statistics indicate that cancer caused 23 percent of the deaths in the U.S. in 2000. If this percentage of deaths from cancer continues, 23 percent of the U.S. population would contract a fatal cancer from all causes. Thus, in the population of 1,000 workers, 230 persons would be likely to contract fatal cancers from all causes. Under the Proposed Action, the incremental impacts from LLNL operations would be small.

TABLE B.5.2.16–2.—*Estimated Radiological Dose and Health Impacts to Radioactive and Hazardous Waste Management Workers for the Proposed Action (Based on 3-year Average)*

Health Impact	Proposed Action
Collective involved worker	0.52[a]
Estimated increase in number of LCFs	3×10^{-4}

Source: DOE 2001c, LLNL 2002q.
[a] Estimated based on RHWM facilities workforce represented less than 3 percent of all LLNL involved workers.
Note: Data for individual divisions within LLNL (for example ES&H Security Directorate) are NR. Organization numbers for LLNL personnel sometimes change due to work changes or corporate reorganizations. During any 3-month period, monitored personnel may change organizations one or more times.
LCFs = latent cancer fatalities.

B.5.2.17 *Site Contamination*

Soil and groundwater contamination at LLNL occurred as the result of past operations. The cleanup of these soils and groundwater would continue and would meet the health risk-based standards corresponding to the intended future uses of the site. At this time, analyses indicate no significant risk to the general public (LLNL 2002p).

As of 2001, the Livermore Site operated 30 treatment facilities: 28 are groundwater treatment facilities and 2 are VTFs. A total of nearly 80 groundwater extraction wells operated at an average flow rate of 2,540 liters per minute. A total of two vapor extraction wells operated at an average flow rate of 670 cubic meters per minute. At present eight CERCLA environmental restoration OUs are being managed to mitigate contamination at Site 300. These OUs are the GSA, the Building 834 complex, the High Explosive Process Area, Building 850/Pits 3 and 5, Building 854 Pit 6, Building 832 Canyon, and Site 300. As of 2001, LLNL operated 10 treatment facilities at Site 300: 3 groundwater and soil vapor extraction systems and 7 portable facilities. Nineteen wells that extract only groundwater, 7 wells that extract only soil vapor, and 24 wells that extract both operated in 2001. The state, NNSA, and LLNL would continue to discuss remediation, investigation, monitoring and potential cleanup activities, as necessary (LLNL 2002cc).

With the RCRA closure of Buildings 513, 514, 280, and 233 CSU; the associated treatment equipment; and the consolidation of waste management operations into the DWTF, the potential for soil contamination from any LLNL waste management operations would be minimized. Also, in the future, chemical, oil, or hazardous material (including wastes in SAAs and WAAs) spills or releases are possible, given the variety of materials handled at LLNL; however, controls are in place to minimize the potential for soil contamination from any LLNL operations.

B.5.3 Reduced Operation Alternative

The Reduced Operation Alternative reflects minimum levels of activity required to maintain waste management operations and activities assigned to support LLNL capabilities over the next 10 years. In some specific operations, waste management operations would increase over the base period. The operations are those that, during the base period, have not yet been operated (e.g., the NIF).

This alternative does not eliminate assigned missions or capabilities, but could entail not consolidating, enhancing, or upgrading operations. However, under this alternative, LLNL waste management operations would not be reduced beyond those required to maintain safety, permit requirements, or other agreements, such as the Site Treatment Plan.

Approximately 20 Class 1 permit modifications would be submitted. No Class 2 or Class 3 permit modifications would be submitted. No new construction would be included. No RCRA closures would be completed other than those that would be performed under the No Action Alternative. A permit renewal would be submitted.

This alternative addresses the same facilities described in Section B.3.1 for the No Action Alternative. This alternative differs from the No Action Alternative in that operations would decease to the lowest reasonably foreseeable levels over the next 10 years. The following sections discuss these resource areas in relation to the No Action Alternative.

B.5.3.1 *Land Use and Applicable Plans*

Implementing the Reduced Operation Alternative would not affect the existing land-use patterns or applicable plans at LLNL waste management facilities.

No changes to waste management facilities land use or applicable plans would occur at LLNL under the Reduced Operation Alternative. The extent of NNSA land available for use by LLNL would remain the same as the No Action Alternative. LLNL waste operations would remain consistent with industrial park uses and would have no foreseeable effects on established land-use patterns or requirements.

Under this alternative, the DWTF operations would not increase and Building 696 would not obtain permit status.

The completion of 50 Class 1 permit modifications request would be consistent with existing waste facility uses and would have no foreseeable effects on established land-use pattern or requirements.

B.5.3.2 *Socioeconomic Characteristics and Environmental Justice*

The implementation of the Reduced Operation Alternative would result in a small change to the economic and demographic characteristics and environmental justice, as discussed below.

The Reduced Operation Alternative would result in a small change in the existing economic base because LLNL (including the RHWM workforce) employment levels and associated expenditures would be reduced by approximately 8 percent from the No Action Alternative.

The Reduced Operation Alternative would have no discernible adverse impacts to land and visual resources, water resources, biological and ecological resources, cultural resources, air quality, infrastructure, transportation, waste generation, noise, or socioeconomics. Thus, no disproportionately high and adverse impacts to minority or low-income communities are anticipated.

As presented in Section B.5.3.16, LLNL operations would have minimal potential to adversely affect human health for offsite residents or onsite workers. Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

Based on the analyses of all the resource and topic areas, impacts that would result during the course of normal operations would not pose disproportionately high and adverse health or environmental impacts on minority and low-income populations.

B.5.3.3 *Community Services*

The implementation of the Reduced Operation Alternative would result in no changes to the community services, as discussed below.

The Reduced Operation Alternative would not likely result in any noticeable change in community services. Overall expenditures and employment at LLNL (including the RHWM workforce) should remain relatively constant through 2014, which, in turn, would tend to

maintain levels of service. Contributory effects from other industrial and economic sectors within the region should reduce or mask LLNL's current proportional impact.

Nonhazardous solid waste generated at the Livermore Site would continue to be transported to the Altamont Landfill for disposal. The landfill is estimated to have sufficient capacity to receive waste until the year 2038 (Hurst 2003). The current total daily permitted throughput at the Altamont Landfill is 11,150 tons (SWIS 2002). Under the Reduced Operation Alternative, approximately 4,400 metric tons per year of solid sanitary waste would be collected and transported to the Altamont Landfill.

B.5.3.4 *Prehistoric and Historic Cultural Resources*

Under the Reduced Operation Alternative, no waste management facility construction would occur. Some maintenance activities that require ground disturbance could result in the discovery of buried archaeological resources. Because the level of operations would be reduced, the amount of maintenance activity would be lower, thereby reducing the likelihood of impacting archaeological resources through these activities. If any such activities occurred in Sensitive Areas II, III, or IV at Site 300, the LLNL archaeologist would be contacted prior to conducting the maintenance activity to determine how to proceed in compliance with the Programmatic Agreement (Appendix G). Previous notification to the archaeologist would not be required for maintenance activities at the Livermore Site. If any resources are discovered during the activities at the Livermore Site or Site 300, the LLNL archaeologist would be notified and work would stop within the immediate vicinity until the archaeologist has assessed the discovery.

Buildings 233 CSU, 280, 513, and 514 would undergo RCRA closure under this alternative. The DWTF, Area 612 Complex, EWTF, EWSF, and Building 883 would not be modified. Thus no effects would occur to these buildings or facilities.

Under this alternative, 50 Class I permit modifications would be completed. If any of the modifications would result in ground disturbing activity or modifications to eligible or potentially eligible buildings or structures, then the permit modification would require review by the LLNL archaeologist. Since these activities are not likely to occur under Class I permit modifications, the need for this review is also unlikely.

B.5.3.5 *Aesthetics and Scenic Resources*

The Reduced Operation Alternative would not adversely change the overall appearance of the existing landscape, obscure views, increase the visibility of LLNL structures, or otherwise detract from the scenic views from the Livermore Site or Site 300 or from areas adjacent to the sites. No modifications to waste management facilities would be completed and no impact to visual resources would be expected.

B.5.3.6 *Agriculture*

No changes to potential agriculture resources would occur at LLNL under the Reduced Operation Alternative. The extent of NNSA land (including the RHWM facilities) available for use by LLNL would remain the same.

B.5.3.7 *Geologic Resources and Hazards*

No impacts to general geology and geologic resources are anticipated. Impacts from geological hazards (seismicity, slope failure) are evaluated below.

Seismology

Strong earthquake ground motion is responsible for producing almost all damaging effects of earthquakes, except for surface-fault rupture. Ground shaking generally causes the most widespread effects, not only because it occurs at considerable distances from the earthquake source, but also because it may trigger secondary effects from ground failure and water inundation. Potential sources for future ground motion at the LLNL include the major regional faults (see Section B.4).

Seismic hazard analyses have been performed for the LLNL. Existing facilities would continue to be upgraded or replaced to the extent possible. Larger earthquakes on more distant faults such as the San Andreas do not significantly affect the hazard estimation for LLNL.

Structure

At the Livermore Site, there is little potential for slope instability because the site is situated on flat topography. At Site 300, the areas around the waste management facilities include hillsides. The hillsides surrounding this area consist of moderately to weakly consolidated sand and gravel and colluvial and alluvial terrace deposits. The hills have evidence of mass movement. There is an increased chance of slope failure during wet years at the hillsides in the vicinity of the waste management facilities. Slope failure at these locations would have no effect on LLNL waste management facilities.

Soils

Since no new waste management facilities are proposed, no impacts to the soils due to erosion would occur.

B.5.3.8 *Ecology*

Under the Reduced Operation Alternative, increased use of the DWTF as described in the permit and permit modifications would not affect any of the biological resources considered in this appendix. As with the No Action Alternative, four RCRA closures would occur; however, no changes to the physical environment would occur. No indirect impacts would occur because no runoff materials would impact sensitive habitats because runoff would be collected and analyzed and disposed of appropriately.

