

CHAPTER 1

Introduction and Purpose and Need for Agency Action

This chapter introduces Sandia National Laboratories' (SNL's) role in supporting the United States (U.S.) Department of Energy's (DOE's) and National Nuclear Security Administration's (NNSA's) statutory missions and operations. It also provides a statement of the purpose and need for the Agency's action, a description of the DOE missions for SNL, an overview of the alternatives to be considered, and discusses the public participation process and related National Environmental Policy Act (NEPA) documents. Finally, it discusses the organization and contents of the remaining chapters in the Site-Wide Environmental Assessment (SWEA).

1.1 INTRODUCTION

Sandia National Laboratories (SNL) is one of three national laboratories that support the DOE's statutory responsibilities for nuclear weapons research and design, development of energy technologies, and basic scientific research. SNL is composed of four geographically separated facilities: Albuquerque, New Mexico (SNL/NM); Tonopah, Nevada; Kauai, Hawaii; and Livermore, California (SNL/CA). This SWEA focuses on SNL/CA.

SNL/CA has an annual budget estimated at \$130 million and a workforce of approximately 1,080. SNL/CA comprises approximately 410 acres of Federal land (owned by the DOE) east of the City of Livermore, California (Figure 1-1). SNL/CA is located directly south of Lawrence Livermore National Laboratory (LLNL). East Avenue separates the two facilities. The NNSA, responsible for carrying out the national security responsibilities of DOE, has prepared the SNL/CA SWEA to examine the environmental impacts associated with three alternatives for SNL/CA's continued operation. In the SNL/CA SWEA, the NNSA describes the consequences, both onsite and offsite, of ongoing and proposed SNL/CA operations, and compares the potential consequences to three alternative levels of future operations. DOE and NNSA activities, at the national laboratories and production facilities, are known as mission/business lines. Descriptions of the DOE mission/business lines are:

- **National Security**—enhancing national security through military application of nuclear technology and by reducing global danger from the potential spread of weapons of mass destruction.
- **Energy Resources**—promoting the development and deployment of systems and practices that provide energy that is clean, efficient, reasonably priced, and reliable.
- **Environmental Quality**—cleaning up the legacy of nuclear weapons and nuclear research activities, safely managing nuclear materials, and disposing of radioactive wastes.
- **Science**—advancing science and scientific tools to provide the foundation for the DOE's applied mis-

sions and to provide insights into our physical and biological world.

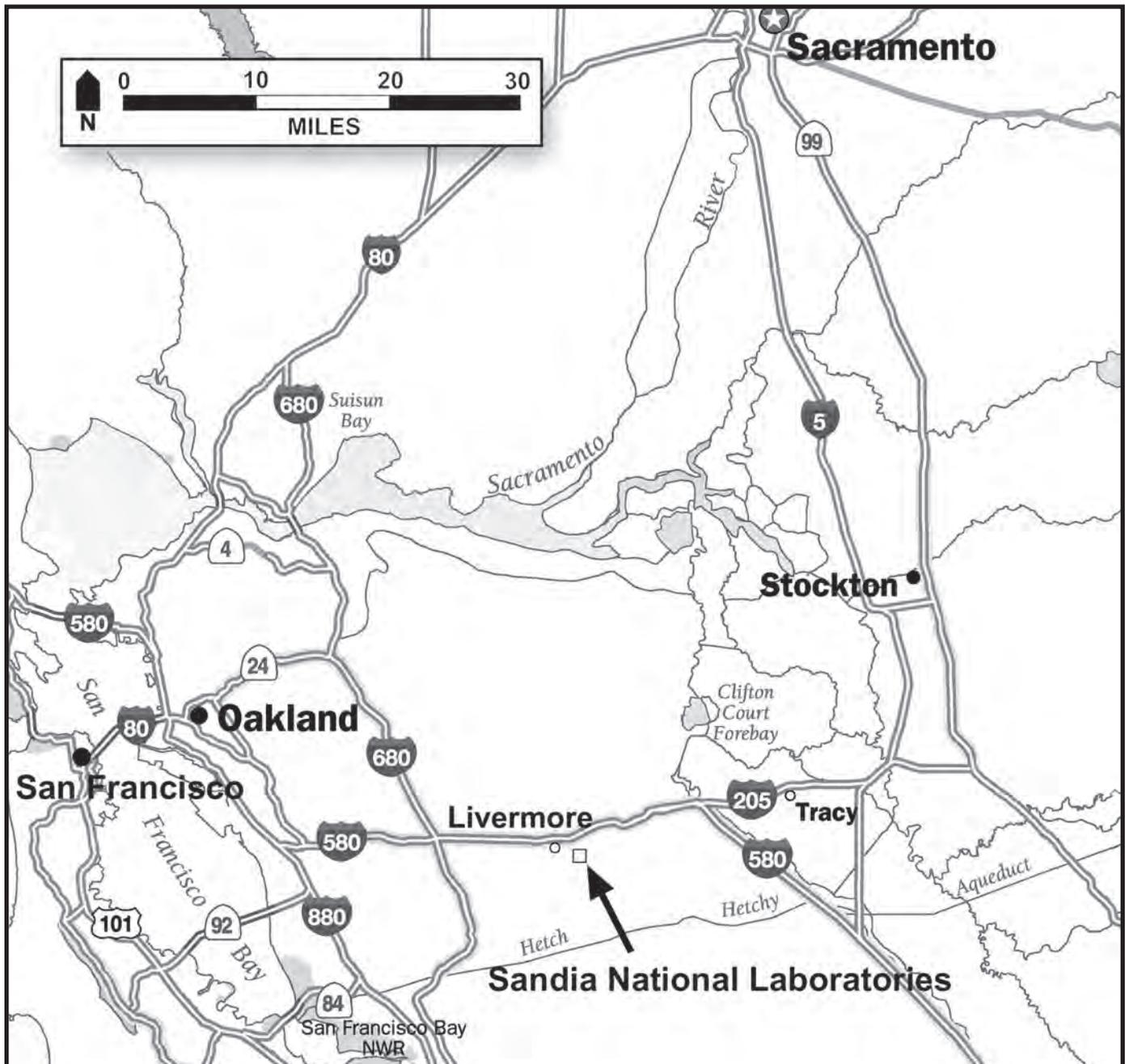
In 2000, the NNSA was created within the DOE to carry out the department's national security responsibilities. Its mission includes maintenance of a safe, secure and reliable stockpile of nuclear weapons and associated materials capabilities and technologies; promotion of international nuclear safety and nonproliferation; and administration and management of the naval nuclear propulsion program. The NNSA officially began operations on March 1, 2000 (NNSA 2002a). The majority of activities, operations, and facilities at SNL/CA are under the responsibility of the NNSA.

The U.S. Department of Energy's Mission Statement

To foster a secure and reliable energy system that is environmentally and economically sustainable; to be a responsible steward of the Nation's nuclear weapons; to clean up the DOE's facilities; to lead in the physical sciences and advance the biological, environmental, and computational sciences; and to provide premier scientific instruments for the Nation's research enterprise (DOE 2002a).

The National Nuclear Security Administration's Mission Statement

To enhance United States national security through the military application of nuclear energy; to maintain and enhance the safety, reliability, and performance of the United States nuclear weapons stockpile, including the ability to design, produce, and test, in order to meet national security requirements; to provide the United States Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants; to promote international nuclear safety and nonproliferation; to reduce global danger from weapons of mass destruction; and to support United States leadership in science and technology (NNSA 2002a).



Source: CDT 2002a

Figure 1-1. Sandia National Laboratories, California is Located East of Livermore in Alameda County, California

Historically, national security has meant defense against foreign military threats. However, over time the threats to our nation have become increasingly varied and complex. To meet these challenges, the DOE/NNSA missions for SNL have evolved in response to emerging national needs. As a result of the terrorist attacks on September 11, 2001, the NNSA believes SNL capabilities in enhancing national security through military application of nuclear technology and developing technologies to reduce the global danger from weapons of mass destruction are needed to support the Office of Homeland Security. Support of the

Office of Homeland Security is part of the ongoing mission lines of the DOE and NNSA.

1.2 PURPOSE AND NEED FOR AGENCY ACTION

The DOE needs to continue to meet its responsibilities for national security (including homeland security), energy resources, environmental quality, and science at SNL/CA. The DOE needs to continue to fulfill its responsibilities as mandated by statute, Presidential Decision Directive (PDD), and congressional authorization

The Office of Homeland Security Mission Statement

On October 8, 2001, the President established within the Executive Office of the President an Office of Homeland Security and the Homeland Security Council (Executive Order [EO] 13228). The mission of the Office will be to develop and coordinate the implementation of a comprehensive national strategy to secure the United States from terrorist threats or attacks. The Office will coordinate the executive branch's efforts to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States (66 FR 51812).

and appropriation, while meeting this need in a manner that protects human health and the environment. As previously stated, the DOE missions for SNL have evolved over time in response to national needs (for example, EO 13228). When assigning missions to SNL, the DOE considers many factors, including the following PDDs; the *National Defense Authorization Act* of 2002 (P.L. 107-107); the Department of Defense (DoD) Nuclear Posture Review; and treaties, both implemented and proposed, including the Nuclear Nonproliferation Treaty, Strategic Arms Reduction Treaty (START) I, proposed START II, and the proposed Comprehensive Test Ban Treaty. Operations at SNL/CA comprise four broad areas: weapons, integrated systems and technologies, research, and exemplary operations. Following are specialized capabilities SNL/CA provides in support of the DOE's mission/business lines:

- science-based performance and reliability testing and computer-based modeling of nuclear weapon components;
- development, design, and testing of nonnuclear components for nuclear weapon systems;
- materials and diagnostic equipment research and testing (involves biological, chemical, waste, and radiological materials including research and testing associated with Homeland Defense);
- energy and environmental research;
- microelectronics, microsystems, and nanotechnologies.

1.3 ALTERNATIVES

The NNSA proposes to continue operating SNL/CA and managing its resources in a manner that meets evolving DOE mission lines and that responds to the concerns of affected and interested individuals and agencies. The NNSA identified three alternatives—No Action, Planned Utilization and Operations, and Maximum Operations—

that will meet its purpose and need for agency action and support existing and potential future program-related activities at SNL/CA.

1.3.1 NO ACTION ALTERNATIVE

The No Action Alternative includes continuing and historical research and development operations and related activities of SNL/CA. Specifically, the No Action Alternative includes:

- continuing the level of activity at 10 existing facilities/groups as discussed in Section 3.2
- continuing the level of support specified as “balance of operations” as detailed in Section 3.5
- constructing and operating (details in Section 3.2) the LIGA Technologies Facility (see LIGA text box in Section 2.3.2), Distributed Information Systems Laboratory, and the Glass Furnace and Melting Laboratory
- continuing modifications to the Hazardous Waste Storage Facilities
- continuing removal of several small structures totaling approximately 15,000 square feet (sq ft)
- continuing routine SNL/CA activities such as maintenance support, environmental monitoring, chemical materials management, and waste management (see Section 2.3.3)
- completing several General Plant Projects previously approved.

1.3.2 PLANNED UTILIZATION AND OPERATIONS ALTERNATIVE

The Planned Utilization and Operations Alternative would include all the operations and activities identified in the No Action Alternative, plus implementing planned facility operations in support of SNL/CA's assigned missions (see Section 3.3), and changing current land use.

This alternative differs from the No Action Alternative in that:

- Thirteen facilities/groups would operate at generally higher levels of activity and staffing (see Section 3.3).
- “Balance of operations” (see Section 3.5) would increase to support higher levels of activity and staffing. In general, the increase would be based on a 13 percent site-wide staffing increase above current levels.
- Arroyo Seco would undergo improvements as described in the *Management Plan for Arroyo Seco* and the Biological Assessment.

- A 30-acre wildlife reserve would be established.
- A Grant of Easement and Agreement would be made with the landowner concerning the land along the SNL/CA western boundary.
- 93 acres would be designated as future construction sites including onsite soil management.
- 122 acres would, for future land use, be identified as undesignated.
- Storm water runoff areas would be upgraded including new sewer line supports and East Avenue security grate.
- Onsite soil management (25 acres within the 93 acres designated as future construction) of clean dirt/fill from Arroyo Seco improvements, storm water projects, and construction projects would be established.
- General Plant Projects including upgrades to the water distribution system would be completed.
- Renovation of Building 916 would be completed.
- A new 5,000 sq ft badge office complex including parking, bus turnaround, and lane improvements would be constructed (8 acres within the 93 acres designated for future construction).

1.3.3 MAXIMUM OPERATIONS ALTERNATIVE

The Maximum Operations Alternative would include all the operations and activities identified in the Planned Utilization and Operations Alternative, plus implementing two shifts at specific facilities in support of SNL/CA's assigned missions (see Section 3.4), changing current land uses, and constructing two new facilities.

This alternative differs from the Planned Utilization and Operations Alternative in that:

- Most of 13 facilities/groups would operate with two shifts (see Section 3.4).
- "Balance of operations" (see Section 3.5) would increase to support higher levels of activity and staffing. In general, the increase would be based on a 53 percent site-wide staffing increase above current levels.
- Building 916 (42,000 sq ft) would be replaced with a building twice the size (84,000 sq ft).
- A new 16,000 sq ft facility, similar to the existing Chemical and Radiation Detection Laboratory (CRDL), would be constructed for research and development.
- Up to 100,000 sq ft of facilities determined to be beyond economically useful life would be removed.