B.5.3.9 *Air Quality*

Radiological Air Emissions

Under the Reduced Operation Alternative LLNL would continue to have several RHWM facilities as radiological point sources and diffuse sources of emissions. Based on a projected site-wide increase of radioactive waste generation, radiological emissions would increase proportionally above the existing conditions. Comparison of the Reduced Operation Alternative

to the existing conditions and the No Action Alternative show that the LLNL projects' radiological emissions dose to the MEI would remain less than 1 millirem per year. Radiological emissions would be within all applicable standards.

Nonradiological Air Emissions

Under the Reduced Operation Alternative, LLNL would continue to have eight RHWM nonexempt emission sources. Based on a projected site-wide staff decrease of 8 percent, traffic emissions would decrease 8 percent below the No Action Alternative. Comparison of the Reduced Operation Alternative air toxic emissions with Bay Area air toxic emissions show that LLNL projects toxic emissions are less than one percent of those for the Bay Area. D&D activities (including RCRA closures) at LLNL could have short-term adverse impacts due to emissions of criteria air pollutants from construction worker traffic, construction equipment, and fugitive dust from earth-moving activities. The fugitive dust from these activities could exceed PM_{10} concentration standards if no dust control measures were implemented. However, engineered controls, such as the application of water or chemical dust suppressants and seeding of soil piles and exposed soils, would minimize fugitive dust. It is expected that PM_{10} concentrations would be within all applicable standards.

The estimated number of daily commuter vehicles to LLNL during FY2002 was 7,500 to 8,500 (RHWM commuters represented 170 commuters). Under the Reduced Operation Alternative, an 8 percent decrease in daily commuter traffic would occur. Decreases of carbon monoxide and nitrogen oxides, an ozone precursor, would occur with the decrease in commuter traffic. Additionally, the EPA model considers that future vehicles will have lower emission rates and more stringent inspection and maintenance programs; actual emissions would be less than the model baseline. Also, the BAAQMD vehicle buyback program, designed to remove older vehicles from the road, would continue and contribute to the reduction in commuter vehicle emissions. Further, the total carbon monoxide emissions for the Reduced Operation Alternative would be less than 1 percent of the maintenance area's emissions of carbon monoxide. As a result, NNSA has concluded that no conformity determination is required for the Reduced Operation Alternative.

B.5.3.10 *Water*

Under this alternative, LLNL would continue to monitor groundwater quality at numerous locations throughout the Livermore Site and Site 300. Past measurements indicate that some contaminants at these sites have periodically exceeded the MCLs in Federal drinking water standards (40 CFR Part 141). However, concentrations at these sites would continue to decrease over time (LLNL 2002cc).

LLNL RHWM facilities do not use groundwater for any portion of its water supply; therefore, no effects to groundwater quantity would be anticipated under the Reduced Operation Alternative.

During storm events at LLNL waste management facilities, including the DWTF, the stormwater runoff that is collected is sampled and managed through the sewer system as appropriate. Some stormwater runs directly off the facility.

The current LLNL stormwater runoff monitoring program includes visually monitoring all facility discharge locations onsite annually; and, during storm events, sampling 10 Livermore Site and 7 Site 300 locations. These samples are the best available indicators of what

contaminant(s) could reasonably be transported offsite. No regulatory limits have been set for pollutants in stormwater runoff. During the most recent sampling, no pollutants were detected at levels that would be a cause for concern. No effects to stormwater compliance would be anticipated under this alternative.

Under the Reduced Operation Alternative, only minor net changes in building and parking lot areas would be anticipated. Annual variation in LLNL surface runoff would occur with variations in rainfall quantity and intensity and declining capability. However, no overall impact to surface water quantity from activities under the Reduced Operation Alternative would be anticipated.

B.5.3.11 *Noise*

Implementation of the Reduced Operation Alternative could include activity levels at some facilities that would increase over the 2002 activity levels. In these cases, the activity levels would be those that were not exercised sufficiently during the recent years to maintain the capability or to satisfy testing requirements of the NNSA.

The frequency of impulse noise events at the EWTF under the Reduced Operation Alternative would be 5 percent less than the 2002 level of activity and approximately 8 percent less than the No Action Alternative level for all treatment activities combined.

B.5.3.12 *Minerals*

No changes to mineral resources would occur at LLNL under the Reduced Operation Alternative. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.3.13 *Traffic and Transportation*

No additional impacts to transportation would occur under the Reduced Operation Alternative. Waste shipments would range from 134 to 201 per year (Table B.5.3.13–1). This would be below the range associated with the No Action Alternative.

TABLE B.5.3.13–1.—*Lawrence Livermore National Laboratory Annual Material Transportation Activities*

Activity	No Action	Reduced Operation Alternative
Material (annual shipments radioactive, chemical, and explosives)	455-535 shipments[a]	386-549 shipments
Waste (annual shipments includes hazardous and radioactive)	158-238 shipments[b]	134-201 shipments
Annual sanitary waste shipments	370-534 shipments[c]	341-492 shipments
Site-related traffic	10,081	9,283
Total daily traffic (RHWM staff)	(150)	(140)

Source: LLNL 1992a, DOE 1999a, TtNUS 2003.
[a] Existing conditions take into account 1992 LLNL EIS/EIR data and 1996-2002 data.
[b] Based on CY2002 data (range is provided to bound impact).
[c] Estimate based on 4,666 metric tons (FY2001) and an average 9 to 13 metric tons per truck.

B.5.3.14 *Utilities and Energy*

All utility and energy systems would operate within existing capacity. Waste management activities at the Livermore Site and Site 300 would continue to use less than 5 percent of all utility and energy systems annual projections for the next 10 years as presented in Table B.5.3.14–1 (TtNUS 2003).

TABLE B.5.3.14–1.—*Reduced Operation Annual Lawrence Livermore National Laboratory Utility and Energy Systems*

Utility System	RHWM Usage	Total LLNL Usage (including RHWM)	Current Capacity	Remaining Capacity (percent)
5ESS Telecomm. Switch	480 (voice lines)	18,973[a]	20,384	7
Telecomm. Dist. System:				
Copper trunk cables (B256 to 13 nodes)	513 (pairs)	20,300[a]	46,800	57
Fiber trunk cables	37	1,395	2,368	41
Copper distribution (Nodes to buildings)	2,450	92,100	115,158	20
Network speed to desktop	10 Mbps	10 Mbps	10 Mbps	NA
Electricity	1.4 MW	54 MW	125 MW	57
Natural gas	526 TPD	22,600 TPD	24,500 TPD	19
Domestic water	0.04M gal/day	1.29M gal/day	2.88M gal/day	55
Low conductivity cooling water	0.95 MW	34.7 MW	70.2 MW	46
Demineralized water	NA	26,300 gal/day	50,400 gal/day	48
Sanitary sewer	7,600 gal/day	222,000 gal/day	1,685,000 gal/day	83
Compressed air	68 SCFM	2,280 SCFM	4,090 SCFM	44

Source: LLNL 2002v, TtNUS 2003.
[a] Assumes current usage would remain the same.
gal/day = gallons per day; Mbps = million bits per second; MW = megawatts; NA = not available; SCFM = standard cubic feet per minute; TPD = therms per day.

B.5.3.15 *Materials and Waste Management*

Materials

The Reduced Operation Alternative would not cause any major changes in the types of materials used at the RHWM facilities or throughout LLNL. Chemical usage at LLNL would decrease, consistent with a 5-percent decrease in LLNL operations. Average maximum quantities would likely remain constant as material storage space remains constant; however, average quantities would be expected to decrease with lower demand (see Tables B.5.1.14–1 and B.5.1.14–2). Under the Reduced Operation Alternative, chemical material projections used for analysis would not exceed existing chemical material management capacities. No substantial or critical material shortages would occur. As reported in the 1999 Supplement Analysis, quantities of chemicals at LLNL declined by over 50 percent (DOE 1999a).

Decreases in overall quantities of radioactive materials and explosive materials based on current administrative limits would be expected. Under the Reduced Operation Alternative, radioactive material and explosive material requirements would not exceed existing material management capacities.

Waste Management

Implementation of the Reduced Operation Alternative would not cause any major changes in the types of waste streams generated onsite. Waste generation levels over the next 10 years at LLNL would remain essentially consistent with recent generation quantities. Any increase would be consistent with increases from new operations and normal fluctuations experienced over the past 10 years with LLNL operations. Continued application of pollution prevention and wastes minimization techniques to further operations would offset a portion of the projected increase. Onsite waste handling capacities are four to five times expected waste volumes. Waste projections used for analysis would not exceed existing offsite waste management disposal capacities.

For projection purposes, the CY1993-FY2002 routine waste generation data were considered a reasonable range for existing facilities, with no major increases or decreases in the amount of wastes generated. New operations wastes would be derived from mission-related work and additive. The amount of waste generated would reflect proportional decreases in LLNL activity levels over the next 10 years. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.3–2 presents estimated annual (routine) waste generation quantities by waste category.

Waste generation levels for special (nonroutine) program waste, such as for unused chemicals or laboratory closeout, are derived separately from CY1993-FY2002 nonroutine waste generation. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.3–2 presents estimated annual (nonroutine) waste generation quantities by waste category.

All Other Wastes

LLNL operations also involve the four additional waste management activity areas discussed below.

Biohazardous (Includes Medical Waste Management Act*) Waste*

In 2001 and 2002, several hundred kilograms of biohazardous waste were generated, treated, and disposed of at an approved offsite facility. Under the Reduced Operation Alternative, biohazardous waste generation would range from 0 to 1 metric ton per year. The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Construction, Decontamination, and Decommissioning

Under the Reduced Operation Alternative, no construction, renovation, or modification of facilities would occur over the next 10 years. No construction waste would be generated.

Except those projects identified under the No Action Alternative, no specific D&D projects were identified under the Reduced Operation Alternative. However, the potential for completing a new D&D project would exist. Assuming that 700,000 square feet of facilities would be removed, D&D activities would generate 4,200 tons of debris. Most of the debris would be diverted; only 350 metric tons would be hazardous, radioactive, or mixed waste.

Under the Reduced Operation Alternative, routine and nonroutine maintenance and repair projects would occur over the next 10 years. Assuming LLNL would require 2 to 5 percent annual reinvestment and maintenance waste are proportional to all wastes, routine and nonroutine maintenance and repair projects would generate 90 to 200 tons per year of debris.

Environmental Restoration Waste

Site-wide environmental restoration waste generation trends at LLNL would generally remain a function of treatment units, the number of wells, and the number of hours of operation. No appreciable onsite impacts to treatment facilities would occur because existing waste handling capabilities are already in place.

Wastewater

Wastewater would decrease to approximately 290,000 gallons per day. Sufficient capacity would remain.

B.5.3.16 *Occupational Protection*

Table B.5.3.16–1 provides estimates of the number of TRCs and LWCs that could occur under the Reduced Operation Alternative. The projected injury rates are based on average historic LLNL injury rates over a 3-year period from 1999 through 2001 (DOE 2001c). These rates were multiplied by the projected employment levels for each alternative to calculate the number of TRCs and LWCs under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The TRC value includes work-related death, illness, or injury that resulted in loss of consciousness, restriction from work or motion, or transfer to another job or that required medical treatment beyond first aid. The data for LWCs represent the number of workdays beyond the day of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

TABLE B.5.3.16–1.—*Estimated Occupational Safety Impacts to Lawrence Livermore National Laboratory Workers for the Reduced Operation Alternative*

Worker Safety Parameters	Reduced Operation Alternative
Workforce –	9,285
Total (RHWM)	(140)
Total recordable cases of accident or injury –	344
Total (RHWM)	(6)
Lost workday cases –	92
Total (RHWM)	(1)

Source: DOE 2002l.
RHWM = radioactive and hazardous waste management.

NNSA expects minimal worker radiological health impacts from the LLNL activities under the Reduced Operation Alternative. The values for the Reduced Operation Alternative were calculated assuming the number of radiation workers and their average annual radiation dose would be the same as the average values for the past 3 years (Table B.5.3.16–1). Table B.5.3.16–1 presents estimated radiation doses for the collective population of workers who would be directly involved in implementing the No Action Alternative, Proposed Action, and Reduced Operation Alternative as well as LCFs likely attributable to these doses.

The estimated number of LCFs listed in Table B.5.3.16–2 for the Reduced Operation Alternative can be compared to the projected number of fatal cancers from all causes. Population statistics indicate that cancer caused 23 percent of the deaths in the U.S. in 1997. If this percentage of

deaths from cancer continues, 23 percent of the U.S. population would contract a fatal cancer from all causes. Thus, in the population of 1,000 workers, 230 persons would be likely to contract fatal cancers from all causes. Under the Reduced Operation Alternative, the incremental impacts from LLNL operations would be small.

TABLE B.5.3.16–2.—*Estimated Radiological Dose and Health Impacts to Radioactive and Hazardous Waste Management Workers for the Reduced Operation Alternative (Based on 3-Year Average)*

Health Impact	Reduced Operation Alternative
Collective involved worker	0.45
Estimated increase in number of LCFs	2×10^{-4}

Source: DOE 2001c.
Note: Data for individual divisions within LLNL (for example ES&H Security Directorate) are NR. Organization numbers for LLNL personnel sometimes change due to work changes or corporate reorganizations. During any 3-month period, monitored personnel may change organizations one or more times.
LCFs = latent cancer fatalities.

B.5.3.17 *Site Contamination*

Soil and groundwater contamination at LLNL occurred as the result of past operations. The cleanup of these soils and groundwater would continue and would meet the health risk-based standards corresponding to the intended future uses of the site. At this time, analyses indicate no significant risk to the general public (LLNL 2002cc). The state, NNSA, and LLNL would continue to discuss remediation, investigation, monitoring, and potential clean-up activities, as necessary (LLNL 2002cc).

As with the No Action Alternative, RCRA closures would occur and the potential for soil contamination from any continued use of these facilities would be reduced. Under the Reduced Operation Alternative, facility-wide chemical usage and waste generation would decrease. Correspondingly, the likelihood of chemical, oil, or hazardous material (including wastes in SAAs and WAAs) spills or releases would be reduced and potential impacts would be minimized by existing controls.

B.6 *CALIFORNIA ENVIRONMENTAL QUALITY ACT* CONSIDERATIONS BY RESOURCE AREA

The NNSA recognizes the need to provide DTSC with necessary information to facilitate their decision-making process. This section contains CEQA project-specific information in one section even though the impact analysis also appears under the individual environmental resources and issue areas in this appendix and the main volume of this LLNL SW/SPEIS.

For completeness of CEQA analysis, NNSA also gathered information on all operations at LLNL including Site 300. Information regarding all facilities, site support services, site-wide water and utility use, site-wide waste generation, hazardous chemicals purchased, process wastewater, and radioactive dose data were incorporated into the analysis where appropriate. These activities include many R&D activities and routine operations; infrastructure, administrative, and central services for LLNL; facility maintenance and refurbishment activities; and environmental, ecological, and natural resource management activities.

This section considers these operations and their effects on environmental conditions under the No Action Alternative, Proposed Action, and Reduced Operation Alternative as part of the cumulative impacts.

In general, waste management operations at LLNL comprise less than three percent of the overall levels of activity at LLNL. This estimate is based, in part, on the relative percentage of waste management workforce (approximately 170 workers) to the overall workforce at LLNL (10,600 workers). Under the No Action Alternative and Proposed Action, conditions at LLNL RHWM were projected to increase by 3 percent and 10 percent above the existing operations, respectively. Under the Reduced Operation Alternative, site operations were projected to decrease by 8 percent. These projected changes are consistent with the analysis presented in the LLNL SW/SPEIS and the earlier sections of this appendix.

To complete the CEQA analysis, four descriptive categories are used to discuss environmental impacts: Potentially Significant Impact, Potentially Significant Unless Mitigated, Less Than Significant Impact, and No Impact. These categories have been created and assigned to individual impacts only for the purposes of supporting CEQA requirements and are used here only in a CEQA context. Under NEPA, the significance of environmental impacts determines the need for the NEPA document. Once that decision has been made, specific impacts are not categorized according to level of impact in an EIS. The following describes the environmental impact categories used in this document:

- **Potentially Significant Impact**—There is substantial evidence that the impact of the proposed project may be significant and cannot be avoided or reduced to a less-than-significant level.

- **Potentially Significant Unless Mitigated**—Absent mitigation measures or project revisions, the impact of the proposed project would be considered significant.

- **Less Than Significant Impact**—The proposed project would result in an impact, but at a level that is not considered significant.

- **No Impact**—The proposed project would not result in an impact.

Based upon examination of the potential environmental effects of direct and indirect actions, NNSA has determined the following resource areas would be specifically analyzed in detail with CEQA considerations:

- Aesthetics

- Agricultural Resources

- Air Quality

- Biological Resources

- Cultural Resources

- Geology and Soils

- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use and Planning
- Minerals
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation and Traffic
- Utilities and Service Systems
- Cumulative Effects
- Mandatory Findings of Significance

Each impact section begins with a brief summary of the resource conditions, followed by a list of the standards of significance relevant to the area being discussed. The use of specific standards of significance is typical of CEQA; however, their use is acceptable in an EIS. They are used in this appendix in the discussion of all significance decisions to meet CEQA requirements. After the standards of significance, each section discusses impacts and mitigation measures as appropriate. Table B.6–1 contains a series of CEQA considerations by resource area that provide specific issues evaluated in context with proposed permit modifications. Each issue consists of a brief description and a corresponding impact indicator (○-No Impact, Δ-Less than Significant Impact, and ●-Potentially Significant Impact).

B.6.1 Aesthetics

This section describes impacts to aesthetics. The analysis focuses on impacts due to implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative, which are compared to existing resources. The ROI for this analysis is the surrounding areas within the general view shed of the waste management facilities.

Significance Criteria

Impacts to visual resources were qualitatively evaluated by assessing the potential degree of visual contrast that implementation of proposed permit modifications and associated waste management activities under each alternative would create with the existing landscape character. An impact is considered significant if it would noticeably increase visual contrast and reduce aesthetic quality. Temporary visual effects (such as construction) are not considered to be significant. Only visual effects that would last beyond construction (or D&D) are potentially considered significant.

California Environmental Quality Act Considerations

Under all alternatives full operation of the DWTF, as described in the permit, permit modifications, and the transition plan, would not affect any of the aesthetic parameters considered in this appendix. With the exception of the RCRA closure of Buildings 513 and 514, full operation would not entail any changes to the physical environment. The RCRA closures of Buildings 513 and 514 (including demolition) would open up views onsite; however, the effect on visual quality of the site and surrounding area would be minimal due to the density of the surrounding structures.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.2 Agricultural Resources

This section describes impacts to agricultural resources. The analysis focuses on impacts due to implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative, which are compared to existing resources. The ROI for this analysis is the surrounding areas within the general footprint of the waste management facilities.

Significance Criteria

Impacts to agricultural resources were qualitatively evaluated by assessing the potential degree of land use changes that implementation of proposed permit modifications and associated waste management activities under each alternative would create with the existing land-use character. An impact is considered significant if it would convert farmland to nonagricultural use. Temporary construction activities (such as removal, maintenance, or placement of underground utilities) are not considered to be significant.

California Environmental Quality Act Considerations

Under all alternatives, full operation of the DWTF as described in the permit, permit modifications, and the transition plan, would not affect any of the agricultural resources considered in this appendix. With the exception of the RCRA closure of Buildings 513 and 514, full operation would not entail any changes to the physical environment. The clean RCRA closures of Buildings 513 and

514 (including demolition) would remove structures from the site; however, no changes in the existing environment would result in conversion of farmland to nonagricultural uses.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.3 Air Quality

This section addresses air quality. It focuses on radiological and nonradiological (includes criteria, hazardous, and toxic air pollutants) emissions. The ROI for air quality varies according to the type pollutant.