1.4 OBJECTIVE OF THE SITE-WIDE ENVIRONMENTAL ASSESSMENT

The DOE established its NEPA implementing regulations (10 *Code of Federal Regulations* [CFR] Part 1021.330) that allow preparation of site-wide documents for certain large, multiple-facility sites, such as SNL/CA. Pursuant to 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 the DOE NEPA regulations (10 CFR Part 1021), the DOE/NNSA decided to complete a SWEA for the SNL/CA site.

The objective of the SNL/CA SWEA is to provide the DOE, 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 SNL/CA;
- a basis for site-wide decision making;
- improved coordination of agency plans, functions, programs, and resource utilization;
- a clearer understanding of the impacts created by SNL/CA operations separate from LLNL operations;
- sufficient information to facilitate routine decisions by the DOE regarding verification of operational status; and
- an understanding of SNL/CA's contribution to cumulative environmental impacts for inclusion in the proposed 2003 LLNL SWEIS (DOE/EIS-0157) (DOE 1992a).

The SNL/CA SWEA provides authorization limits for the Laboratory. The SNL/CA SWEA will also enable NNSA to "tier" its NEPA documentation, to eliminate repetitive discussion of the same issues in future NEPA reviews, and to focus on the actual issues ready for decisions at each level of environmental review.

In February 2002, the NNSA identified the need to update baseline information and impact analysis to support the current SNL/CA site planning. To meet this need, NNSA decided to prepare a SWEA and sepa-

Sandia Site Office (SSO)

The OKSO is the DOE/NNSA onsite presence and serves as a steward for the preservation and enhancement of SNL as a national resource for science and technology. The main office of OKSO is located on Kirtland Air Force Base in Albuquerque, New Mexico.

rate the analysis of SNL/CA operations from those at LLNL. The previous site-wide analysis of SNL/CA operations was contained in a joint 1992 Environmental Impact Statement (EIS)/ Environmental Impact Report (EIR) (DOE 1992a) prepared for the two sites. At the time that the SWEA decision was made, a revision date for the LLNL EIS/EIR had not been set. The LLNL site-wide EIS/EIR has since been proposed for 2003. The NNSA recognizes and understands that the SNL/CA SWEA will provide valuable information for use in the LLNL NEPA process and analysis of cumulative impacts. NNSA also recognizes that waiting for the next LLNL site-wide EIS (SWEIS) would delay planned actions at SNL/CA and place unnecessary burdens on the NNSA/Sandia Site Office (SSO) NEPA compliance and decision-making process. As a result, the NNSA decided to continue with preparation of a SWEA to provide a thorough environmental analysis and description of impacts for ongoing and proposed SNL/CA operations.

1.5 DECISIONS TO BE SUPPORTED BY THE SITE-WIDE ENVIRONMENTAL ASSESSMENT

The SWEA will be used to support the DOE/NNSA's decisions on the levels of operations at SNL/CA, and serve as a basis for tiering future NEPA analyses and decisions regarding specific activities. If mitigation measures, monitoring, or other conditions are adopted as part of the DOE/NNSA decision, these too, will be summarized. The NNSA's Notice of Intent (NOI) (67 FR 5089) proposed two preliminary alternatives, the No Action and Expanded Operations Alternatives, to be considered in the SWEA. The SWEA analyzes the environmental impacts of activities at SNL/CA associated with three alternatives, as well as activities common to all alternatives including maintenance support and material management.

1.6 PUBLIC PARTICIPATION

Public participation is part of the process used in the preparation of the SWEA. This section summarizes the public scoping process.

1.6.1 SCOPING PROCESS

Scoping is a process for determining the range of issues addressed in a NEPA document and for identifying significant issues associated with the alternatives (40 CFR Part 1501.7). The objectives of the scoping process are to notify interested persons, agencies, and other groups about the proposed action and the alternatives being considered; solicit comments about environmental issues, alternatives, and other items of interest; and consider those comments in the preparation of the SWEA.

Scoping for the SWEA consisted of both internal NNSA scoping and external public scoping processes. The internal NNSA scoping process began with working groups comprised of DOE/NNSA managers and SNL/CA managers. The external scoping process period began after the publication of the NOI (67 FR 5089) on February 4, 2002, and continued until March 6, 2002. The NOI notified the public that the NNSA was intending to prepare a SWEA on SNL/CA operations and to invite other Federal agencies, Native American tribes, state and local governments, and the general public to participate in the scoping process. The NOI also presented background information on SNL/CA and preliminary alternatives and issues identified through the internal scoping process.

Public scoping meetings for the general public were held on February 20, 2002. At these meetings, the DOE/NNSA presented information on its proposal to prepare the SWEA and the alternatives to be analyzed.

The public was invited to present oral and/or written comments at the scoping meetings. Comments were accepted by mail, facsimile, electronic mail, or by a toll-free telephone number.

1.6.2 SUMMARY OF SCOPING ISSUES AND CONCERNS

During the public scoping process, no individuals or organizations submitted requests for information or made oral or written comments.

1.6.3 PUBLIC COMMENT PROCESS

The NNSA released the Draft SWEA in November 2002 for review and comment by the state of California, Native American tribes, local governments, other Federal agencies, and the general public. The formal public comment period lasted 30 days, ending on November 30, 2002.

The NNSA anticipated answering all comments received during the public comment period, to evaluate the accuracy and adequacy of the Draft SWEA and to determine whether it needed to correct, clarify, or otherwise revise the SWEA text. During the Draft SWEA comment period, a limited number of comments were received, a summary of the changes to the SWEA are found in Section 1.6.4 below.

1.6.4 CHANGES TO THE DRAFT SWEA

The NNSA revised the Draft SWEA in response to the limited number of comments received from other Federal agencies; tribal, state, and local governments; nongovernmental organizations; the general public and internal reviews. The NNSA received no comments from other Federal agencies; tribal, local governments, or nongovernmental organizations. One member of the general public submitted comments primarily associated with geology,

soils, and water resources. A letter from the State of California Governor's Office of Planning and Research was received with no comments attached. All comments received were considered and every effort was made to incorporate changes to the document.

In addition, revisions were made on internal reviews. The text was changed to provide additional environmental baseline information, correct inaccuracies, make editorial correction, and provide additional discussions of technical considerations and clarify text.

1.6.5 NEXT STEPS

Based on the analysis in the SWEA, NNSA will determine whether the three alternatives are a major federal action significantly affecting the quality of the human environment within the meaning of NEPA, 42 U.S.C. 4321, *et seq.* NNSA will publish the decision to issue a Finding of No Significant Impact (FONSI) or to prepare an EIS.

1.7 RELATED NATIONAL ENVIRONMENTAL POLICY ACT DOCUMENTS

The following NEPA documents analyzed ongoing programs and activities at SNL/CA:

- Final (September 1996) Programmatic EIS (PEIS) for Stockpile Stewardship and Management (SSM) (DOE/EIS 0236-F).
- Final (May 1997) Waste Management PEIS for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (DOE/EIS-0200-F).
- Nonnuclear Consolidation Environmental Assessment (EA) (June 1993) (DOE/EA-0792).
- Final (August 1992) EIS and EIR for Continued Operation of LLNL and SNL/CA (DOE/EIS-0157).
- Supplement Analysis (March 1999) for Continued Operation of LLNL and SNL/CA (DOE/EIS-0157-SA-01).
- Draft (May 2002) EA for the East Avenue Security Upgrade at LLNL and SNL/CA (DOE/EA 1439).

1.7.1 FINAL (SEPTEMBER 1996) STOCKPILE STEWARDSHIP AND MANAGEMENT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (DOE/EIS-0236-F)

The DOE prepared the SSM PEIS to evaluate stockpile stewardship activities required to maintain a high level of confidence in the safety, reliability, and performance of nuclear weapons in the absence of underground testing and to be prepared to resume underground testing of nuclear weapons if directed by the President. Stockpile management activities include maintenance, evaluation, repair, or replacement of weapons in existing stockpiles.

The SSM PEIS examined the existing basic capabilities of the DOE laboratory and industrial complex, including those of SNL. The Record of Decision (ROD) for the PEIS determined SNL would continue as one of three weapons laboratories possessing most of the core intellectual and technical competencies of the U.S. in nuclear weapons.

1.7.2 FINAL (MAY 1997) WASTE MANAGEMENT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR MANAGING TREATMENT, STORAGE, AND DISPOSAL OF RADIOACTIVE AND HAZARDOUS WASTE (DOE/EIS-0200-F)

In the Waste Management PEIS (WM PEIS), the DOE evaluated the environmental impacts of alternatives for managing five types of radioactive and/or hazardous waste generated by defense and research activities at a variety of DOE sites around the United States. SNL/CA manages three of the five waste types: low-level waste (LLW), low-level mixed waste (LLMW), and hazardous waste.

On January 23, 1998, the DOE decided SNL/CA would continue to ship its hazardous waste offsite for treatment (DOE 1998a). The DOE decided on a national strategy for treatment and disposal of LLW and LLMW; SNL/CA would ship both waste types offsite for disposal.

1.7.3 NONNUCLEAR CONSOLIDATION ENVIRONMENTAL ASSESSMENT (JUNE 1993) (DOE/EA-0792)

The DOE prepared the Nonnuclear Consolidation EA to evaluate the consolidation of nonnuclear component manufacturing, storage, and surveillance functions (DOE 1993a). The EA discussed six categories of capabilities: electrical/mechanical; tritium handling; detonation; beryllium technology and pit support; neutron generators, cap assemblies, and batteries; and special products. The Finding of No Significant Impact (FONSI) for the EA determined the significance of impacts for the continuation of SNL/CA's existing research, development, testing, and prototyping capability (DOE 1993a).

1.7.4 FINAL (AUGUST 1992) ENVIRONMENTAL IMPACT STATEMENT AND ENVIRONMENTAL IMPACT REPORT FOR CONTINUED OPERATION OF LAWRENCE LIVERMORE NATIONAL LABORATORY AND SANDIA NATIONAL LABORATORIES, LIVERMORE (DOE/EIS-0157)

In the Final EIS and EIR for Continued Operation of LLNL and SNL/CA, the DOE evaluated the environmental impacts of alternatives for continuing operations, programmatic enhancements, and near-term proposed projects (DOE 1992a).

**1.7.5 SUPPLEMENT ANALYSIS (MARCH 1999)
FOR CONTINUED OPERATION OF LAWRENCE
LIVERMORE NATIONAL LABORATORY AND
SANDIA NATIONAL LABORATORIES, LIVERMORE
(DOE/EIS-0157-SA-01)**

The DOE prepared the Supplement Analysis for Continued Operation of LLNL and SNL/CA to consider whether the 1992 EIS/EIR should be supplemented, a new environmental impact statement should be prepared, or no further NEPA documentation was required.

In March 1999, the DOE decided that supplementation of the 1992 EIS/EIR was not needed and therefore, no further NEPA documentation was required (DOE 1999a).

**1.7.6 DRAFT (MAY 2002) ENVIRONMENTAL
ASSESSMENT FOR THE EAST AVENUE SECURITY
UPGRADE AT LAWRENCE LIVERMORE NATIONAL
LABORATORY/SANDIA NATIONAL LABORATORIES,
LIVERMORE (DOE/EA-1439)**

The DOE is preparing the East Avenue EA to evaluate the upgrade of the 1.25-mi roadway running between the LLNL and SNL/CA. The EA discusses three alternatives: the Proposed Action, No Action, and construction of new facilities and relocation of personnel and equipment. The Proposed Action would restrict the roadway to the general public on either a temporary or a permanent basis to improve security.

**1.8 THE SITE-WIDE
ENVIRONMENTAL ASSESSMENT**

The remaining chapters in the SWEA include an overview of SNL/CA operations, alternatives for continuing operations at SNL/CA, the affected environment, the environmental consequences, and cumulative impacts.

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CHAPTER 2

Operations Overview of Sandia National Laboratories, California

Chapter 2 provides an overview of Sandia National Laboratories, California (SNL/CA) operations, programs, and facilities. It begins with a brief history of the laboratories and site-wide operations, followed by a discussion of SNL/CA support for the United States (U.S.) Department of Energy (DOE) mission lines, programs, and projects. Descriptions of specific facilities and their operations are located at the end of the chapter.

During World War II, nuclear weapons were designed, developed, and tested at Los Alamos National Laboratories (LANL) in New Mexico. In late 1945, LANL began transferring its field-testing and engineering organization, known as Z-Division, to Sandia Base near Albuquerque, New Mexico. This organization was the nucleus of what became Sandia National Laboratories (SNL) in 1949. The initial focus of the newly formed SNL was on nuclear weapons engineering and production coordination, with a growing emphasis on research and development (R&D) to improve weapons design. By 1952, SNL focused on weapons development. The Laboratories undertook extensive field testing of components, supported the atmospheric tests conducted by its partner laboratories, and established an advanced development group to anticipate future nuclear weapons proliferation, weapons development, and treaty monitoring technological projects.

In 1956, SNL established the SNL/CA location to provide a closer relationship with Lawrence Livermore National Laboratory (LLNL) design work. The SNL/CA facility evolved into an engineering research and development laboratory by the early 1960s and into a multiprogram engineering and science laboratory during the 1970s.

As international arms control efforts increased in the late 1970s and throughout the 1980s, the U.S. emphasized treaty monitoring, safety, security, and control of the national nuclear weapons stockpile. With the end of the Cold War in the late 1980s, the role of SNL/CA to support stockpile stewardship ensuring nonproliferation and continued safety, security, and reliability, took on greater importance.