Significance Criteria

Air quality impacts are judged to be significant if the No Action Alternative, Proposed Action, and Reduced Operation Alternative would directly or indirectly:

- Produce emissions that would cause or contribute to a violation of state or Federal ambient air quality standards
- Cause pollutant emissions in excess of BAAQMD impact significant thresholds
- Conflict with specific Air Quality Management Plan polices or programs

An alternative may have significant effects on LLNL or the RHWM facilities if it would increase demand in waste storage, treatment, and disposal in excess of storage, treatment, and disposal capabilities to the point that substantial expansion would be necessary. Significant impacts also could result from system deterioration due to improper maintenance or extension of facilities and waste management operations beyond its useful life. Effects also would be identified as significant if Federal, state, or local standards or requirements regulating the RHWM facilities (RCRA-permitted) would be violated.

California Environmental Quality Act Considerations

Under all alternatives, full operation of the DWTF, as described in the permit, permit modifications, and the transition plan, would not affect any of the air quality parameters considered in this appendix. Adequate waste management capacities exist to support all LLNL operations and LLNL waste management operations. Also full operation of the DWTF would be expected to decrease potential impacts because the existing outdoors waste operations at Area 514 would be moved inside to the DWTF (a modern waste management facility).

RHWM facilities are estimated to emit approximately 6 pounds of criteria pollutants per day. On the basis on the air toxics inventories, LLNL is ranked as a low-risk facility for nonradiological emissions. Emissions of HAPs are well below regulatory limits for single pollutants and combined pollutant HAP thresholds. No traffic-related emissions impacts associated with the No Action Alternative, Proposed Action, and Reduced Operation Alternative at RHWM facilities would be expected. No violations of Federal, state, or local standards or requirements would be expected. RCRA closures at Buildings 513, 514, 280, and 233 CSU would occur. Under all alternatives, no impacts would be expected.

The hazard risk assessment completed for the permit found that the risk and the hazard due to the continued operation of the existing facilities, even at maximum throughput conditions, would be below levels of concern described in the regulatory literature. Once the DWTF becomes operational, the facility would treat the same waste streams that are treated in the existing facilities; however, the DWTF would have improved air emissions control equipment and would treat some additional new waste streams. DOE also assessed the environmental impacts associated with the construction and operation of DWTF in an environmental assessment (DOE/EA-1150) (LLNL 1996c). Based on this assessment, the DOE issued a Finding of No Significant Impact on June 12, 1996.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.4 Biological Resources

This section analyses potential impacts on biological resources. The ROI for biological resources includes the Livermore Site, including the waste management facilities and surrounding native habitats within the vicinity of the site. All of the existing native habitat at the waste management facilities would be retained under all alternatives.

Significance Criteria

The determination of significant impacts to biological resources includes direct and indirect impacts. Direct impacts are those in which activities reduce or remove a biological resource. Indirect impacts could occur when the activity causes other actions that affect biological resources. Indirect impacts could also occur from the introduction of runoff materials into sensitive habitats.

California Environmental Quality Act Considerations

Under all alternatives, full operation of the DWTF, as described in the permit, permit modifications, and the transition plan, would not affect any of the biological resources considered in this appendix. With the exception of the RCRA closure of Buildings 513 and 514, full operation would not entail any changes to the physical environment. The RCRA closures of Buildings 513 and 514 (including demolition) would remove structures from the site; however, no changes in the existing environment would result in biological resources. No indirect impacts would occur because no runoff materials would impact sensitive habitats because runoff is collected and analyzed and disposed of appropriately.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.5 Cultural Resources

This section analyses potential impacts to cultural resources. The ROI for cultural resources includes the Livermore Site, and associated waste management facilities.

Significance Criteria

Impacts to cultural resources have been assessed using the following criteria of significance. Impacts to cultural resources listed on or eligible for the NRHP are considered significant. Impacts to buildings, structures, or archaeological sites that do not qualify for inclusion in the NRHP are not considered to be significant impacts to cultural resources.

California Environmental Quality Act Considerations

Under all alternatives, full operation of the DWTF, as described in the permit, permit modifications, and the transition plan, would not affect any of the cultural resources considered in this appendix, because proposed actions would not entail any changes to cultural resources.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.6 Geology and Soils

This ROI for geology and soils includes lands within the property boundaries of the RHWM facilities, LLNL, and adjacent contiguous land.

Significance Criteria

A project may result in a significant geologic impact if it increases the likelihood of earthquake damage, loss of mineral resources (see Section B.6.10), slope and/or foundation instability, erosion or sedimentation, land subsidence, or other severe problems of a geologic nature. Any physical changes to the property that would increase the likelihood of these events would be considered a significant impact. For CEQA purposes only, an additional significance criterion is identified. Under CEQA guidelines, a project that exposes people or structures to a major geologic hazard such as an active earthquake fault is considered a significant impact. No physical change to the environment is required for this environmental impact to be considered significant under CEQA.

California Environmental Quality Act Considerations

Under all alternatives, no impacts associated with increasing the likelihood of earthquake damage, loss of mineral resources (see Section B.6.10), slope and/or foundation instability, erosion or sedimentation, land subsidence, or other severe problems of a geologic nature would be expected. Clean RCRA closures at Buildings 513, 514, 280, and 233 CSU would not result in impacts.

Worker exposure near the geologically active Greenville and Las Positas faults by implementing the No Action Alternative and Proposed Action (the Reduced Operation Alternative decreases the number of personnel) would result in impacts and, for purposes of CEQA only, would result in a significant impact. The RCRA closures at Buildings 513, 514, 280, and 233 CSU would result in reduced impacts. No new mitigations would be implemented; Area 612 and the DWTF were previously assessed as described in the current permit.

Buildings 612, 614, and 625 have been seismically reviewed and have received a performance rating of "Good," which indicates that, during a major seismic disturbance, some structural and nonstructural damage and falling hazards may result, but that these would not significantly jeopardize life. A major seismic disturbance is defined as an earthquake at LLNL that would be given a Modified Mercalli Intensity Scale rating of at least IX. A rating of "Good" represents an acceptable level of earthquake safety. Building 693, built in 1987, was constructed to meet the 1985 UBC seismic standards, which were the standards in effect at that time. Building 695 and the Building 693 Annex have been designed to meet 1994 UBC seismic standards.

Specific CEQA considerations resulting in impacts are presented in Table B.6–1.

B.6.7 Hazards and Hazardous Materials (Includes Waste)

This section analyzes the impacts of RHWM facilities and associated operations and the implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative on existing utilities and service systems. Hazards and hazardous materials covered include radioactive, chemical, and explosive materials and wastes, including radioactive, mixed, hazardous, biohazardous, and other solid and liquid wastes. The ROI relative to hazardous material and waste is LLNL and the RHWM facilities capacities.

Significance Criteria

An alternative may have significant effects on LLNL or the RHWM facilities if it would increase demand in excess of hazardous material storage or waste storage, treatment, and disposal capacities to the point that substantial expansion would be necessary. Significant impacts also could result from system deterioration due to improper maintenance or extension of facilities and waste management operations beyond their useful life. Significant impacts to the public could result from routine or accident conditions involving the release of hazardous materials (includes waste) into the environment from the RHWM facilities. Effects also would be identified as significant if Federal, state, or local standards or requirements regulating the RHWM facilities (RCRA-permitted) would be violated.

California Environmental Quality Act Considerations

No impacts to the public or the environment involving hazardous materials and wastes associated with RHWM facilities and associated operations would result from implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative (see Table B.6–1). Adequate waste management capacities exist to support all LLNL operations and LLNL waste management operations. Under all alternatives, full operation of the DWTF, as described in the permit, permit modifications, and the transition plan, would decrease potential impacts because the existing outdoor waste operations at Area 514 would be moved inside to the DWTF (a modern waste management facility). Full implementation of the DWTF capabilities would be consistent with the goals established under the Federal Facility Compliance Order and Site Treatment Plant.

A health risk assessment completed for the permit found that the risk and the hazard due to the continued operation of the existing facilities, even at maximum throughput conditions, would be below levels of concern described in the regulatory literature (see Section B.4.18.3). Once the DWTF becomes operational, the facility would treat the same waste streams that are treated in the existing facilities; however, the DWTF would have improved air emissions control equipment and would treat some additional new waste streams. DOE also assessed the environmental impacts associated with the construction and operation of the DWTF in an Environmental Assessment (DOE/EA-1150) (LLNL 1996c). Based on this assessment, DOE issued a Finding of No Significant Impact on June 12, 1996.

LLNL would continue to use trained personnel and approved program procedures to control waste from the point of generation through storage, treatment, and disposal. LLNL waste management procedures would continue to cover the identification, generation, handling, packaging, storing, and transporting of all wastes including radioactive, hazardous, mixed, and medical wastes. No violations of Federal, state, or local standards or requirements would be expected. Clean RCRA closures at Buildings 513, 514, 280, or 233 CSU would occur.

LLNL would continue to use trained personnel and approved program procedures to control hazardous materials laboratory-wide. Laboratory-wide hazardous material maximum inventories would not change across the No Action Alternative, Proposed Action, and Reduced Operation Alternative. RHWM activities would account for less than 3 percent of the total hazardous material use at the Laboratory. As reported in the 1999 Supplement Analysis, quantities of chemicals at LLNL declined by over 50 percent. No additional material storage facilities are planned.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.8 Hydrology and Water Quality

This section analyzes impacts to hydrology and water resources. The ROI considered for water resources includes the RHWM facilities and the LLNL property.

Significance Criteria

An alternative may have significant effects on hydrology and water quality if it would increase demand in excess of the aquifer, drainage systems, or the floodplain areas to the point that interference or substantial changes would occur. Significant impacts also could result from deterioration due to erosion, silting, flooding, or groundwater level changes. Effects also would be identified as significant if Federal, state, or local standards or requirements regulating groundwater and surface water quality, stormwater, and wastewater discharge system would be violated.

California Environmental Quality Act Considerations

The RHWM facilities are not located in the 100-year floodplain, no surface water discharges would occur (rainwater is controlled) and no onsite groundwater use would occur. Groundwater monitoring is in place. No impacts are expected as a result of the two alternatives or the Proposed Action. Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.9 Land Use and Planning

This section analyses land-use impacts potentially resulting from implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Impacts to waste management facilities and surrounding land uses (including LLNL and offsite) are evaluated and compared to existing land use conditions.

Significance Criteria

The proposed changes under the No Action Alternative, Proposed Action, and Reduced Operation Alternative would cause a significant impact on land use if their implementation would conflict with established land use patterns.

California Environmental Quality Act Considerations

Implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative would not impact land use because no changes to onsite land uses would occur as part of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.10 Minerals

This section analyzes impacts to mineral resources resulting from implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Impacts to mineral resources are evaluated and compared to existing mineral resource conditions.

Significance Criteria

The proposed changes under the No Action Alternative, Proposed Action, and Reduced Operation Alternative would cause a significant impact if their implementation would result in the loss of availability of a known mineral resource.

***California Environmental Quality Act* Considerations**

Implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative would not impact mineral resources because no changes to onsite land uses would occur as part of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.11 Noise

This section addresses noise and vibration impacts resulting from RHWM facilities and associated operations and the implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative and determines potential effects of that noise and vibration on nearby and onsite sensitive receptors. The ROI includes the Livermore Site and Site 300 property boundaries.

Significance Criteria

Criteria used to analyze the significance of noise impacts are derived from applicable land-use compatibility guidelines or from regulatory thresholds established by NNSA (state and local codes are considered but are not applicable). Significant impacts could result from a substantial temporary, periodic, or permanent increase in ambient noise levels in the vicinity of the RHWM facilities above existing levels.

***California Environmental Quality Act* Considerations**

Under all alternatives, full operation of the DWTF, as described in the permit, permit modifications, and the transition plan, would decrease ambient noise levels because the existing outdoor waste operations at Area 514 would be moved inside to the DWTF (a modern waste management facility). Further, LLNL employs a proactive ear protection program. No violations of Federal, state, or local standards or requirements would be expected (see Table B.6–1).

No offsite temporary noise disturbance associated with RCRA closures at Buildings 513, 514, 280, or 233 CSU would occur (see Table B.6–1). No residential locations are within 400 feet of the four facilities. With recent construction of the NIF, planned construction of several laboratory buildings, recent removal of over 200,000 square feet of buildings and structures, the potential removal of an additional 700,000 square feet of buildings, and an active environmental restoration drilling program, the RCRA closures would not alter the ambient noise levels associated with LLNL.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.12 Population and Housing

This section analyzes population and housing impacts resulting from the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The ROI includes Alameda County, San Joaquin County, Contra Costa County, and Stanislaus County.

Significance Criteria

The significance of population and housing impacts is relative to the characteristics of the geographic area and the timeframe of the analysis. Regional changes in population and housing are considered neither beneficial nor adverse impacts. These changes reflect the normal range of fluctuations in population and housing.

Population and housing changes in a given area can result in beneficial or adverse impacts to the extent that such changes would be expected to result in environmental and socioeconomic effects. However, increasing population in and of itself is not an environmental effect. Increases in population and housing would be constrained by local planning regulations. However, population and housing growth could lead to secondary impacts that could be adverse, such as the potential traffic and infrastructure costs that growth could induce.

California Environmental Quality Act Considerations

Implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative would not result in impacts on population and housing. The projected changes in the RHWM workforce under each of the No Action Alternative, Proposed Action, and Reduced Operation Alternative would be small. Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.13 Public Services

This section analyzes impacts to public services. Public services include police, fire, and other services including landfill space. The ROI includes LLNL, the city of Livermore, Alameda County, and San Joaquin County.

Significance Criteria

A project could have a significant impact on public services if it would result in hazardous conditions, emergency response time, a need for additional facilities, or substantial increases in staffing levels.

California Environmental Quality Act Considerations

Under all alternatives, full operation of the DWTF, as described in the permit, permit modifications, and the transition plan, would not affect any public services. The projected changes in the RHWM workforce are small. No changes to existing hazardous conditions or emergency response times would occur. No additional security, fire, or other public service facilities would be needed. No additional waste management facilities would be required; in fact, several waste management facilities would undergo RCRA closure under two of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. A specific CEQA consideration resulting in no impacts is presented in Table B.6–1.

B.6.14 Recreation

This section analyzes recreation impacts resulting from the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The ROI includes Alameda, San Joaquin, Contra Costa, and Stanislaus counties.

Significance Criteria

The significance of recreation is relative to the characteristics of the geographic area. Additional recreational facilities are considered beneficial. Minor changes in annual fiscal impacts are not considered to be environmental impacts and are not discussed in this section.

California Environmental Quality Act Considerations

No changes to existing recreation opportunities would be expected under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.15 Transportation and Traffic

This section presents the transportation and traffic analysis of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The ROI includes the Livermore Site, Site 300, and local transportation corridors (Greenville Road and Vasco Road).

Significance Criteria

Transportation and traffic impacts are identified as significant based on the level of service criteria. As the volume of traffic at any intersection affected by a project alternative increases, the capacity of that intersection to handle that increased volume is affected. As the level of service becomes worse, delays at intersections increase. Thus, a particular alternative would be considered to create a significant impact if the addition of its traffic resulted in a level of service at or beyond the maximum capacity. For any intersection operating beyond capacity, an increase in overall intersection delays of four percent or greater is considered to represent a significant impact.

This section assesses the traffic, parking, transit, and pedestrian impacts of each alternative.

California Environmental Quality Act Considerations

Currently daily waste management commuters are approximately 150 vehicles, assuming no carpooling, transit, or other transportation mode. Under the Proposed Action, the No Action Alternative, and the Reduced Operation Alternative, waste management commuters would number 170, 160, and 140, respectively. The current traffic loads associated with Greenville Road and Vasco Road vary from 12,000 to 15,600 vehicles per day and 16,600 and 30,000 vehicles per day, respectively. Both Greenville Road and Vasco Road are at or beyond capacity in the vicinity of I-580. Total LLNL traffic levels on these roads are estimated to be 21 percent and 36 percent, respectively, adjacent to the Livermore Site. Waste management commuter traffic would be approximately 1.5 percent of the total LLNL traffic. Additionally, 5 to 15 hazardous material shipments/receipts, 1 to 2 radioactive and hazardous waste shipments, and 7 to 10 shipments of municipal solid waste occur per week at LLNL.

Overall, the accident history near LLNL is good. LLNL parking is adequate with additional space designed into new projects including when buildings are removed.

Under all alternatives, waste management traffic would be less than 0.3 percent of the total traffic in the area including projected increases in RHWM commuters and total hazardous material and waste shipments. The level of service on these roads would not increase to or beyond the maximum capacity. No impacts would be expected (see Table B.6–1).

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.16 Utilities and Service Systems

This section analyzes the impacts of waste management facilities and associated operations and the implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative on existing utilities and service systems. Utilities covered include water distribution, wastewater, storm drainage, electrical, natural gas, telephone, and solid waste management systems. The ROI includes the Livermore Site and Site 300 property boundaries and, in the case of solid waste, regional landfill capacity.

Significance Criteria

An alternative may have significant effects on a utility or service if it would increase demand in excess of utility or service capacity to the point that substantial expansion would be necessary. Significant impacts could also result from system deterioration due to improper maintenance or extension of service beyond its useful life. Effects would also be identified as significant if Federal, state, or local standards or requirements regulating a public utility system would be violated.

California Environmental Quality Act Considerations

No impacts to utility systems would result from implementation of the two alternatives or Proposed Action (see Table B.6–1). Adequate system capacities exist to support all LLNL operations and LLNL waste management operations. No violations of Federal, state, or local standards or requirements would be expected.

Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.6.17 Cumulative Impacts

Cumulative impacts are defined as two or more individual affects that, when considered together, are considerable or that compound or increase other environmental impacts. Cumulative impacts from several projects are derived from the combined incremental impact of the project added to other approved, pending, and reasonably foreseeable future projects. Cumulative impacts can result from individually minor but collectively significant effects.

This section analyzes the cumulative impacts of waste management facilities and associated operations and the implementation of the Proposed Action along with several relevant projects. These other projects considered for cumulative impacts included:

- LLNL SW/SPEIS (Proposed Action, includes several recent environmental assessments)
- SNL/CA Site-Wide Environmental Assessment (Maximum Operation Alternative)

Significance Criteria

An alternative may have significant cumulative effects if it would adversely affect air, water, habitats, natural resources, and other resource areas. Cumulative effects also would be identified as significant if Federal, state, or local standards or requirements regulating aspects of NNSA facilities would be violated.

***California Environmental Quality Act* Considerations**

Several resource areas would, for the purposes of CEQA only, experience cumulatively significant impacts. Worker exposure near the geologically active Greenville and Las Positas faults, cumulatively, would result in a significant impact. Currently both Greenville Road and Vasco Road are at or beyond capacity in the vicinity of I-580. The projected increases in commuters would be greater than 4 percent and result in a significant impact.

Adequate infrastructure (including utilities and hazardous material management) system capacities and waste management capabilities exist to support all LLNL operations and SNL/CA operations. No violations of Federal, state, or local standards or requirements would be expected. Changes in emissions, discharges, and resource management would be less than significant. Specific CEQA considerations resulting in no impacts or Less Than Significant Impacts are presented in Table B.6–1.

B.6.18 Mandatory Findings of Significance

This section analyzes the Mandatory Findings of Significance with impacts of the RHWM facilities and associated operations and the implementation of the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

Significance Criteria

An alternative could have significant effect if it would adversely affect air, water, habitats, natural resources, and other resource areas. Effects also would be identified as significant if Federal, state, or local standards or requirements regulating aspects of the NNSA facilities would be violated.

***California Environmental Quality Act* Considerations**

No impacts are expected. Specific CEQA considerations resulting in no impacts are presented in Table B.6–1.

B.7 REFERENCES

10 CFR Part 61 — U.S. Department of Energy (DOE), "Nuclear Regulatory Commission, Licensing Requirements for Land Disposal of Radioactive Wastes," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised January 1, 2003.