The DOE uses management and operating (M&O) contractors to manage its facilities, including SNL/CA. SNL/CA (Sandia Corporation) was managed and operated by American Telephone and Telegraph (AT&T) from 1956 to 1993. In 1993, the M&O contract was awarded to Martin Marietta Corporation, now known as Lockheed Martin Corporation.

2.1 SANDIA NATIONAL LABORATORIES, CALIFORNIA SUPPORT FOR THE U.S. DEPARTMENT OF ENERGY MISSION LINES

As discussed in Chapter 1, the DOE is responsible for ensuring the safety, reliability, and effectiveness of the

nation's nuclear deterrent; fostering a secure and reliable energy system that is environmentally and economically sustainable; reducing the environmental, safety, and health risks and impacts from the DOE facilities and materials; maintaining leadership in basic research; and advancing scientific knowledge.

SNL/CA's primary capabilities are:

- Supporting stockpile surveillance activities of hardened weapons systems and components to ensure these systems function properly when exposed to radiation from hostile sources, whether encountered by satellites and reentry vehicles in space or by the conditions created by nuclear detonations. SNL/CA integrates experimentation and computational simulation in support of radiation effects testing, radiation transport, diagnostics, and analyses to certify that electrical, mechanical, energetic, and other nonnuclear components will operate as designed in such hostile radiation environments.
- Developing specific, limited "piece parts" required to repair deterioration or defects in existing weapons components or to make modifications essential to maintaining deterrent credibility as the existing stockpile continues to shrink and age.
- Developing fundamental capabilities required to take advantage of technologies in state-of-the-art large computers and networked computers. Expertise ranges from fundamental, broadly applicable efforts to those of a developmental nature, all of which support both high-end computing and specific stockpile systems simulations.
- Conducting computer science research that addresses computational methods and technologies such as numerical methods for designing and processing new stockpile materials, new massively parallel (many calculators working simultaneously) numerical algorithms (repetitive calculations), and new strategies for code reusability, portability, and debugging.
- Providing sensor development and technical analysis support for the control and prevention of nuclear and nonnuclear (chemical, biological, explosive, and missiles) proliferation. Detection technology capabilities include airborne, satellite, seismic, and chemical-based monitoring systems.

- Conducting fundamental energy research in a wide variety of energy resources including electrical energy, energy storage, hydrogen storage (fuel cells), fossil fuels, geothermal technology (wireless telemetry), solar energy technology, and applied wind power technology.
- Conducting numerous projects that contribute to the DOE's science and technology mission. These include activities in scientific computing and basic energy conducting sciences; developing methods using computational science research for solving scientific and engineering problems with state-of-the-art software; using massively parallel computers (many computers working simultaneously) to meet critical DOE mission requirements in advanced computing; conducting scientific research, development, and applied engineering on materials and systems in areas of chemistry, physics, material science, biology, and environmental sciences.
- Developing technology to improve waste processing and reduce impacts to the environment, including pollution prevention projects.

The DOE directs SNL/CA activities in support of its programs and missions. In turn, SNL/CA's facilities and operations are designed to meet the requirements of the programs, projects, and activities assigned to the laboratory.

2.1.1 SANDIA NATIONAL LABORATORIES, CALIFORNIA SUPPORT FOR THE U.S. DEPARTMENT OF ENERGY'S NATIONAL SECURITY MISSION LINE

SNL/CA's principal DOE assignments under the National Security mission line focus on the nuclear stockpile and reducing the vulnerability of a reduced stockpile; managing nonnuclear components; and reducing the vulnerability of the U.S. to threats of proliferation and the use of weapons of mass destruction, nuclear incidents, and environmental damage.

2.1.2 SANDIA NATIONAL LABORATORIES, CALIFORNIA SUPPORT FOR THE U.S. DEPARTMENT OF ENERGY'S ENERGY RESOURCES MISSION LINE

SNL/CA supports the DOE assignments under the Energy Resources mission line to enhance the safety, security, and reliability of energy supplies. This work focuses on implications for our nation's security related to the increasing interdependencies among domestic elements and global resources. SNL/CA helps develop strategies to protect the supply of the nation's energy resources. SNL/CA applies science and technology capabilities to develop various technologies.

2.1.3 SANDIA NATIONAL LABORATORIES, CALIFORNIA SUPPORT FOR THE U.S. DEPARTMENT OF ENERGY'S ENVIRONMENTAL QUALITY MISSION LINE

SNL/CA supports the DOE assignments under the Environmental Quality mission line with onsite waste operations and by developing technology for national environmental problems. Activities include treatment (such as elemental neutralization), temporary storage, and offsite disposal of hazardous waste, low-level waste (LLW), low-level mixed waste (LLMW), and solid wastes generated by ongoing mission-related activities. Environmental restoration activities at SNL/CA were completed in 1999. However, monitoring activities and regulatory agency interaction are expected to continue.

2.1.4 SANDIA NATIONAL LABORATORIES, CALIFORNIA SUPPORT FOR THE U.S. DEPARTMENT OF ENERGY'S SCIENCE AND TECHNOLOGY MISSION LINE

SNL/CA's facilities and expertise are used in support of the Science and Technology mission line through R&D in modeling and simulation testing, physical sciences, and advanced chemical and materials sciences. SNL/CA activities include developing microelectronic components, computer-based testing, modeling, and simulation.

2.2 SANDIA NATIONAL LABORATORIES, CALIFORNIA SUPPORT FOR OTHERS

SNL/CA performs work for other sponsors, which falls into three general categories: Laboratory Directed Research and Development (LDRD), Work for Others (WFO), and Partnerships. This work must be compatible with the DOE mission work conducted at SNL/CA and must be work that cannot reasonably be performed by the public sector. Details regarding this type of support activities and projects are provided in SNL/CA's *Facilities and Safety Information Document* (FSID) (SNL/CA 2002a), and the *SNL Institutional Plan* FY 2002-2007 (SNL 2001a). Each category is discussed below.

2.2.1 LABORATORY DIRECTED RESEARCH AND DEVELOPMENT

The *National Defense Authorization Act* (P.L. 103-160) for fiscal year (FY) 1991 established the LDRD Program at DOE national laboratories. This Act authorized expenditures up to six percent of a laboratory's total budget to "maintain the scientific and technical vitality of the laboratories; enhance the laboratory's ability to address future DOE missions; foster creativity and stimulate exploration of forefront science and technology; serve as a proving ground for new research; and support high-risk,

potentially high-value R&D.” LDRD supports DOE’s four primary mission lines identified in Section 2.1.

2.2.2 WORK FOR OTHERS

SNL/CA performs reimbursable work for other Federal agencies and sponsors, including the private sector. This work, also known as WFO, must be compatible with the DOE mission work conducted at SNL/CA and must be work that cannot reasonably be performed by the public sector. SNL/CA activities support major agencies including the Department of Defense (DoD), U.S. Nuclear Regulatory Commission (NRC), U.S. Department of Transportation (DOT), National Aeronautics and Space Administration (NASA), Department of State, and U.S. Environmental Protection Agency (EPA).

2.2.3 PARTNERSHIPS

SNL/CA performs research and development under several teaming efforts including Established Partnerships, cooperative Research and Development Agreements (CRADA), Funds-in Agreements, Licenses, Memoranda of Understanding, and other mechanisms including teaming with universities for foundation grants. Universities and approved researchers are allowed to use select SNL/CA facilities to conduct research.

2.3 SANDIA NATIONAL LABORATORIES, CALIFORNIA FACILITIES: A FRAMEWORK FOR IMPACTS ANALYSIS

As discussed above, SNL/CA provides a diverse set of capabilities that support DOE’s mission lines through various programs. The major consideration in deciding to analyze impacts by facility rather than by program was the complexity of the analysis. Any given program may use operations in more than one facility, and SNL/CA facilities serve multiple programs. An analysis of environmental impacts requires knowledge of particular activities in a particular place over a known span of time in order to project the effect those activities will have on the surrounding environment. A presentation of impacts by program would require that impacts from operations at each facility be subdivided into the contribution from each program using the facility. The resulting impacts would then have to be reassembled by program. The complexity of analysis would greatly increase, and the clarity of the presentation would suffer. Therefore, the National Nuclear Security Administration (NNSA) chose to group the operations to be analyzed by facility.

The operations within these facilities or areas are the basis for differentiating among the three alternatives analyzed in the SWEA and any associated environmental impacts. Taken together, these facilities and areas represent the majority of exposure risks associated with continuing operations at SNL/CA.

2.3.1 FRAMEWORK FOR ANALYSIS

The SWEA evaluates SNL/CA facilities, operations, and their effects on environmental conditions under the three alternatives. Because of their importance, potential environmental impacts from some facilities are described and evaluated in greater detail than from other SNL/CA facilities. This in-depth look at these specific facilities provides the framework for analyzing impacts.

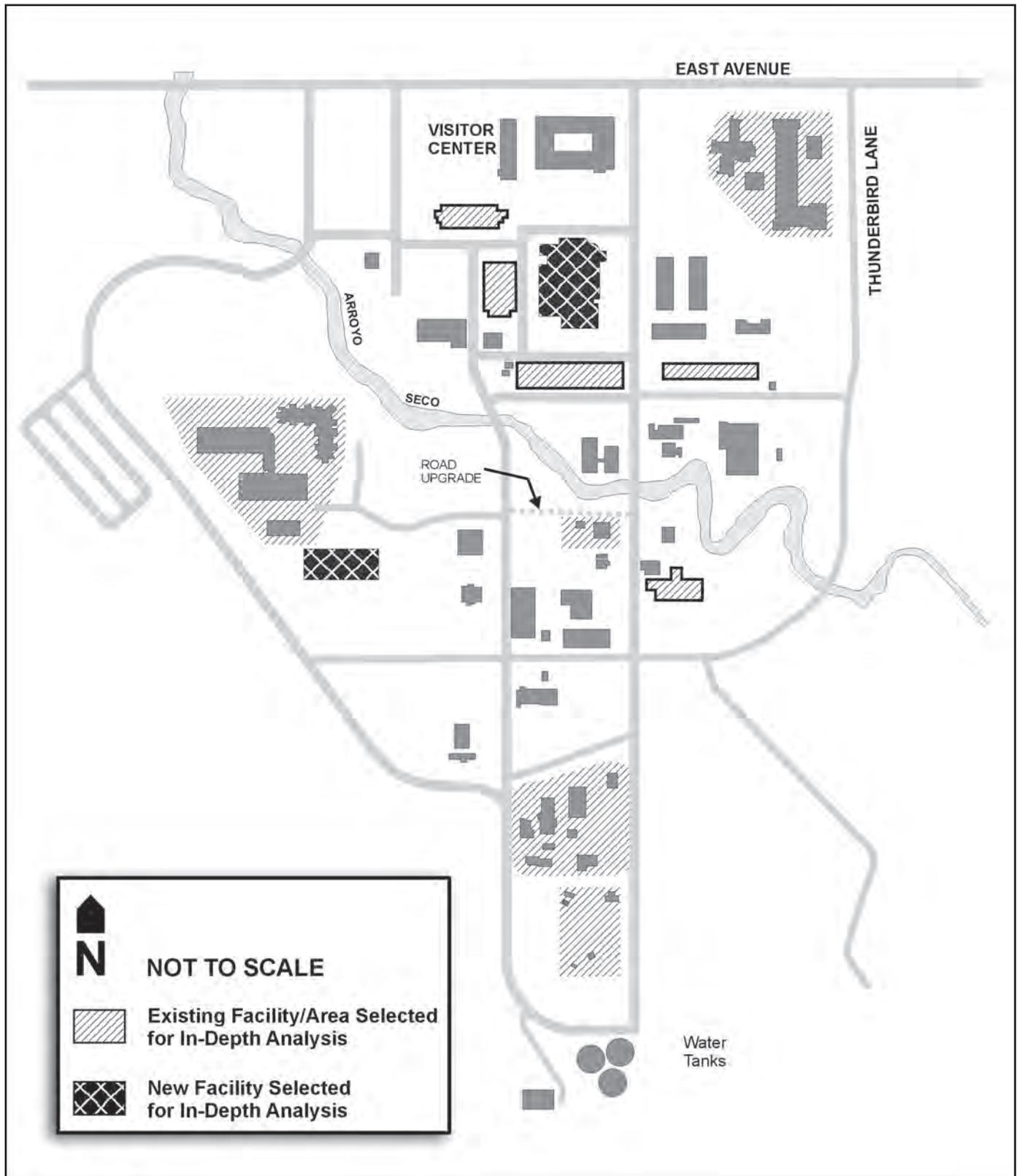
For completeness of analysis, the DOE also gathered information on the balance of operations at SNL/CA. Information regarding other facilities, site support services, water and utility use, waste generation, hazardous chemicals purchased for use, and process wastewater data were incorporated into the analysis. The NNSA examined preliminary hazard screening for SNL/CA facilities. In addition, facility walk-throughs and interviews were performed to ensure that hazards and safety concerns were properly captured in the accident analysis. This information is included in the current environmental consequences (Chapter 5).

The following sections provide an overview of the facilities and areas at SNL/CA and describe the facilities the DOE identified for detailed analysis.

2.3.2 SITE-WIDE ENVIRONMENTAL ASSESSMENT FACILITIES

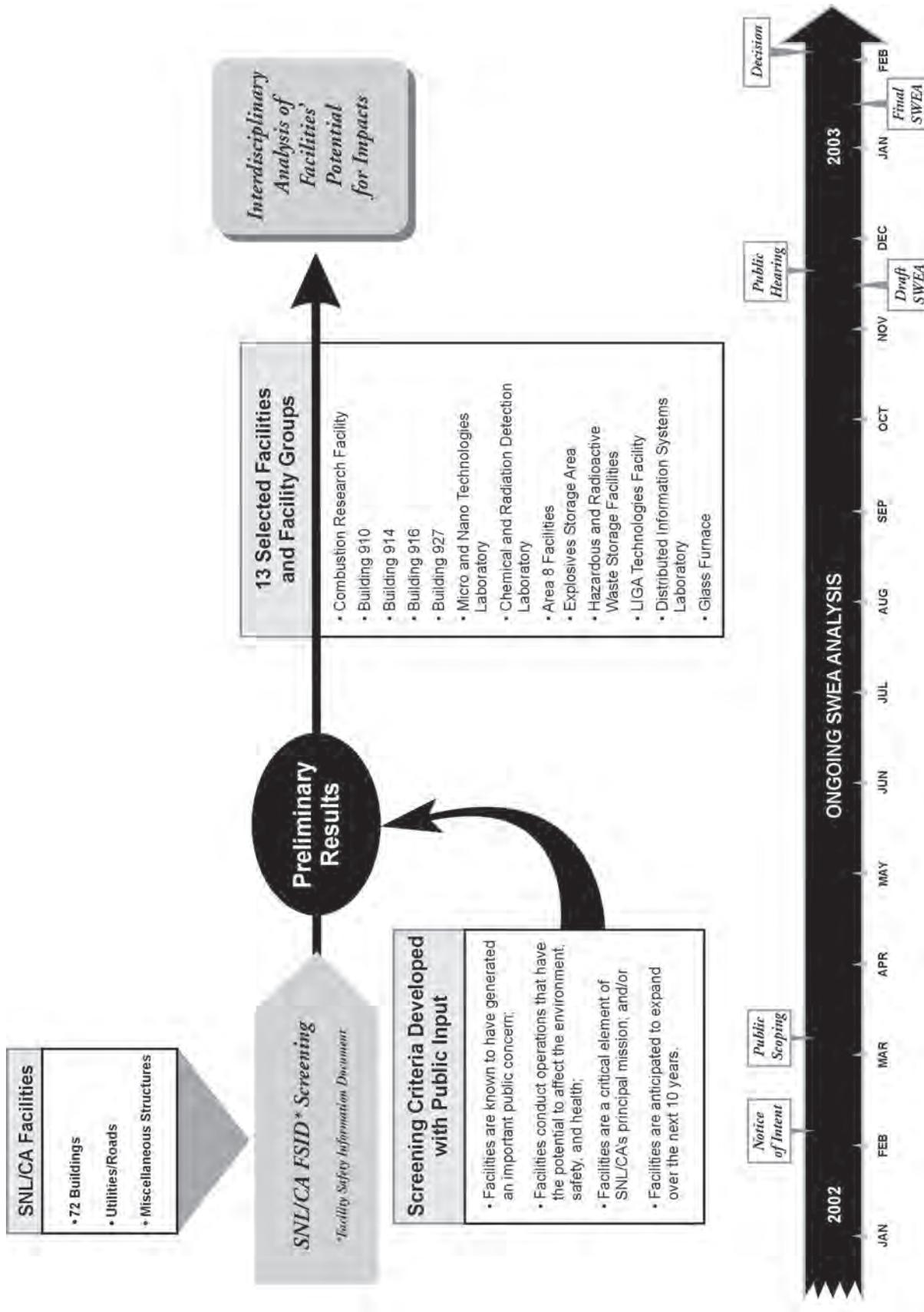
The 13 facilities or areas selected for in-depth analysis are identified below. Taken together, these facilities represent the main activities at SNL/CA that have the potential to affect the environment, safety, and health have generated public concern, are critical to SNL/CA’s missions, or are anticipated to expand over the next 10 years. Figure 2-1 is a site map. Figure 2-2 illustrates the SNL/CA facility selection process used during the SWEA analysis of potential impacts.

1. **Combustion Research Facility (CRF)**—Supports R&D in combustion science and technology.
2. **Building 910**—Supports R&D in science-based engineering and technology in a wide variety of sciences including advanced electronics prototype and development, surface physics, neutron detector research, and telemetry systems.
3. **Building 914**—Conducts weapons test, assembly, and machine shop activities.
4. **Building 916**—Provides R&D of ceramics, semiconductors, organic polymers, and metals, including thin film interface science, mechanics, ion implantation, gases in metals, hydrogen storage, plasma, annealing, detectors, science-based modeling, extreme ultraviolet lithography, microsystems, and fluidics.



Source: SNL 2001a

Figure 2-1. A Number of Sandia National Laboratories, California Facilities/Areas were selected for In-Depth Analysis



Source: Original

Figure 2-2. Conceptual Illustration of the Site-Wide Environmental Assessment Analysis

LIGA—What is it?

LIGA is an acronym derived from *Lithographie* and *Galvanoformung* and *Abformung*, which mean electroforming and molding, respectively. This technology allows for defining high aspect ratio structures in nickel. The process consists of exposing a sheet of film bonded to a wafer using X-ray lithography. The film is then developed and the exposed material is removed. Nickel is then electroplated onto the open areas of the film. The nickel over-plate is removed by polishing, leaving high aspect ratio nickel parts. The film is removed, and the nickel parts may remain anchored to the substrate or be released. The actual X-ray lithography is done at the Stanford linear accelerator or Lawrence Berkeley National Laboratory.

5. **Building 927**—Stores nuclear and classified materials, assembles subsystems, conducts system verification, and stores equipment.
6. **Micro and Nano Technologies Laboratory (MANTL)**—Supports a wide variety of operations involving micromachining, miniature component fabrication, fuel cell R&D, sensors, and signal processing, and extreme ultraviolet lithography.
7. **Chemical and Radiation Detection Laboratory (CDRL)**—Supports R&D and fabrication of chemical and radiation detection systems.
8. **Area 8 Facilities**—Provides testing activities involving high-pressure hydrogen, mechanical, high explosives, vibration, climate, temperature, and high acceleration.
9. **Explosive Storage Area**—Receives, handles, packages and stores explosives, and onsite transports.
10. **Hazardous and Radioactive Waste Storage Facilities**—Supports waste generation, waste management, and waste disposal.
11. **LIGA Technologies Facility (LTF)**—A new facility, for providing microfabrication processes involving electrodeposition and replication. Activities would focus on R&D, and prototyping of LIGA and LIGA-like microdevices necessary to meet defense program objectives.
12. **Distributed Information Systems Laboratory (DISL)**—A new facility, for supporting a wide variety of technologies including secure networking, high performance distributed computing, visualization and collaboration technologies, and design and manufacturing of productivity environments.

13. **Glass Furnace Combustion and Melting Laboratory (part of the CRF)**—A new facility, for conducting studies in glass manufacturing processes. The R&D would focus on increasing production efficiency, improving product quality, and maintaining industry competitiveness.

2.3.3 ACTIVITIES COMMON TO ALL ALTERNATIVES

Some activities at SNL/CA are not expected to change significantly, regardless of which alternative the NNSA selects for continued operations. In general, these balance of operations activities involve little or no toxic materials, and are of low hazard. Balance of operations analyses were included for each resource area. These analyses are evaluated along with the more detailed analyses of the specific facilities for each alternative to provide the total impacts from SNL/CA operations. The balance of operations activities include other R&D activities, maintenance support, material management, chemical material management, explosive material management, radioactive material management, waste management, pollution prevention, recycling, and fire hazard management. Other common activities include balance of operations, safety and health enhancements, environmental monitoring, asbestos management, custodial services, D&D projects, modification of research facilities, and infrastructure projects.

The following sections provide brief descriptions of these common activities.

2.3.3.1 Research and Development Activities

R&D activities at SNL/CA are focused in materials and process science, computational and information sciences, microelectronics and microsystems, basic sciences, engineering sciences, and bioagent sciences. Many aspects of the missions described in Section 2.1 are R&D activities conducted in facilities other than those described in Section 2.3. This section is intended to capture those activities, including testing of subassemblies under extreme “G” forces (see Chapter 11 of the FSID for additional details) (SNL/CA 2002a, SNL 2001b).

SNL/CA’s research expertise in materials and process science develops the scientific basis for current and future mission needs. New and replacement materials are created for refurbished weapons components, enhanced safety subsystems, and advanced energy storage devices.

SNL/CA’s research expertise in computational and information sciences develops technology using model- and simulation-based life-cycle engineering. Increases in supercomputing capabilities are needed to analyze complicated accident scenarios, to design weapons components and systems, and to predict the aging of key stockpile materials.

SNL/CA's research expertise in microelectronics and microsystems provides the science and technology to ensure implementation of its electronics systems. This research ranges from fundamental solid-state physics to design and fabrication of radiation-hardened integrated circuits.

SNL/CA's research expertise in engineering sciences focuses on model- and simulation-based, life-cycle engineering. Life-cycle engineering at SNL/CA occurs within a comprehensive validated modeling and simulation environment required for validation and verification of simulations.

SNL/CA's research expertise in micro- and nano-technology applies various technological advances in conjunction with other DOE laboratories, U.S. industry, and universities.

SNL/CA supports science-based experiments to certify the survivability of strategic systems in the stockpile. SNL/CA has produced a unique opportunity to collaborate with LLNL in weapons physics and experimentation. These capabilities are especially critical in the absence of underground nuclear testing for certification of weapons survivability and performance (SNL 2001b).

Other areas include extreme ultraviolet lithography, fuel cell prototyping, lightweight components, signal processing, modeling and simulation sensors, information systems, micro parts, and bench- and small-scale chemical, bioagent, and radiation detection research (DOE 2001a, DOE 2001b).

2.3.3.2 Maintenance Support Activities

Maintenance and support activities are frequently and routinely requested services for operational support of SNL/CA facilities and associated DOE properties (see Table 2-1). Activities range from ongoing custodial services to corrective, preventive, predictive, and training actions required to maintain and preserve buildings, structures, roadways (including widening in disturbed areas), and equipment in a condition suitable for fulfilling their designated purposes. While these activities are intended to maintain current operations, they would not substantially extend the life of a facility or allow for substantial upgrades or improvements.

2.3.3.3 Material Management and Operations

Routine operations at SNL/CA require the management of hazardous, industrial, commercial, and recyclable materials. Both the FSID and the SNL/CA *Environmental Information Document* (EID) (SNL/CA 2002b) contain information regarding the responsible organizations, regulatory requirements, and types and quantities of material at SNL/CA. SNL/CA standards, which were developed in accordance with the DOE, Occupational

Safety and Health Administration (OSHA), U.S. Environmental Protection Agency (EPA), DOT, and State of California policies, determine if a material constitutes an onsite hazard.

Four types of hazardous material regulated by the DOT are tracked by SNL/CA: radioactive materials, chemicals, explosive materials, and fuels.

2.3.3.4 Chemical Materials Management and Control

The primary goal for managing and controlling chemicals at SNL/CA is to protect the health and safety of workers, the public, and the environment.

Chemical Materials

SNL/CA handles more than 8,000 chemicals in 35,000 chemical containers annually (SNL/CA 2002b). Chemicals defined as hazardous materials are listed in 29 CFR Parts 1900-1999, 40 CFR Parts 300-372, and 49 CFR Part 172. 101. Chemicals are managed using administrative and physical controls designed to minimize exposure to an identified hazard. Facilities that use and store chemicals are evaluated using SNL's Integrated Safety Management System to determine appropriate approaches to managing and controlling hazards.

Historic Chemical Materials Use

SNL/CA previously maintained inventories of hazardous chemicals at levels sufficient to meet immediate needs that could arise at any time. This approach involved economical bulk chemical purchases; however, this approach also led to the shelf life of some chemicals expiring before they could be used. These chemical procurement practices created legacy chemicals that had to be disposed of properly. Now, SNL/CA orders chemicals on an as-needed basis (SNL/CA 2002b).

Baseline Hazardous Chemical Materials Use

SNL/CA tracks chemicals using a chemical inventory tracking system known as the *Chemical Information System* (CIS). This system requires bar coding of chemical containers as they enter SNL/CA that allows tracking of individual containers by an online chemical inventory database. This system interfaces readily with other environment, safety, and health programs, including those for industrial hygiene, hazardous waste management, radioactive and mixed waste management, waste minimization, emergency preparedness, fire protection, and NEPA. For NEPA, the CIS database provides essential information on the chemical inventory and is a necessary element for calculating potential health effects.

The CIS database is used for the Federal *Emergency Planning and Community Right-to-Know Act* (EPCRA), also known as *Superfund Amendments and Reauthoriza-*

tion Act, Title III (SARA) (42 U.S.C. §11001), reporting, and the California Community Right-to-Know regulations. Both the Federal and state regulations require that a facility generate an annual list documenting the presence of certain hazardous chemicals in quantities exceeding prescribed safety thresholds and provide the list to emergency planning officials in the state and local community.

2.3.3.5 Explosive Material Management and Control

SNL/CA manages explosive material through the *Explosive Inventory System*, a comprehensive database that tracks explosives and explosive-containing devices and assemblies from acquisition through use, storage, reapplication, and transfer or disposal. It provides information on material composition, characteristics, shipping requirements, life-cycle cost, plan of use, and duration of ownership. This system includes an inventory of explosive material owned or controlled by SNL/CA line organizations.

2.3.3.6 Radioactive Material Management and Control

SNL/CA uses a twofold approach to radioactive material management: reduce surplus legacy radioactive material inventories and manage current nuclear material inventories at mission-essential levels. SNL/CA maintains an inventory of radioactive isotopes used in laboratory research and radiation monitoring activities.