10 CFR § 1021.330 — DOE, "Energy, National Environmental Policy Act Implementing Procedures, Programmatic (Including Site-wide) NEPA Documents," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised January 1, 2003.

10 CFR Part 1021 — DOE, "Energy, National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, January 1, 2003.

10 CFR Part 835 — DOE, "Energy, Occupational Radiation Protection," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised January 1, 2003.

14 CFR Part 150 — U.S. Department of Transportation (DOT), "Aeronautics and Space, Airport Noise Compatibility Planning," Code of Federal Regulations, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised January 1, 2003.

29 CFR § 1910.95 — U.S. Department of Labor (DOL), "Labor, Occupational Safety And Health Standards, Occupational Noise Exposure," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

29 CFR Part 1926 — DOL, "Labor, Regulations Relating to Labor, Safety and Health Regulations for Construction," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

40 CFR 61 — U.S. Environmental Protection Agency (EPA), "Protection of the Environment, National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, July 21, 2003.

40 CFR Part 302 — EPA, "Protection of the Environment, Designation, Reportable Quantities, and Notification," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

40 CFR Part 260 — EPA, "Protection of the Environment, Hazardous Waste Management System: General," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

40 CFR §1502.14[a] — Council on Environmental Quality (CEQ), "Protection of the Environment, Environmental Impact Statement, Alternatives Including the Proposed Action, Subpart a," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

40 CFR §270.42 — CEQ, "Protection of the Environment, EPA, Administered Permit Programs, Permit Modification at the Request of the Permittee," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

40 CFR Part 141 — CEQ, "Protection of the Environment: National Primary Drinking Water Regulations," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

40 CFR Parts 1500-1508 — CEQ, "Protection of the Environment," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 2003.

40 CFR Part 261 — EPA, "Protection of the Environment, Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised January 1, 2003.

15 U.S.C. § 2601 — "Control of Toxic Substances, Finding, Policy and Intent," *United States Code*, Title 15, Chapter 53, Subchapter 1, Section 2601

42 U.S.C. § 2011 et seq. "*Atomic Energy Act*," *United States Code*, Title 42, Chapter 23, §§2011 - 2259.

42 U.S.C. § 6901 et seq. "*Resource Conservation and Recovery Act* of 1976," *United States Code*, Title 42, Chapter 82, Section 6901, 1976.

42 U.S.C. § 6901 Subtitle I "Solid Waste Disposal, General Provisions, Congressional Findings," *United States Code*, Title 42, Chapter 82, Subchapter I, Section 6901.

42 U.S.C. § 6902 "*Solid Waste Disposal Act* of 1976," *United States Code*, Washington, DC, Title 42, Section 6902, 1976.

42 U.S.C. § 6961 "*Federal Facility Compliance Act* of 1992," *United States Code,* Title 42, Chapter 82, Subchapter VI, Section 6961, 1992.

42 U.S.C. § 9601 "*Comprehensive Environmental Response, Compensation, and Liability Act* of 1980," *United States Code*, Title 42, Chapter 103, Section 9601, 1980 as Amended.

42 U.S.C. § 13101 "*Pollution Prevention Act* of 1990," *United States Code*, Title 42, Sec. 13101, 1990.

42 U.S.C. § 4321 et seq. "*National Environmental Policy Act*," *United States Code*, Title 42, Chapter 55, Sec. 4321 through 4347, Revised January 22, 2002

66 FR 14626 U.S. Fish and Wildlife Service (USFWS), "Endangered and Threatened Wildlife and Plants, Final Determination of Critical Habitat for the California Red-Legged Frog, Final Rule." *Federal Register*, Vol. 66 Pg. 14626, Office of the Federal Register National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, March 13, 2001.

Alameda County 1994 Alameda County, *East County Area Plan*, Alameda County Community Development Agency, Planning Department, Hayward, CA, May 5, 1994.

BEA 2002 U.S. Bureau of Economic Analysis (BEA), *Regional Accounts Data-Local Area Personal Income for California*, BEA, Washington, DC, Available online http://www.bea.gov, December 2002, Accessed 2002.

CADC 2002 California Department of Conservation (CADC)*, 2001 Annual Report of the State Oil & Gas Supervisor*, California Department of Conservation, Available online at http://www.consrv.ca.gov/DOG/index.htm, 2002, Accessed January 2002.

California Code of Regulations § 1500 et seq.	"*California Environmental Quality Act* of 1970," *California Public Resources Code* § 21000 et seq., Division 13, Environmental Protection, Sacramento, CA, 1970.
California Department of Education 2003	California Department of Education, (Sitewide Enrollment Reports, California Department of Education, Available online at http://data1.cde.ca.gov/dataquest , Assessed November 14, 2003.
California EPA 1993	California Environmental Protection Agency (California EPA), *Preliminary Endangerment Assessment (PEA) Guidance Manual,* California EPA, Sacramento, CA, 1993.
California EPA 1994	California Environmental Protection Agency (California EPA), *Notice of Final Permit Decision LLNL Site 300 Explosives Wastes Treatment Facility*, California EPA, Department of Toxic Substances Control, Sacramento, CA, 1994.
California Health and Safety Code § 25100 et seq.	"*Hazardous Waste Control Act*," *California Health and Safety Code*, Chapter 6.5, Article 1, Sections 25100 et seq., Sacramento, CA.
California Health and Safety Code § 25244. 12-25	"Hazardous Waste Source Reduction and Management Review Act of 1989," *California Health and Safety Code*, Division 20, Chapter 6.5, Article 11.9, Sections 25244.12-25, Sacramento, CA, 1989.
Census 2002b	U.S. Bureau of the Census, *Census Data for Livermore, Dublin, and Pleasanton, California, United States Bureau of the Census*, Washington, DC, Available online at http://census.abag.ca.gov, 2002, Accessed December 2002.
CEQ 1997	CEQ, *Environmental Justice-Guidance Under the National Environmental Policy Act*, Council on Environmental Quality, Washington DC, December 10, 1997.
City of Livermore 1975	City of Livermore, *Community General Plan, 1976-2000*, Based on a document prepared by Grunwald Crawford Associates, December 1975 and amended by the City of Livermore, City Council, Livermore, CA, March 1976.
City of Livermore 2002a	City of Livermore, *City of Livermore Zoning District Maps,* Chapter 2-04, Livermore, CA. 2002.
City of Livermore 2002b	City of Livermore, *Status of Livermore Airport Master Plan Update*, City of Livermore Public Services Department, Livermore, CA, Available online at http://www.ci.livermore.ca.us/airport-mp.html, Accessed November 21, 2002.

City of Livermore n.d. City of Livermore, *Large Employers*, Livermore, CA. n.d.

City of Tracy 1993 City of Tracy, *General Plan: An Urban Management Plan*, Tracy, CA. July 19, 1993.

CIWMB 2002 California Integrated Waste Management Board (CIWMB), *Class 1 Permit Modification Notice*, Sacramento, CA, April 19, 2002.

Dibblee 1980d Dibblee, T.W., Jr., *A Preliminary Map of the Altamont Quadrangle, Alameda County, CA*, Open-File Report 80-538, U.S. Geological Survey, 1980.

DOE 1999a DOE, *Supplemental Analysis for Continued Operation of Lawrence Livermore National Laboratory and Sandia National Laboratories*, Vol. 1, DOE/EIS-0157-SA-01, U.S. Department of Energy, Oakland Operations Office, Oakland, CA, March 1999.

DOE 2001a DOE, *Institutional Plan Fiscal Year 2002-2007, Lawrence Livermore National Laboratory,* UCAR-10076-20, U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory, U.S. Government Printing Office, Washington, DC, October 2001.

DOE 2001c DOE, *Occupational Radiation Exposure 2000 Report- Exhibit 3-17*, U.S. Department of Energy, 2001.

DOE 2002d DOE, *FY03 Final Ten Year Comprehensive Site Plan, Lawrence Livermore National Laboratory*, UCRL-AR-143313-02, U.S. Department of Energy by the University of California, Livermore, CA, October 2002.

DOE 2002h DOE, *Finding of No Significant Impact for the East Avenue Security Upgrade at Lawrence Livermore National Laboratory/Sandia National Laboratories, California*, DOE/EA-1439, U.S. Department of Energy, 2002.

DOE 2002l DOE, *Summary Report, Occupational Injury and Property Damage Summary, January through December 2001, Table S3 - Injury and Illness Ranking of Research Contractors, January through December 2001*, U.S. Department of Energy, Washington, DC, Available online at http://tis.eh.doe.gov/cairs/cairs/summary/archive/oipds014/ts3.html, March 19, 2002, Accessed March 27, 2002.

DOE 2002s — DOE, *2002 Waste Generation Trending Report for DOE Reporting Site showing Routine Waste Generation Reported for Lawrence Livermore National Laboratory for CY1993, CY1994, CY1995, CY1996, CY 1997, CY1998, CY1999, FY2000, FY2001, FY2002*, U.S. Department of Energy, Washington, DC, Available online at http://tis.eh.doe.gov/p2/wastemin/NewTrendSite.Asp?wherefrom=SITE, 2002, Accessed May 14, 2003.

DOE 2003b — DOE, *FY2004 Final Ten Year Comprehensive Site Plan*, UCRL-AR-143313-03, U.S. Department of Energy by the University of California, Livermore, CA, October 2003.

DOE O 435.1 — DOE, *Radioactive Waste Management*, U.S. Department of Energy, Washington, DC, July 9, 1999.

DOE O 440.1A — DOE, *Worker Protection Management for DOE Federal and Contractor Employees*, U.S. Department of Energy, Washington, DC, March 27, 1998.

DOE O 6430.1A — DOE, *General Design Criteria*, U.S. Department of Energy, Washington, DC, April 6, 1989.

DOF 2002 — U.S. Department of Finance (DOF), *Official State Estimates as of January 1, 2002*, California Department of Finance, Sacramento, CA, Available online at http://www.dof.ca.gov, Accessed 2002.