2.3.3.7 Waste Management and Operations

Waste Operations

This section generally describes waste operations that are not analyzed in detail, as noted in Section 2.3.3. SNL/CA manages all wastes in accordance with applicable Federal, state, and local laws and regulations and DOE Orders. The EPA, the DOE, and the California Department of Toxic Substance Control (DTSC) primarily regulate these wastes. All current waste operations are implemented following SNL/CA policies established to ensure worker and public safety and compliant management of regulated waste. These policies clearly define waste acceptance and disposal criteria, limit the number of workers who handle wastes, provide appropriate waste-specific training, and centralize waste handling areas.

Hazardous Waste

Hazardous wastes managed at the Hazardous Waste Storage Facility include wastes regulated under *Resource Conservation and Recovery Act* (RCRA) (42 U.S.C. §6901) and wastes regulated under the *Toxic Substances Control Act* (TSCA) (15 U.S.C. §2601); wastes regulated by the state of California that are not RCRA wastes, and biohazardous wastes. The hazardous waste generated at SNL/CA is

predominantly from experiments, testing, other R&D activities, and infrastructure fabrication and maintenance. Decontamination and Decommissioning (D&D) activities also generate hazardous waste. Hazardous waste generated at each facility is usually coordinated by the facility user's department, with the exception of waste from large projects focused on asbestos abatement, which is managed separately through subcontracts.

Radioactive Waste

Radioactive wastes managed at the Radioactive Waste Storage Facility include low-level waste (LLW) and low-level mixed waste (LLMW). No transuranic (TRU) waste or mixed transuranic waste is managed or generated at SNL/CA. No high level waste is managed or generated at SNL/CA. In general, LLW and LLMW are generated during laboratory experiments and component tests. As noted in the Sandia National Laboratories/New Mexico Site-Wide Environmental Impact Statement (SNL/NM SWEIS) (DOE 1999b), LLMW generated at SNL/CA has been shipped to SNL/NM for management in accordance with a New Mexico Environment Department (NMED) compliance order issued under the *Federal Facility Compliance Act* (FFCA) (42 U.S.C. §6961).

2.3.3.8 Pollution Prevention and Waste Minimization

SNL/CA has implemented a Pollution Prevention Program to comply with State of California and DOE requirements. SNL/CA's Pollution Prevention Program applies to all pollutants generated by routine and non-routine operations. It consists of activities that encourage pollution prevention or waste source reduction, recycling, resource and energy conservation, and procurement of EPA-designated recycled products.

2.3.3.9 Recycling

SNL/CA recycles plain paper, cardboard, used oil, scrap metal, batteries, fluorescent light bulbs, solvents, mercury,

Low-hazard Nonnuclear

The term "low-hazard nonnuclear" is applied to facilities or project activities that have the potential for minor onsite impacts (within the boundaries of SNL/CA controlled areas) and negligible offsite impacts (outside the boundaries of SNL/CA-controlled areas) to people or the environment. SNL/CA uses primary hazards screening to identify hazards, hazard classifications, training requirements, and required safety documents. A "low-hazard nonnuclear" facility does not require additional safety documentation. All facilities at SNL/CA meet this definition.

landscaping waste, aluminum cans, tires, and used toner cartridges (SNL/CA 2002b).

2.3.3.10 Fire Hazard Management and Control

SNL/CA has implemented a fire hazard management program to reduce wildfires and accidental brush fires. Vegetation control includes mowing in grassland areas and application of herbicides along fence lines and roads.

2.3.3.11 Other Common Activities

Table 2-1 provides brief descriptions of other common activities.

2.3.4 SANDIA NATIONAL LABORATORIES, CALIFORNIA FACILITIES

Following Chapter 2 are a series of facility descriptions that provide additional detail for all of the facilities that are named in Section 2.3.2. They consist of a brief description of the location, hazard class (low-hazard nonnuclear), primary purpose, and the major types of activities performed at the facility. Also identified are the basic processes performed at the facility, the programs and activities currently being supported, and the hazards and hazard controls associated with the facility. For 10 of the facilities/areas described here, the FSID contains more

Table 2-1. Other Common Activities

Project/Activity Title	Project/Activity Description (partial listing).
<i>Safety and Health Enhancements at Existing Facilities Modifications</i>	Replacement, installation, and modification of lighting, heating, ventilation, and air conditioning
	Replacement and installation of air and water filters and filtering systems
	Replacement, installation, and modifications of radiation monitoring devices and shielding
<i>Asbestos Management</i>	Building surveys
	Sampling and analysis of potential asbestos containing materials
	Asbestos abatement (for example, encapsulation, removal, and repair of friable and nonfriable material)
<i>Maintenance Activities and Custodial Services</i>	Landscaping, interior and exterior painting of surfaces, and equipment maintenance
	Minor seismic reinforcement, building maintenance, and custodial actions
	Site maintenance and routine decontamination of surfaces
<i>Characterization, Decontamination, and Demolition of Buildings and Structures that are less than 20,000 gross square feet</i>	Building surveys (information audit, site inspection, sampling)
	Safe removal of utilities, foundations, walkways, and landscaping
	Decontamination, demolition, and disposal
<i>Modifications of Research Facilities and Relocation of Laboratory Operations</i>	Removal, renovation and upgrade of utility, security, and fire safety systems
	Trenching in support of utility system modifications
	Removal, replacement, and installation of exhaust systems and fume hoods
<i>Siting, Construction, Modification, Operation, Relocation and Consolidation of Support Structures, Infrastructure, and Equipment</i>	Installation, construction, modification, relocation, replacement, and operation of security-related equipment
	Remodeling and renovation of existing structures and site infrastructure
	Construction and operation of new support structures
<i>Environmental Monitoring</i>	Sampling and analysis of environmental media (such as ground water)
	Installation, modification, and replacement of environmental monitoring-related equipment
	Environmental surveys (information gathering, site surveys, sampling)

Sources: DOE 2000a, b, c; 2001c, d, e
NEPA: National Environmental Policy Act

detail including estimated quantities specific radioactive and hazardous chemicals used and emissions or waste generated by a facility's operations. Additional information is available in the document *Comparison of Parameters to be Used to Analyze SNL/CA Facilities under the No Action, Planned Operations, and Maximum Operations* (TtNUS 2002a). For the three new facilities, additional sources contain more details (DOE 1998b, 1999c, 2001f). All of these sources were considered in completing the consequence analysis in Chapter 5.

2.3.4.1 Major Facility Changes

Three major facility changes have occurred at SNL/CA since the 1992 LLNL SWEIS. The Defense Engineering Laboratory changed to the Integrated Manufacturing Technology Laboratory and recently changed again, to become the MANTL; the Tritium Research Laboratory is now the Chemical and Radiation Detection Laboratory (CRDL); and Building 913 was demolished and the work was consolidated and relocated to various other buildings on site. Additional information is available in the FSID.

CHAPTER 3

Alternatives for Continuing Operations at Sandia National Laboratories, California

This chapter describes the three alternatives the National Nuclear Security Administration (NNSA) has analyzed in detail regarding continuing operations at Sandia National Laboratories, California (SNL/CA). It describes the activities and the level of activities, which will vary depending on the alternative analyzed, at SNL/CA's facilities.

3.1 INTRODUCTION

Council on Environmental Quality (CEQ) regulations (40 *Code of Federal Regulations* [CFR] Parts 1500-1508) require that the Department of Energy (DOE) and other Federal agencies use the review process established by the *National Environmental Policy Act* (NEPA) of 1969, as amended (42 *United States Code* [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 is to continue to operate SNL/CA as a DOE national laboratory. The NNSA developed three alternatives to accomplish this action and to assess environmental impacts of activities at SNL/CA. This chapter examines and compares the three alternatives. For clarity and brevity, the descriptions of the alternatives in the text (Sections 3.2, 3.3, and 3.4) and in the tables (Section 3.6) focus on significant distinguishing features that characterize the variation of activities across alternatives. SNL/CA activity descriptions, by facility, are provided in Chapter 2. All of the activities discussed in Chapter 2 were used in evaluating the impacts of each alternative. The alternatives are defined below:

- No Action Alternative (Section 3.2),
- Planned Utilization and Operations Alternative (Section 3.3), and
- Maximum Operations Alternative (Section 3.4).

These three alternatives represent the range of levels of operation necessary to carry out the DOE mission lines, from the minimum levels of activity that maintain core capabilities (No Action Alternative) to the highest reasonable activity levels that could be supported by current facilities, and the potential expansion and construction of new facilities for specifically identified future actions (Maximum Operations Alternative).

Under the No Action Alternative, ongoing NNSA and interagency programs and activities at SNL/CA would

continue operating at planned levels as reflected in current DOE management plans. In some cases, these planned levels include increases over today's operating levels. The No Action Alternative includes any recent activities that have already been approved by the NNSA and have existing NEPA documentation.

The Notice of Intent (NOI) (67 *Federal Register* [FR] 5089) proposed that the No Action and Expanded Operations Alternatives be considered in the Site-Wide Environmental Assessment (SWEA) (see Chapter 14 of the SWEA); however, the Expanded Operations Alternative was dropped and two other alternatives, the Planned Utilization and Operations Alternative and Maximum Operations Alternative, were added to show a broader range of alternatives and respond to internal comments received during the scoping process (Section 1.6.1).

Under the Maximum Operations Alternative, NNSA and interagency programs and activities at SNL/CA would increase to the highest reasonable activity levels, as set forth in this SWEA, that could be supported by current facilities and their potential expansion and construction of new facilities for future actions specifically identified in the SWEA.

The SWEA analyzes the environmental impacts of activities at SNL/CA associated with these three alternatives, as well as activities common to all alternatives including maintenance support and material management.

The DOE's work assignments to SNL/CA are based on using existing personnel and facility capabilities, as described in Chapters 1 and 2. The DOE has examined the various activity levels typical of past SNL/CA operations (generally within the past few years), and assumes that future work descriptions would resemble current and recent activities.

The three alternatives represent the range of operating levels that could be reasonably implemented in the 10-year time frame of the SWEA analysis (2002 to 2012). Many of SNL/CA's ongoing and planned activities do not vary by alternative. The No Action Alternative reflects currently planned activities or projects, some of which may already have NEPA documentation and analysis.

Table 3-1 provides a brief summary of the facilities activity levels evaluated in this SWEA. Table 3-4 (see

Table 3-1. Comparison of Activity Levels at 13 Specific Facilities under the No Action, Planned Utilization and Operations, and Maximum Operations Alternatives

FACILITY	PRIMARY FUNCTION	ACTIVITY TYPE OR MATERIAL	LEVEL OF ACTIVITY	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
Combustion Research Facility (CRF)	Bench-Scale chemistry, physics, and engineering experiments	Research and Development	Workforce/yr	250	300	500
Building 910	Weapons research and development	Research and Development	Workforce/yr	75	94	150
Building 914	Machine shop and test assembly operations	Prototypes and Assemblies	Workforce/yr	22	22	44
Building 916	Advanced materials research and development	Research and Development	Workforce/yr	46	70	91
Building 927	Material control and hardware assembly and testing	Program Support	Workforce/yr	4	6	8
Micro and Nano Technologies Laboratory (MANTL)	Development of Advanced Micro and Nano Technologies	Materials evaluation, synthesis, and processing	Workforce/yr	97	118	194
Chemical and Radiation Detection Laboratory (CRDL)	Detection system research, development, and fabrication	Research and Development	Workforce/yr	8	42	46
Area 8 Facilities	Research, development, and testing	Research and Development	Workforce/yr	25	8	40
Explosive Storage Area	Packaging and storage of explosives	Storage	Kg Capacity	234.2	234.2	234.2
Hazardous and Radioactive Waste Storage Facilities	Waste Management	Collection, packaging, handling, and short-term storage of hazardous, radioactive, and mixed wastes	LLW (kg/yr)	5,308	5,998	8,121
			LLMW (kg/yr)	451	510	690
			Total Hazardous Waste (kg/yr)	90,488	98,833	133,820
LIGA Technologies Facility (LTF)	Research, development, and prototyping	LIGA and LIGA-like devices and systems	Wafers/yr	1,300	1,300	2,600

Table 3-1. Comparison of Activity Levels at 13 Specific Facilities under the No Action, Planned Utilization and Operations, and Maximum Operations Alternatives

FACILITY	PRIMARY FUNCTION	ACTIVITY TYPE OR MATERIAL	LEVEL OF ACTIVITY	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
<i>Distributed Information Systems Laboratory (DISL)</i>	Distributed information systems development and implementation	Research and Development	Workforce/yr	130	180	180
<i>Glass Furnace and Melting Laboratory (part of the CRF)</i>	Glass manufacturing research and development	Pilot scale glass melting tank furnace	Feed Materials (lbs, weekly)	16,800-sand 14,000-crushed recycled glass	16,800-sand 14,000- crushed recycled glass	16,800-sand 14,000- crushed recycled glass

Sources: SNL/CA 2002a; TtNUS 2002a

kg: kilogram

lbs: pounds

LIGA: X-ray lithography, electroforming, and molding

LLMW: low-level mixed waste

LLW: low-level waste

yr: year

Section 3.6) provides an expanded look at the materials used and wastes generated at each facility.

In order to provide comprehensive baseline data from which operational levels could be projected, the NNSA gathered the best-available data representing the facilities' normal levels of operation. In most cases, the base year for data was 2000.