EDD 2002a — California Employment Development Department (EDD), *Civilian Labor Force, Employment, and Unemployment for Alameda, San Joaquin, Contra Costa, and Stanislaus Counties, California*, California Employment Development Department, Sacramento, CA, Available online at http://www.calmis.ca.gov, Accessed November 6, 2002.

EDD 2002b — EDD, *County Snapshot for Alameda, San Joaquin, Contra Costa, and Stanislaus Counties, California*, California Employment Development Department, Sacramento, CA, Available online at http://www.calmis.ca.gov, Accessed 2002.

EDD 2002c — EDD, *Labor Market Information for Alameda, San Joaquin, Contra Costa, and Stanislaus Counties, California*, California Employment Development Department, Sacramento, CA, Available online at http://www.calmis.ca.gov, Accessed December 2002.

EO 12898 — Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," Issued on February 11, 1994 by President William J. Clinton.

EPA 2002a — EPA, *Environmental Justice*, U.S. Environmental Protection Agency, Washington, DC, 2002.

EPA n.d. — EPA, *Permitting of Treatment, Storage, and Disposal Facilities*, U.S. Environmental Protection Agency, Washington, DC, n.d.

Hurst 2003 — Hurst, Karen, Email from Karen Hurst, Waste Management, Inc. to Ross Dimmick Tetra Tech NUS, regarding the Lifespan of Altamont Landfill, July 2002.

ICRP 1990 — International Commission on Radiological Protection (ICRP), *Recommendations of the ICRP on Radiation Protection*, ICRP Publication 60, International Commission on Radiological Protection, Adopted in November 1990.

Jones and Stokes 2001 — Jones and Stokes Associates, Inc., *Biological Assessment for the United States Department of Energy's Lawrence Livermore National Laboratory, (Site 300)*, prepared for Lawrence Livermore National Laboratory, Livermore, CA, November 2001.

Jones and Stokes 2002a — Jones and Stokes Associates, Inc., *Special-Status Plant Species Surveys and Vegetation Mapping at Lawrence Livermore National Laboratory*, prepared for Lawrence Livermore National Laboratory, Livermore, CA, September 2002.

Jones and Stokes 2002b — Jones and Stokes Associates, Inc., *2002 Small Mammal Inventory at Lawrence Livermore National Laboratory Site 300*, prepared for Lawrence Livermore National Laboratory, Livermore, CA, October 2002.

Jones and Stokes 2002c — Jones and Stokes Associates, Inc., *Delineation of Waters of the United States, for Arroyo Las Positas, for Lawrence Livermore National Laboratory*, prepared for Lawrence Livermore National Laboratory, Livermore, CA, September 2002.

LLNL 1992a — Lawrence Livermore National Laboratory (LLNL), *Final Environmental Impact Statement and Environmental Impact Report for Continued Operation of Lawrence National Laboratory and Sandia National Laboratories,* Vols. 1-5, DOE/EIS-0157, Lawrence Livermore National Laboratory, Livermore, CA, August 1992.

LLNL 1996c — LLNL, *Environmental Assessment Under NEPA Regulations Decontamination and Waste Treatment Facility (DWTF)*, DOE/EA-1150, Lawrence Livermore National Laboratory, Livermore, CA, February 23, 1996.

LLNL 1997e — LLNL, *1996 Site Annual Environmental Report (SAER) for LLNL*, UCRL-50027-96, Lawrence Livermore National Laboratory, Livermore, Environmental Protection Department, CA, September 1, 1997.

LLNL 1997i — LLNL, *Operation Plan for Site 300 Explosive Waste Treatment Facility LLNL*, UCRL-AR-113868, Rev.3, Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, September 1995, Revised March 1997.

LLNL 1997q — LLNL, H*ealth Risk Assessment for Hazardous and Mixed Waste Management Units at Lawrence Livermore National Laboratory*, UCRL-AR-119482-97, Lawrence Livermore National Laboratory, Health and Ecological Assessment Division, Livermore, CA, February 1997.

LLNL 1998b — LLNL, *1997 Site Annual Environmental Report (SAER) for LLNL*, UCRL-50027-97, Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, September 1, 1998.

LLNL 1999b — LLNL, *Fire Hazards Analysis, Building 231*, Lawrence Livermore National Laboratory, Fire Protection Engineering, Livermore, CA, August 1999.

LLNL 1999c — LLNL, *1998 Site Annual Environmental Report (SAER) for LLNL*, UCRL-50027-88, Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, September 1, 1999.

LLNL 1999j — LLNL, *Final Safety Analysis Report for the Building 233 Container Storage Unit*, UCRL-AR-123632, Lawrence Livermore National Laboratory, Environmental Protection Department, Hazardous Waste Management Division, Livermore, CA, September 1999.

LLNL 2000aa — LLNL, *Part B Permit Application for Hazardous Waste Treatment and Storage Facilities, Livermore Site,* Part I-Part XV, UCAR-10275-00, prepared by Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, for U.S. Department of Energy, Oakland Operations Office, Oakland, CA, 1996, Revised December 2000.

LLNL 2000d — LLNL, *Hazards Analysis Report, Building 327,* UCRL-AR-145432, Lawrence Livermore National Laboratory, Hazards Control Department, Livermore, CA, October 3, 2000.

LLNL 2000g — LLNL, *1999 Site Annual Environmental Report (SAER) for LLNL*, UCRL-50027-99, Lawrence Livermore National Laboratory, Livermore, CA. September 1, 2000.

LLNL 2000i LLNL, *Environmental Safety & Health Manual*, Vols. 1-6, UCRL-MA-133867, Lawrence Livermore National Laboratory, Livermore, CA, 2000.

LLNL 2000l LLNL, *Hazards Analysis Report, B151 Complex, Chemistry and Materials Science*, UCRL-AR-140406, Rev. 0, Lawrence Livermore National Laboratory, Livermore, CA, September 8, 2000.

LLNL 2000t LLNL, *Hazardous Waste Management Facilities Final Safety Analysis Report*, FSP-S300.3, UCRL-CR-113523, Rev. 2, Lawrence Livermore National Laboratory, Livermore, CA, May 2000.

LLNL 2001e LLNL, *Hazards Analysis Report, Building 322, Metal Finishing Facility*, UCRL-AR-142558, Rev.1, Lawrence Livermore National Laboratory, Livermore, CA, March 2001.

LLNL 2001f LLNL, *Hazards Analysis Report, Building 241, Laboratories, Offices, and Yard*, UCRL-AR-142755, CMS4241-HAR, Lawrence Livermore National Laboratory, Chemistry and Materials Science Directorate, Livermore, CA, January 15, 2001.

LLNL 2001h LLNL, *Environmental Safety and Health Manual,* S*hipping Explosives Offsite*, Document 21.4, Lawrence Livermore National Laboratory, Livermore, CA, April 1, 2001.

LLNL 2001v LLNL, *2000 Site Annual Site Environmental Report (SAER),* UCRL-50027-00, Lawrence Livermore National Laboratory, Livermore, CA, September 1, 2001.

LLNL 2001x LLNL, *Facility Safety Plan for Building 131 High Bay,* FSP-131, Lawrence Livermore National Laboratory, Engineering Directorate, Livermore, CA, September 2001.

LLNL 2001af LLNL, *Part B Permit Application for Hazardous Waste Treatment and Storage Facilities, Livermore Site: Changes to Volume 1,5,7,9,10,11, Part A and the Permit*, UCAR-10275-01-1, prepared by Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, for U.S. Department of Energy, Oakland Operations Office, Oakland, CA, September 2001.

LLNL 2001ag LLNL, *Hazard Analysis Report for Building 235*, Laboratories, Offices and Yard, UCRL-AR-143858, Lawrence Livermore National Laboratory, Chemistry and Materials Science Directorate, Livermore, CA, April 2001.

LLNL 2001aq LLNL, *Environmental Safety and Health Manual, Management of Satellite and Waste Accumulation Areas*, Document 36.3, Lawrence Livermore National Laboratory, Livermore, CA, August 27, 2001.

LLNL 2001ar LLNL, *Part B Permit Application for Hazardous Waste Treatment and Storage Facilities, Livermore Site*, Vol. 7, Part XIV.1, Appendix XIV.1-A thru Appendix XIV.1-E, UCRL-10275-00, prepared by Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, for U.S. Department of Energy, Oakland Operations Office, Oakland, CA, Revised September 2001.

LLNL 2002d LLNL, *Landscape Architecture Master Plan,* Lawrence Livermore National Laboratory, Livermore, CA, June 2000.

LLNL 2002e LLNL, *Air Emissions Offsets Management Plan*, Lawrence Livermore National Laboratory, Livermore, CA, Available online at http://www.llnl.gov/es_and/h/hsm/doc_31.01/air.htm, Accessed 2002.

LLNL 2002h LLNL, C*omprehensive Site Plan*, LLNL-0062, Lawrence Livermore National Laboratory, Livermore, CA, September 17, 2002.

LLNL 2002k LLNL, *Data Collection Template, for Building B262 Dome*, Lawrence Livermore National Laboratory, NAI Directorate, Livermore, CA, September 27, 2002.

LLNL 2002m LLNL, *Annual Data Updates for Permit Renewals- 2001 LLNL (Main Site) and Transmittal Letter*, PRA02-050, Lawrence Livermore National Laboratory, Livermore, CA, April 10, 2002.

LLNL 2002p LLNL, *PEM Report for September and August 2002*, Lawrence Livermore National Laboratory, Hazardous Waste Management Division, Livermore, CA, October 2002.

LLNL 2002q LLNL, *Collective Dose for the LLNL Environmental Impact Statement*, RSS-02-063, Lawrence Livermore National Laboratory, Livermore, CA, November 18, 2002.

LLNL 2002v LLNL, *FY 2002 LLNL Payroll Data*, Lawrence Livermore National Laboratory, Livermore, CA, 2002.

LLNL 2002y LLNL, *EIS Facilities and Initiatives list showing Director, Project Name, DOE Sponsor, Budget Yr, Funding, Project Description*, Comments, from Chuck Meier, LLNL, Lawrence Livermore National Laboratory, Livermore, CA, October 15, 2002.