The NNSA is not revisiting any programmatic decisions previously made in other NEPA documents, such as those addressing weapons complex consolidation and reconfiguration, materials disposition, or waste management. The SWEA includes these programmatic activities in order to provide the NNSA and the public with an overall understanding of the activities at SNL/CA.

Many of the SNL/CA facilities are engaged primarily in activities supporting the DOE's National Security mission. Other facilities are engaged in energy resources and research and development (R&D) efforts, such as materials research, radiochemistry, and health research. The NNSA examined specific activities performed at SNL/CA facilities that relate to issues of known public interest, the DOE mission lines, and the potential for environmental impacts.

3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, ongoing NNSA and interagency programs and activities at SNL/CA would continue operating at planned levels as reflected in current DOE/NNSA management plans for 2002 through 2012. In some cases, these planned levels include increases over today's operating levels. This would also include any recent activities that have already been approved by DOE/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 facility operations that would implement current management plans for assigned programs.

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. The No Action Alternative analysis includes any approved and interim actions and facility expansion, construction or management plans, where detailed design and associated NEPA documentation were completed by the end of March 2002. The analysis also includes facilities, including new construction (LIGA Technologies Facility [LTF], Distributed Information Systems Laboratory [DISL], and Glass Furnace and Melting Laboratory), several upgrades, and removal of several small structures totaling approximately 15,000

square feet (sq ft) for which NEPA documents have been prepared, decisions made, and funds allocated in the fiscal year 2002 planning year budget (submitted in 2000).

The DOE management plans include continued support of major DOE programs, such as Defense Programs (DP), Nuclear Energy, Fissile Material Disposition, Environmental Management, and Science. They also include projects to maintain existing facilities, capabilities, and projects for which a NEPA determination has been made.

Other plans used to prepare the description of the No Action Alternative include the site development plans for SNL/CA, Programmatic Environmental Impact Statements (PEISs), Presidential Decision Directives (PDDs), and the DOE work for others (WFO) proposals and guidance. Some documents have future projects included for planning purposes; others have been deleted due to lack of funding or other reasons. The activities reflected in this alternative include planned increases in some SNL/CA operations and activities over previous years' levels.

The *Facilities and Safety Information Document (FSID)* (SNL/CA 2002a) and the *Comparison of Parameters to be Used to Analyze SNL/CA Facilities Under the No Action, Planned Operations, and Maximum Operations* document (TtNUS 2002a) provide in-depth information concerning the activities, operations, and hazards of specific SNL/CA facilities. These documents have been used extensively to describe the facility activities in this chapter. The facilities discussed below are also described in detail in the Facility Descriptions following Chapter 2. For most facilities, the base year considered is 2000.

The following sections summarize the activities that would be performed at each of the SNL/CA facilities. Balance of operations (SNL/CA operations not associated with the 13 facilities are described in detail) were included for this alternative and discussed in Section 3.5. Activities common to all alternatives are discussed in Section 2.3.3.

3.2.1 COMBUSTION RESEARCH FACILITY

Under the No Action Alternative, the Combustion Research Facility (CRF) would continue to be used for broad-based research in combustion science and technology. Support activities would include a wide variety of research and development in areas of combustion engines and chambers, combustion chemistry, combustion reactions, industrial and combustion processes and diagnostics and remote sensing. Staffing levels would remain at approximately 250.

3.2.2 BUILDING 910

Building 910 would continue to be used to conduct weapons R&D activities. The facility would conduct science-based engineering and technology in a wide variety of sciences including advanced electronics prototype

and development, surface physics, neutron detector research, and telemetry systems. Generally, the activities would focus on electronics and microelectronics prototypes. Materials studied would include ceramics, semiconductors, organic polymers, and metals. Staffing levels would remain at approximately 75.

3.2.3 BUILDING 914

Building 914 would continue to be used to conduct weapons test assembly and machine shop activities. The facility would continue to support SNL/CA's primary mission of ensuring that the United States (U.S.) nuclear weapons stockpile is safe, secure, and reliable. Activities would include prototype machining and hardware generation, mechanical inspection, calibration, and electrical laboratory operations. Staffing levels would remain at approximately 22.

3.2.4 BUILDING 916

Under the No Action Alternative, Building 916 would continue to be used to conduct R&D. Generally the activities would focus on materials studies including chemical and physical properties and characteristics (phases). Materials studied would include ceramics, semiconductors, organic polymers, and metals. Areas of research would include thin film interface science, mechanics, ion implantation, gases in metals, hydrogen storage, plasma, annealing, detectors, science-based modeling, extreme ultraviolet lithography, microsystems, and fluidics. Staffing levels would remain at approximately 46.

3.2.5 BUILDING 927

Building 927 would continue to be used to store nuclear and classified materials, assemble subsystems, conduct system verification, and store equipment. The Explosive Destruction System (EDS) subsystems would continue to be assembled in the facility. No testing with explosives or other hazardous materials would be completed at this location. Staffing levels would remain at approximately 4.

3.2.6 MICRO AND NANO TECHNOLOGIES LABORATORIES

Under the No Action Alternative, the Micro and Nano Technologies Laboratories (MANTL) activities would include a wide variety of operations such as micro machining, miniature component fabrication, fuel cell research and development, sensors and signal processing, and extreme ultraviolet lithography. Areas of materials research and development would include characterization, chemistry, composite and lightweight components, engineered materials (welding, brazing, and joining), science-based modeling, and radiography. Specific operations would include materials evaluation, materials synthesis and processing, microsystems processing, and

nanolithography equipment development. Staffing levels would remain at approximately 97.

3.2.7 CHEMICAL AND RADIATION DETECTION LABORATORY

The Chemical and Radiation Detection Laboratory (CRDL) would continue to be used as a multi-purpose R&D facility. Generally, the facility would support research, development, and fabrication of chemical and radiation detection systems. Activities would involve development of biological/chemical species sensors that detect trace amounts of toxins, viruses, and biological species and protein research. Areas of research and development would include microstructures, radiation detectors, laser-based detectors, and sensor research (nerve agents, drugs, and explosives). Rooms within the CRDL would continue to operate as Centers for Disease Control (CDC) and Prevention registered Biosafety Level 2 laboratories and provide standard chemical, biological, and analytical laboratory capabilities for conducting research in areas of advanced micro-separation technologies, laser-based detection, microelectronic biosensors, biological chemistry, and toxins handling. Staffing levels would remain at approximately 8.

3.2.8 AREA 8 FACILITIES

The Area 8 Facilities would continue to be used to support SNL/CA work. Testing activities would involve material response to high-pressure hydrogen, mechanical stresses, high explosives, vibration, climate variations, temperature variations, and high acceleration stress. Experiments and research in areas of welding, hydrogen fueled engines, and special materials would continue. Data collection activities would support the above testing work. Staffing levels would remain at approximately 25.

3.2.9 EXPLOSIVE STORAGE AREA

The Explosive Storage Area would continue to support the R&D work performed at SNL/CA on a variety of energetic compounds. The Explosive Storage Area would receive, handle, package, transport on-site, and store explosives.

3.2.10 HAZARDOUS AND RADIOACTIVE WASTE STORAGE FACILITIES

The Hazardous Waste Storage Facility would receive, handle, package, store (short-term), and ship hazardous, toxic, and nonhazardous chemical wastes. The facility is a *Resource Conservation and Recovery Act* (RCRA), Part B-permitted facility that would support waste generators throughout SNL/CA. Activities would include preparing wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would operate one shift. Modifications to the existing facility to improve flexibility and operational efficiencies would be

completed. Quantities of RCRA hazardous waste managed (see Section 3.6, Table 3-4) would be 23,395 kilograms (kg) per year. Total hazardous wastes managed are presented in Section 3.6, Table 3-4.

The Radioactive Waste Storage Facility, also a Part B-permitted facility, would continue to serve as a centralized facility for receipt, characterization, compaction, treatment, repackaging, certification, and storage of low-level waste (LLW) and low-level mixed waste (LLMW). SNL/CA does not manage or generate transuranic (TRU) waste. SNL/CA does not manage or generate high-level waste. Annual quantities of radioactive waste managed (see Section 3.6, Table 3-4) would be 5,308 kg for LLW and 451 kg LLMW. The facility would operate one shift. Total wastes by waste type are presented in Section 3.6, Table 3-4.

3.2.11 LIGA TECHNOLOGIES FACILITY

The LTF would operate microfabrication processes involving x-ray lithography, electrodeposition, and replication. Activities would focus on research and development, and prototyping of LIGA and LIGA-like micro devices necessary to meet defense program objectives. The facility would provide process and process-support clean room, functional areas, and laboratory environments essential to LIGA and LIGA-like part and device microfabrication, assembly, aging, and testing. The LTF would be equipped with specialized tools and equipment used exclusively for LIGA and LIGA-like processing. The LTF would produce approximately 1,300 wafers per year. The current staffing located throughout SNL/CA would increase by 20 employees.

3.2.12 DISTRIBUTED INFORMATION SYSTEMS LABORATORY

DISL operations would focus on a wide variety of technologies including secure networking, high-performance

LIGA—What is it?

LIGA is an acronym derived from *Lithographie*, *Galvanoformung*, and *Abformung*, which mean electroforming and molding, respectively. This technology allows for defining high aspect ratio structures in nickel. The process consists of exposing a sheet of film bonded to a wafer using X-ray lithography. The film is then developed and the exposed material is removed. Nickel is then electroplated up in the open areas of the film. The nickel over-plate is removed by polishing, leaving high aspect ratio nickel parts. The film is removed, and the nickel parts may remain anchored to the substrate or be released. The actual X-ray lithography is done at the Stanford linear accelerator or Lawrence Berkeley National Laboratory.

distributed computing, visualization and collaboration technologies, and design and manufacturing of productivity environments. Laboratory activities would consist of connecting off-the-shelf hardware components into multi-structural, multimedia, multi-purpose networks, models, and information systems. The DISL would be staffed with 130 employees.

3.2.13 GLASS FURNACE AND MELTING LABORATORY

The Glass Furnace and Melting Laboratory would conduct studies in glass manufacturing processes. Research and development would focus on increasing production efficiency, improving product quality, and maintaining industry competitiveness. The facility would use a pilot-scale glass melting tank furnace. Research would include a wide variety of activities including measurement of process parameters using laser-based techniques, imaging of the combustion process using laser sheets, studying of the physical and chemical changes of sand and molten glass, testing of furnace performance under different operating conditions, testing of product quality under different operating conditions, and monitoring furnace wear. The furnace would handle 14,000 pounds (lbs) of glass weekly. The Glass Furnace and Melting Laboratory would be staffed with 12 employees. To support proposed operations, an additional natural gas line would be installed.

3.3 PLANNED UTILIZATION AND OPERATIONS ALTERNATIVE

The Planned Utilization and Operations Alternative includes all operations and activities identified in the No Action Alternative. In general, over 10 years, land uses would change and planned facility operations for many facilities would increase in support of SNL/CA's assigned missions. Land use changes would include improving Arroyo Seco (see Table 3-2), creating a 30-acre wildlife reserve, designating 93 acres for future construction (including approximately 25 acres for soil management), identifying 122 acres as undesignated, and establishing an easement agreement with land owners along SNL/CA's western boundary (single-family residences) and some new construction. Onsite soil management of clean dirt/fill from Arroyo Seco improvement, storm water projects, and construction projects would begin.

Infrastructure improvements and construction activities would include General Plant Projects such as upgrades to the water distribution system, upgrades to the storm water runoff areas, and renovating Building 916 (SNL 2001c).

New construction would include a 5,000- sq ft badge office in the northwest corner of the SNL/CA site (8 acre location within the 93 acres designated as future construction).

This alternative addresses the same facilities described in Section 3.2 for the No Action Alternative. This alternative differs from the No Action Alternative in that operations could increase 13 percent site-wide over the next 10 years. Balance of operations would increase proportionally as discussed in Section 3.5. Activities common to all alternatives are discussed in Section 2.3.3. The following sections describe the activities that would occur at specific facilities because of implementing assignments under the Planned Utilization and Operations Alternative.

3.3.1 COMBUSTION RESEARCH FACILITY

Under the Planned Utilization and Operations Alternative, the CRF activity level would increase by an estimated 20 percent in areas of broad-based research in combustion science and technology. The increases would include a wide variety of R&D in combustion engines and chambers, combustion chemistry, combustion reactions, industrial and combustion processes and diagnostics, and remote sensing. The staff would increase from 250 to 300 persons over the next 5 years.

3.3.2 BUILDING 910

Building 910 would continue to be used to conduct weapons R&D activities. The facility would increase activities in weapon system instrumentation, fusion energy, surety design engineering, electronics prototyping, and microsystems engineering. Generally, the types of materials studied (ceramics, semiconductors, organic polymers, and metals) would remain the same. However, the level of activity would increase by an estimated 25 percent. The staff would increase from 75 to 94 persons over the next 5 years.

3.3.3 BUILDING 914

Building 914 would continue to be used to conduct weapons test assembly and machine shop activities. The activities would be the same as those discussed in the No Action Alternative. The staff would remain at 22 persons over the next 5 years.

3.3.4 BUILDING 916

Under the Planned Utilization and Operations Alternative, Building 916 would continue to be used to conduct materials chemistry R&D. An estimated 53 percent increase in activities would occur in materials studies including ceramics, semiconductors, organic polymers, and metals. Other areas of increased research would include thin film interface science, ion implantation, gases in metals, hydrogen storage, plasma, detectors, science-based modeling, extreme ultraviolet lithography, microsystems, and fluidics. The staff would increase from 46 to 70 persons over the next 5 years.

Table 3-2. Summary of Improvements to Arroyo Seco by Priority

Improvement Task	Activity
1	The project would install a new 8" gravity sewer line along East Avenue crossing the arroyo between the box culvert and road and terminate at the manhole just upstream of the flow monitoring station on Sandia property. A pump station would be installed immediately downstream of the flow monitoring station and 6" force main crossing East Avenue to West Perimeter Drive and terminate at the existing LLNL manhole approximately 20 feet north of the LLNL arroyo crossing. The existing sewer line crossing structures would be demolished and the channel would be restored.
2	A wing wall on west side of the East Avenue box culvert would be installed. The protruding rebar would be removed. Under the toe of an existing asphalt storm drain outfall apron located on the east bank large boulders would be placed.
3	Concrete debris that was placed in the arroyo as erosion control effort would be removed. The streambed would be graded to fill any holes and eliminate any rough transitions in the channel.
4	The concrete apron associated with the sewer line crossing would be removed and a grouted rock apron extending down the channel bank and along the channel bottom would be installed. The apron would function as a splash curtain for a storm drain outlet at this location.
5	The stream bank would be stabilized by removing a pine tree on the north bank and the bank would be graded.
6	The eroded area downstream of security grate would be filled with riprap. The riprap would extend approximately 30 feet downstream.
7	The eroded area at pedestrian bridge wing wall would be repaired by grading the up-slope areas to direct runoff to a field located southeast of the bridge. The wing wall would be cut back approximately 6 feet to remove the exposed footing. The channel slope around the wing wall would be regraded.
8	The storm drain outlet between C Street and pedestrian bridge would be repaired by grading the existing slope back to create a small inset bench with a slight depression. The existing erosion gully would be filled with riprap and compacted fill. The culvert would be trimmed back to the bank. Riparian trees would be planted on the inset bench.
9	At the C Street Bridge, erosion and scour holes caused by hydraulic jump and high velocity flows would be repaired. Bioengineering solutions would not be feasible at this location because of high velocities. Other tasks would include installing an engineered drop structure, removing the security grate, and abandoning the sewer line and concrete blocks in streambed.
10	The concrete debris from streambed between C Street and A Street would be removed. Rock would be used to provide grade control.
11	The storm drain outlet between C Street and A Street would be repaired by creating a small inset bench and planting with riparian trees.
12	The erosion and scour holes at the A Street Bridge crossing would be repaired by installing an engineered drop structure.
13	The storm drain outlet upstream of A Street would be repaired by creating small inset bench and planting with riparian trees.
14	The storm drain outlet downstream of land bridge would be repaired by creating small inset bench and planting with riparian trees.
15	The land bridge and two 4-ft culverts would be removed. A small inset floodplain would be created using compacted fill, coir wrap, and rock.
16	An engineered drop structure at the Thunderbird Lane Bridge would be constructed to prevent future erosion and resulting structural problems.
17	The abandoned concrete structure and steel posts within streambed in wetland area located upstream of Thunderbird Lane Bridge would be removed.
18	The surface drainage problems (site-wide) would be corrected by installing curbs, catch basins, and storm water detention facilities.
19	An inset floodplain between A Street and Thunderbird Lane would be graded to reduce the velocity of flow during storm events.
20	An inset floodplain adjacent to wetland area upstream of Thunderbird Lane would be graded to reduce the velocity of flow during storm events.

Source: GMA 2002a

3.3.5 BUILDING 927

Under the Planned Utilization and Operations Alternative, Building 927 activities would increase by 50 percent. All areas identified in the No Action Alternative would increase. EDS subsystems would be assembled in the facility. No testing with explosives or other hazardous materials would occur at this location. The staff would increase from 4 to 6 persons over the next 5 years.

3.3.6 MICRO AND NANO TECHNOLOGIES LABORATORY

Under the Planned Utilization and Operations Alternative, the MANTL activities would increase in micro machining, miniature component fabrication, fuel cell research and development, sensors and signal processing, and extreme ultraviolet lithography. An estimated 22 percent increase in materials R&D would include characterization, chemistry, composite and lightweight components, engineered materials (welding, brazing, and joining), and science-based modeling. The staff would increase from 97 to 118 persons over the next 5 years.

3.3.7 CHEMICAL AND RADIATION DETECTION LABORATORY

The CRDL would continue to be used as a multi-purpose R&D facility. Generally, the facility would support research, development, and fabrication of chemical and radiation detection systems. Small increases in microstructures (LIGA) and radiation detector testing would be expected. A large increase within the CRDL CDC-registered Biosafety Level 2 laboratories that provide standard chemical, biological, and analytical laboratory capabilities for conducting research in areas of advanced micro-separation technologies, laser-based detection, microelectronic biosensors, biological chemistry, and toxins handling would be expected. The staff would increase from 8 to 42 persons over the next 5 years.

3.3.8 AREA 8 FACILITIES

The Area 8 Facilities would continue to support SNL/CA work. Testing activities would involve high-pressure hydrogen, mechanical, high explosives, vibration, climate, temperature, high acceleration, and EDS. Experiments and research in areas of welding, hydrogen fueled engines, and special materials would continue. Data collection activities would support the above testing work. A decrease in staffing associated with the EDS work would occur.

3.3.9 EXPLOSIVE STORAGE AREA

The Explosive Storage Area activities would remain the same as under the No Action Alternative. Under the Planned Utilization and Operations Alternative, the

Explosive Storage Area explosive storage capacity would remain the same.

3.3.10 HAZARDOUS AND RADIOACTIVE WASTE STORAGE FACILITIES

Activities at the facilities would remain the same as under the No Action Alternative. The facilities would operate one shift. Annual quantities of (total) hazardous waste managed (see Section 3.6, Table 3-4) would be 98,833 kg. Annual quantities of radioactive waste managed (see Section 3.6, Table 3-4) would be 5,998 kg for LLW and 510 kg LLMW managed. Other wastes by waste types are presented in Section 3.6, Table 3-4.

3.3.11 LIGA TECHNOLOGIES FACILITY

The LTF would support R&D, and prototyping of LIGA and LIGA-like micro devices. Activities at the LTF would be similar to those under the No Action Alternative. No increase would be anticipated. The LTF would produce 1,300 wafers per year.

3.3.12 DISTRIBUTED INFORMATION SYSTEMS LABORATORY

The DISL would support the DOE's Science-Based Stockpile Stewardship and Management Program through development and implementation of distributed information systems. Activities at the DISL would be similar to those under the No Action Alternative. The staff would increase by 50 persons.

3.3.13 GLASS FURNACE AND MELTING LABORATORY

Activities at the Glass Furnace and Melting Laboratory would be similar to those under the No Action Alternative. No increase would be anticipated.

3.4 MAXIMUM OPERATIONS ALTERNATIVE

The Maximum Operations Alternative includes all operations and activities identified in the Planned Utilization and Operations Alternative. In general, implementation of assignments would result in the highest reasonable foreseeable activity levels that could be supported by current facilities (with two shifts) and the potential expansion and construction of new facilities.

Land use changes, infrastructure improvements, and construction activities (including upgrades) would be the same as the Planned Utilization and Operations Alternative (see Section 3.3).

New construction would include the projects identified in the Planned Utilization and Operations Alternative plus two additional projects. Building 916 (42,000 sq ft) would be replaced with a building twice the size (84,000 sq ft). A new 16,000-sq-ft facility similar to the existing

CRDL would be constructed for R&D. Up to 100,000 sq ft of structures determined to be beyond useful life would be removed over the next 10 years.

This alternative addresses the same facilities described in Section 3.2 for the No Action Alternative. This alternative differs from the Planned Utilization and Operations Alternative in that operations would increase to the highest reasonably foreseeable levels over the next 10 years. Balance of operations would increase proportionately as discussed in Section 3.5. Activities common to all alternatives are discussed in Section 2.3.3. The following sections describe the activities that would occur at specific facilities because of implementing assignments under the Maximum Operations Alternative.

3.4.1 COMBUSTION RESEARCH FACILITY

The CRF would continue to be used for broad based research in combustion science and technology. Two shifts would support a wide variety of R&D in combustion engines and chambers, combustion chemistry, combustion reactions, industrial and combustion processes and diagnostics and remote sensing. Activity levels would increase as staffing doubled from 250 to 500 persons.

3.4.2 BUILDING 910

Building 910 activities would increase in areas of weapons R&D. The facility would increase science-based engineering and technology activities in a wide variety of sciences including advanced electronics prototype and development, surface physics, neutron detector research, and telemetry systems. Additional activities that focus on electronics and microelectronics prototypes would increase. Materials studies involving ceramics, semiconductors, organic polymers, and metals would increase. Staffing would increase from 75 to 150 persons.

3.4.3 BUILDING 914

Building 914 would increase weapons test assembly and machine shop activities. The facility would support SNL/CA's primary mission of ensuring that the U.S. nuclear weapons stockpile is safe, secure, and reliable. Increased activities would include prototype machining and hardware generation, mechanical inspection, calibration, and electrical laboratory operations. A second shift would increase staffing from 22 to 44.

3.4.4 BUILDING 916

Under the Maximum Operations Alternative, Building 916 would continue to be used to conduct R&D. Generally, the activities focused on materials studies including chemical and physical properties and characteristics (phases) would expand. The number of materials

studies would increase in areas of ceramics, semiconductors, organic polymers, and metals. Research would increase including thin film interface science, mechanics, ion implantation, gases in metals, hydrogen storage, plasma, annealing, detectors, science-based modeling, extreme ultraviolet lithography, microsystems, and fluidics. A second shift would increase staffing from 46 to 91. A larger building replacing Building 916 would be necessary.

3.4.5 BUILDING 927

Building 927 would continue to be used to store nuclear and classified materials, assemble subsystems, conduct system verification, and store equipment. No testing with explosives or other hazardous materials would be completed at this location. Staffing levels would increase from 4 to 8 persons.

3.4.6 MICRO AND NANO TECHNOLOGIES LABORATORY

MANTL activities would increase in a wide variety of operations including micro machining, miniature component fabrication, fuel cell research and development, sensors and signal processing, and extreme ultraviolet lithography. Materials R&D would increase and include characterization, chemistry, composite and lightweight components, engineered materials (welding, brazing, and joining), science-based modeling, and radiography. Specific operations would increase including materials evaluation, materials synthesis and processing, microsystems processing, and nanolithography equipment development. A second shift would increase staffing from 97 to 194.

3.4.7 CHEMICAL AND RADIATION DETECTION LABORATORY

The CRDL operations would increase slightly above the Planned Utilization and Operations Alternative and continue to be used as a multi-purpose R&D facility. Generally, the facility would support research, development, and fabrication of chemical and radiation detection systems. Increases in activities would involve development of biological/chemical species sensors that detect trace amounts of toxins, viruses, and biological species and protein research. Areas of research and development would expand and include microstructures, radiation detectors, laser-based detectors, and sensor research (nerve agents, drugs, and explosives). Rooms within the CRDL would continue to operate as CDC registered Biosafety Level 2 laboratories and provide standard chemical, biological, and analytical laboratory capabilities for conducting research in areas of advanced micro-separation technologies, laser-based detection, microelectronic biosensors, biological chemistry, and toxins handling. CRDL staffing would increase to 46 persons.

3.4.8 AREA 8 FACILITIES

The Area 8 Facilities activities would continue to support SNL/CA work, but would increase testing activities involving high-pressure hydrogen, mechanical, high explosives, vibration, climate, temperature, and high acceleration. Experiments and research in areas of welding, hydrogen fueled engines, and special materials would continue. Data collection activities would support the above testing work. Area 8 staffing would increase to 40 persons.

3.4.9 EXPLOSIVE STORAGE AREA

The Explosive Storage Area activities would remain the same as under the No Action Alternative. Under the Maximum Operations Alternative, the Explosive Storage Area explosive storage capacity would remain the same (234.2 kg).

3.4.10 HAZARDOUS AND RADIOACTIVE WASTE STORAGE FACILITIES

Activities would remain the same as under the No Action Alternative. The facility would operate two shifts. Annual quantities of (total) hazardous waste managed would be 118,465 kg. Annual quantities of radioactive waste managed (see Section 3.6, Table 3-4) would be 8,121 kg for LLW and 690 kg LLMW. Other wastes by waste types are presented in Section 3.6, Table 3-4.

3.4.11 LIGA TECHNOLOGIES FACILITY

The LTF would support R&D, and prototyping of LIGA and LIGA-like micro devices. Activities at the LTF would be similar to those under the No Action Alternative; the facility would operate two shifts and produce 2,600 wafers per year.

3.4.12 DISTRIBUTED INFORMATION SYSTEMS LABORATORY

The DISL would support DOE's Science-Based Stockpile Stewardship and Management Program through development and implementation of distributed information systems. Activities at the DISL would be similar to those under the No Action Alternative. No increase would be anticipated.

3.4.13 GLASS FURNACE AND MELTING LABORATORY

Activities at the Glass Furnace and Melting Laboratory would be similar to those under the No Action Alternative. No increase would be anticipated.

3.5 BALANCE OF OPERATIONS

For completeness of analysis, the NNSA also gathered information on the balance of operations at SNL/CA. Information regarding other 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. Balance of operations activities include many R&D activities and routine operations; infrastructure, administrative, and central services for SNL/CA; traffic flow adjustments to existing onsite roads in predisturbed areas, including road realignment and widening; facility maintenance and refurbishment activities; and environmental, ecological, and natural resource management activities. Some routine refurbishment, renovation, and small-scale removal of specific surplus facilities and closures will continue at SNL/CA regardless of alternative.