LLNL 2002z LLNL, *Additional Revisions to the Part B Permit*, Lawrence Livermore National Laboratory, Livermore, CA, 2002.

LLNL 2002an LLNL, *LLNL SWEIS Data Collection – Biology and Biotechnology Research Program for Buildings 361, 362, 363, 364, 365, 366, 376, 377, and BSL-3*, Lawrence Livermore National Laboratory, Livermore, CA, 2002.

LLNL 2002bb LLNL, *LLNL NESHAPS 2001 Annual Report*, UCRL-ID-113867-02, Lawrence Livermore National Laboratory, Livermore, CA, June 1, 2002.

LLNL 2002bj LLNL, Email from Paul McGuff, LLNL to Mitch Marken, Tetra Tech, Inc. dated November 19, 2002, regarding *Reference for CRM Section*, Lawrence Livermore National Laboratory, Livermore, CA, 2002.

LLNL 2002bv LLNL, *LLNL Parking Master Plan and Parking Policy*, UCRL-ID-124950-01, Lawrence Livermore National Laboratory, Plant Engineering, Livermore, CA, June 2002.

LLNL 2002bx LLNL, *Joint Frequency Distribution (JFD) for Livermore Dry and Wet Season Prepared for SWEIS;* Wind Roses and Tabular Data, Lawrence Livermore National Laboratory, Livermore, CA, 2002.

LLNL 2002bz LLNL, Personal communication from Bergman, Michele, Manager, Office of Program Planning, Safeguards & Security, to Ross Dimmick, Tetra Tech, Inc., dated December 13, 2002, Lawrence Livermore National Laboratory, Livermore, CA, 2002.

LLNL 2002ca LLNL, *Radioactive, Hazardous, and Mixed Waste Treatment Storage Facility-Area 514*, FSP-514, Lawrence Livermore National Laboratory, Livermore, CA, April 2002.

LLNL 2002cb LLNL, *Past B Permit Application Revisions for Hazardous Waste Treatment and Storage Facilities, Livermore Site,* Vol 6, UCAR – 10275, prepared by Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, for U.S> Department of Energy, Oakland Operations Office, Oakland, CA, October 2002.

LLNL 2002cc LLNL, *2001 Site Annual Environmental Report (SAER) for LLNL*, UCRL-50027-01, Lawrence Livermore National Laboratory, Livermore, CA, September 1, 2002.

LLNL 2002cd LLNL, *Part B Permit Application Revision for Hazardous Waste Treatment and Storage Facilities*, Vol. 1, UCAR-10275, Prepared by Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, for the U.S. Department of Energy, Oakland Operations Office, Oakland, CA, October 2002.

LLNL 2002ce — LLNL, *Radioactive and Hazardous Waste Management Division Hazards Analysis Report for Area 514 Facility*, UCRL-AR-151421, Rev. 1, Lawrence Livermore National Laboratory, Environmental Protection Department, Livermore, CA, December 2002.

LLNL 2002ci — LLNL, *Joint Frequency Distribution (JFD) for Site 300 Dry and Wet Season Prepared for SWEIS; Wind Roses and Tabular Data*, Lawrence Livermore National Laboratory, Livermore, CA, October 11, 2002.

LLNL 2002da — LLNL, *Safety Analysis Report for the B696R Radioactive Waste Storage Area*, HWMD-01-065, Rev. 2, Lawrence Livermore National Laboratory, Livermore, CA, June 2002.

LLNL 2003b — LLNL, *Fire Protection and Emergency Services Questionnaire for LLNL SWEIS,* Lawrence Livermore National Laboratory, Livermore, CA, December 16, 2002.

LLNL 2003l — LLNL, *2002 Site Annual Environmental Report (SAER)*, UCRL-50027-02, Lawrence Livermore National Laboratory, Livermore, CA, August 29, 2003.

LLNL 2003r — LLNL, *Amendment to the Health Risk Assessment for Hazardous and Mixed Waste Management Units at LLNL*, URCL-AR-119482-03, Lawrence Livermore National Laboratory, Livermore, CA, June 11, 2003.

LLNL 2003s — LLNL, *Safety Analysis Report for the B695 Segment of the Decontamination and Waste Treatment Facility*, UCRL-AR-149550, Lawrence Livermore National Laboratory, Livermore, CA, February 2003.

LLNL 2003v — LLNL, *Legacy Waste Project 2003 Baseline*, Vol. 1, Lawrence Livermore National Laboratory, Radioactive and Hazardous Waste Management Division, Livermore, CA, July, 2003.

LLNL 2003l — LLNL, *2002 Site Annual Environmental Report (SAER)*, UCRL-50027-02, Lawrence Livermore National Laboratory, Livermore, CA, August 29, 2003.

LLNL 2003aj — LLNL, Email from Bruce McDowell, dated January 10, 2003, regarding *Class 2 Permit Modifications*, Lawrence Livermore National Laboratory, Livermore, CA, 2003.

LLNL 2003av — LLNL, *Revised Annual Updates to the Hazardous Waste Management Facilities Final Safety Analysis Report and Technical Safety Requirements*, UCRL-AR-152931, Lawrence Livermore National Laboratory, Livermore, CA, September 2003.

LLNL 2003ax — LLNL, *Hazardous Waste Department Logbook,* Lawrence Livermore National Laboratory, Livermore, CA.

LLNL 2003bd — LLNL, Personal communication from Kent Wilson, Glen Garabedian, and Mary Svendsen, dated March 13, 2003, regarding *Non-Hazardous Waste, Data Gaps*, Lawrence Livermore National Laboratory, Livermore, CA, 2003.

LLNL 2003be — LLNL, Email from John Scott and Judy Steenhoven, LLNL, to Jim Bartosch, Tetra Tech NUS, dated January 23, 2003, regarding *Waste Information for SWEIS*, Lawrence Livermore National Laboratory, Livermore, CA, 2003.

LLNL 2003by — LLNL, *LLNL Avian Monitoring Program: Variable Circular Plot Point Count and Constant Effort Mist Netting Lawrence Livermore National Laboratory, Site 300, Alameda and San Joaquin Counties, CA, Draft Report*, Lawrence Livermore National Laboratory, Livermore, CA, January 15, 2003.

LLNL 2003bz — LLNL, Email to George Pratt, Tetra Tech, Inc., dated February 11, 2003, regarding the Inventory of Animal and Plants at the Livermore Site in 2001 (includes attachment: 2001 Spring and Fall Fauna and Floral Inventory for Site 300, Livermore, CA), 2003.

LLNL 2003ca — LLNL, Email from Paul McGuff, LLNL to Kathy Roxlau, Tetra Tech Inc. dated November 14, 2003, regarding *Email Needed for Reference*, Lawrence Livermore National Laboratory, Livermore, CA, 2003.

Lombardo 2002 — Lombardo, Victoria, Email from Victoria Lombardo, City of Tracy, Development and Engineering Services Department, to Edward Yates, Tetra Tech, Inc., dated November 2002, Tracy, CA, 2002.

NNSA 2003a — NNSA, *Final Site-Wide Environmental Assessment of the Sandia National Laboratories*, NNSA/DOE-AL; DOE/EA-1422, U.S. Department of Energy, National Nuclear Security Administration, January 2003.

San Joaquin County 1992 — San Joaquin County, *San Joaquin County General Plan 2010, Countywide General Plan*, Vol. 1, San Joaquin County, Board of Supervisors, Stockson, CA, July 29, 1992.

Sandhu 1999 — Sandhu, M., *Hazardous Waste Facility Permit, 1999*, Approval 9-NC-006, May 27, 1999.

Sandhu 2001 — Sandhu, M., *Hazardous Waste Facility Permit, 2001 Permit Modifications*, Approval 99-NC-006, September 26, 2001.

Sculley 2003 — Sculley, R., *Hourly Station Summary of Short Term Noise Monitoring Data Along Roadways Adjacent to the Lawrence Livermore Site*, January 2003.

SNL 1997 — Sandia National Laboratory (SNL), 1996 Site Annual Environmental Report (SAER), SAND97-8015.UC402, Sandia National Laboratory, Albuquerque, NM, August 1997.

SWIS 2002 — Solid Waste Information System (SWIS), *Facility/Site Summary Details- Vasco Road Sanitary Landfill, Solid Waste Information System,* California Integrated Waste Management Board, *Solid Waste Information System, Available online at* http://www.ciwmb.ca.gov/swis/detail.asp?PG=DET&SITESCH =01-AA-0010&OUT=HTML, *Accessed December 12, 2002.*

TtNUS 2003 — Tetra Tech (Tt) NUS, *Site-Wide Environmental Impact Statement (SWEIS) and Supporting Environmental Documentation, Draft Comparison of Parameters to be Used to Analyze LLNL Facilities Under the No Action, Proposed Action and Reduced Operations*, Tetra Tech NUS, Aiken, SC, May 2003.

USDA 1966 — U.S. Department of Agriculture (USDA), *Soil Survey of the Alameda Area, California*, U.S. Department of Agriculture Soil Conservation Service, U.S. General Printing Office, Washington, DC, 1966.

USDA 1990 — USDA, *National Cooperative Soil Survey of the San Joaquin County, California*, U.S. Department of Agriculture, 1990.

USFWS 1998 — U.S. Fish and Wildlife Service (USFWS), *Amendment to the United States Fish and Wildlife Service Biological Opinion (1-1-97-F-173) on the Arroyo Maintenance Project on Arroyo Las Positas at LLNL, Alameda County, CA*, U.S. Fish and Wildlife Service, 1998.

USFWS 2002a — USFWS, *Formal Intra-Service Endangered Species Consultation on a Research Proposal to Examine Effects of Prescribed Burns and Other Fuels Management on the Alameda Whipsnake (Re-Initiation of),* U.S. Fish and Wildlife Service, 2002.

USGS 2003 — U.S. Geological Survey (USGS), *Earthquake Potential for the East Bay Area (California) 2003-2032*, U.S. Geological Survey, Earthquake Hazards Program, Northern California, Available online at http://quake.usgs.gov/research/seismology/wg02, Accessed April 30, 2003.