The SWEA considers balance of operations and their effects on environmental conditions under the three alternatives. Balance of operations activities involve little or no toxic materials, are of low hazard, and are usually categories of actions excluded from analysis by DOE's NEPA regulations (10 CFR Part 1021). Because of this, potential environmental impacts from the balance of operations are not described in detail but evaluated collectively.

In general, balance of operations equals site-wide totals minus selected facilities contributions. The No Action Alternative consists of conditions at SNL/CA in 2000 (baseline) while the Planned Utilization and Operations Alternative and the Maximum Operations Alternative were increased by 13 percent and 53 percent above the No Action Alternative, respectively. These increases are related to projected staffing increases.

The *Environmental Information Document* (EID) (SNL/CA 2002b), *FSID* (SNL/CA 2002a), and *Comparison of Parameters to be Used to Analyze SNL/CA Facilities under the No Action, Planned Operations, and Maximum Operations* (TtNUS 2002a) provide information concerning site-wide and facility specific information. These documents have been extensively used in the defining of balance of operations data and are not cited repeatedly.

3.6 DATA USED TO ANALYZE ALTERNATIVES

Table 3-3 summarizes operational data for specific facilities. Table 3-4 presents data used in performing impact analyses in Chapter 5 by resource area (see the FSID for data regarding typical chemical and radioactive material inventories).

Table 3-3. Comparison of Data Used to Analyze Specific Facilities under the No Action, Planned Utilization and Operations, and Maximum Operations Alternatives

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
Chemical and Radiation Detection Laboratory (CRDL)						
Operational Parameters	Waste	LLW	kg	13	68	75
		LLMW	kg	0	0	0
	Total Hazardous	kg	1,169	6,135	6,719	
	Wastewater	gallon	77,100	404,775	443,325	
	Facility Staffing	employee	8	42	46	
	Expenditures	dollar	1.7 M	10.5 M	13.4 M	
	Electrical Use	megawatt-hour	2,259	11,857	12,986	
Natural Gas Use	thousand cubic foot	8,941	8,941	8,941		
Area 8 Facilities						
Operational Parameters	Waste	LLW	kg	168	67	336
		LLMW	kg	0	0	0
		Total Hazardous	kg	814	326	1,628
	Wastewater	gallon	Not measured ^a	Not measured ^a	Not measured ^a	
	Facility Staffing	employee	25	8	40	
	Expenditures	dollar	10.8 M	2.4 M	21.6 M	
	Electrical Use	megawatt-hour	720	288	1,440	
Natural Gas Use	thousand cubic foot	0	0	0		
Explosive Storage Area						
Operational Parameters	Explosive Material	Storage Capacity	kg	234.2	234.2	234.2
	Waste	LLW	kg	0	0	0
		LLMW	kg	0	0	0
		Total Hazardous	kg	0	0	0
	Wastewater	gallon	Not measured ^a	Not measured ^a	Not measured ^a	
	Facility Staffing	employee	No staffing	No staffing	No staffing	
	Expenditures	dollar	10.8 M	2.4 M	21.6 M	
Electrical Use	megawatt-hour	Minimal	Minimal	Minimal		
Natural Gas Use	thousand cubic foot	0	0	0		

Table 3-3. Comparison of Data Used to Analyze Specific Facilities under the No Action, Planned Utilization and Operations, and Maximum Operations Alternatives

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
Building 916						
Operational Parameters	Waste	LLW	kg	1.5	2.3	3
		LLMW	kg	0	0	0
		Total Hazardous	kg	596	912	1,192
	Wastewater		gallon	31,000	47,430	62,000
	Facility Staffing		employee	46	70	91
	Expenditures		dollar	12.3 M	18.1 M	24.6 M
	Electrical Use		megawatt-hour	3,464	5,291	6,928
Natural Gas Use		thousand cubic foot	5,535	5,535	5,535	
Building 927						
Other Parameters	Waste	LLW	kg	0	0	0
		LLMW	kg	0	0	0
		Total Hazardous	kg	4,182	6,273	8,364
	Wastewater		gallon	Not measured ^a	Not measured ^a	Not measured ^a
	Facility Staffing		employee	4	6	8
	Expenditures		dollar	1.2 M	1.9 M	2.4 M
	Electrical Use		megawatt-hour	145	218	290
Natural Gas Use		thousand cubic foot	1,907	1,907	1,907	
Micro and Nano Technologies Laboratory (MANTL)						
Operational Parameters	Waste	LLW	kg	0	0	0
		LLMW	kg	0	0	0
		Total Hazardous	kg	7,109	8,673	14,218
	Wastewater		gallon	120,337	146,811	240,674
	Facility Staffing		employee	97	118	194
	Expenditures		dollar	30.1 M	35.4 M	60.2 M
	Electrical Use		megawatt-hour	5,440	6,637	10,880
Natural Gas Use		thousand cubic foot	25,754	25,754	25,754	

Table 3-3. Comparison of Data Used to Analyze Specific Facilities under the No Action, Planned Utilization and Operations, and Maximum Operations Alternatives

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
Chemical and Radiation Detection Laboratory (CRDL)						
Operational Parameters	Waste	LLW	kg	13	68	75
		LLMW	kg	0	0	0
	Wastewater	Total Hazardous	kg	1,169	6,135	6,719
		Facility Staffing	gallon	77,100	404,775	443,325
		Expenditures	employee	8	42	46
	Electrical Use	dollar	1.7 M	10.5 M	13.4 M	
	Natural Gas Use	megawatt-hour	2,259	11,857	12,986	
		thousand cubic foot	8,941	8,941	8,941	
Area 8 Facilities						
Operational Parameters	Waste	LLW	kg	168	67	336
		LLMW	kg	0	0	0
	Wastewater	Total Hazardous	kg	814	326	1,628
		Facility Staffing	gallon	Not measured ^a	Not measured ^a	Not measured ^a
		Expenditures	employee	25	8	40
	Electrical Use	dollar	10.8 M	2.4 M	21.6 M	
	Natural Gas Use	megawatt-hour	720	288	1,440	
		thousand cubic foot	0	0	0	
Explosive Storage Area						
Operational Parameters	Explosive Material	Storage Capacity	kg	234.2	234.2	234.2
		LLW	kg	0	0	0
	Waste	LLMW	kg	0	0	0
		Total Hazardous	kg	0	0	0
		Wastewater	gallon	Not measured ^a	Not measured ^a	Not measured ^a
	Facility Staffing	employee	No staffing	No staffing	No staffing	
	Expenditures	dollar	10.8 M	2.4 M	21.6 M	
Electrical Use	megawatt-hour	Minimal	Minimal	Minimal		
Natural Gas Use	thousand cubic foot	0	0	0		

Table 3-3. Comparison of Data Used to Analyze Specific Facilities under the No Action, Planned Utilization and Operations, and Maximum Operations Alternatives

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
Hazardous and Radioactive Waste Storage Management Facilities						
Operational Parameters	Waste	LLW	kg	Minimal	Minimal	Minimal
		LLMW	kg	Minimal	Minimal	Minimal
		Total Hazardous	kg	Minimal	Minimal	Minimal
	Wastewater		gallon	Not measured ^a	Not measured ^a	Not measured ^a
	Facility Staffing		employee	10-12	11-14	20-24
	Expenditures		dollar	Not Reported	Not Reported	Not Reported
	Electrical Use		megawatt-hour	62 M	70 M	124 M
Natural Gas Use		thousand cubic foot	0	0	0	
LIGA Technologies Facility (LTF)						
Operational Parameters	Waste	LLW	kg	0	0	0
		LLMW	kg	0	0	0
		Total Hazardous	kg	2,836-2,964	2,836-2,964	5,672-5,928
	Wastewater		gallon	30,000	30,000	60,000
	Facility Staffing		employee	20	20	40
	Expenditures		dollar	2.5 M	2.5 M	5 M
	Electrical Use		megawatt-hour	10,000	10,000	10,000
Natural Gas Use		thousand cubic foot	5,000	5,000	5,000	
Distributed Information Systems Laboratory (DISL)						
Operational Parameters	Waste	LLW	kg	0	0	0
		LLMW	kg	0	0	0
		Total Hazardous	kg	0	0	0
	Wastewater		gallon	0	0	0
	Facility Staffing		employee	130	180	180
	Expenditures		dollar	20M	20M	20M
	Electrical Use		megawatt-hour	2,500	2,500	2,500
Natural Gas Use		thousand cubic foot	0	0	0	

Table 3-3. Comparison of Data Used to Analyze Specific Facilities under the No Action, Planned Utilization and Operations, and Maximum Operations Alternatives

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
Glass Furnace and Melting Laboratory	Waste	LLW	kg	0	0	0
		LLMW	kg	0	0	0
		Total Hazardous	kg	50	50	50
	Glass Furnace emissions	NOX	lbs/hour peak	1	1	1
		SO ₂	lbs/hour peak	1	1	1
		PM ₁₀	lbs/hour peak	0.7	0.7	0.7
		CO	ppmv	0.3	0.3	0.3
	Operational Parameters	VOCs	ppmv	<1	<1	<1
		Wastewater	gallon	5,200	5,200	5,200
		Facility Staffing	employee	12	12	12
	Electrical Use	Expenditures	dollar	2.1M	2.1M	2.1M
		Natural Gas Use	megawatt-hour	2,000	2,000	2,000
			thousand cubic foot	30,000	30,000	30,000

Source: SNL/CA 2002a, TINUS 2002a

*Although the wastewater flows are not measured at certain facilities, the quantities are captured in the site-wide quantities in Table 3-4.

<: less than

kg/year: kilograms per year

lb/hour peak: pounds per hour peak

LLMW: low-level mixed waste

LLW: low-level waste

M: million

NA: not applicable/not available

NOX: nitrogen oxides

PM₁₀: particulate matter smaller than 10 microns in diameter

ppmv: parts per million by volume

SO₂: sulfur dioxide

Total Hazardous: includes Resource Conservation and Recovery Act (RCRA) hazardous, California toxic, Toxic Substance and Control Act waste, and biohazardous.

VOCs: volatile organic compounds

Table 3-4. Comparison of Parameters Used to Analyze Sandia National Laboratories, California under the No Action, Planned Utilization and Operations, and Maximum Operations Alternative

RESOURCE AREA	UNITS	FY 2000 ^a	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
LAND USE					
Total Acreage	acre	410	410	Same as No Action	Same as No Action
DISL Construction	acre	NA	4	Same as No Action	Same as No Action
LTF Construction	acre	NA	2	Same as No Action	Same as No Action
Hazardous Waste Storage Facility Modifications	acre	NA	Within Existing Footprint	Same as No Action	Same as No Action
Biological Area Set Aside (Reserve)	acre	NA	No changes	30	Same as Planned
Soil Management	cy/yr	NA	Not Part of This Alternative	4,000 to 5,000	Same as Planned
New Badge Office Complex	acre	NA	Not Part of This Alternative	8	Same as Planned
Removal of Structures	ft ²	NA	20,000	Same as No Action	No Action Plus 100,000
Identifying Areas as "Undesignated"	acre	NA	Not Part of This Alternative	122	Same as Planned
Identifying Areas as "Future Construction" (including Soil Management)	acre	NA	Not Part of This Alternative	93 (approximately 25 acres for soil management)	Same as Planned
New Building Similar to CRDL	acre	NA	Not Part of This Alternative	Not Part of This Alternative	2
New Building as Replacement for Building 916	acre	NA	Not Part of This Alternative	Not Part of This Alternative	4
INFRASTRUCTURE					
Utilities (Annual Basis)					
Water Use (Potable)	gal/yr	53 M	50 to 60 M	56.5 to 67.8 M	76.5 to 91.8
Sanitary Sewer Discharge	gal/yr	15 M	12 to 19M	13.6 to 21.5 M	18.4 to 29.1 M
Natural Gas Use	ft ³ /yr	59 M	94 M	94 M	94 M
Electrical Use	MWh/yr	22,434	36,934	39,850	48,800
Balance of Operations	NA	Supports 1,100 Workforce	Same as FY 2000	No Action Plus 13 Percent	No Action Plus 53 Percent

Table 3-4. Comparison of Parameters Used to Analyze Sandia National Laboratories, California under the No Action, Planned Utilization and Operations, and Maximum Operations Alternative

RESOURCE AREA	UNITS	FY 2000 ^a	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
GEOLOGY AND SOILS					
Solid Waste Management Units	Number	23 (20-NFA) 3-Long Term Monitoring	Same as FY 2000	Same as FY 2000	Same as FY 2000
Soil Removed ^b	cy/yr	NA	Not Part of This Alternative	4,000 to 5,000	Same as Planned
New Material, Backfill, Stone, etc. ^b	cy/yr	NA	Not Part of This Alternative	3,000 to 6,000	Same as Planned
Onsite Soil Managed	cy/yr	NA	Not Part of This Alternative	3,000 to 4,000	Same as Planned
WATER RESOURCES AND HYDROLOGY					
Water Use	gal/yr	53 M	50 to 60 M	56.5 to 67.8 M	76.5 to 91.8 M
Irrigation Water Use	gal/yr	16-17 M	16 to 17 M	16 to 17 M	16 to 17 M
Impervious Surface	acre	49.2	49.2	76.9	76.9
BIOLOGICAL AND ECOLOGICAL RESOURCES					
Improvement	NA	NA	No changes	20 Improvement Tasks	Same as Planned
Disturbance of California red-legged frog critical habitat	acre	NA	No changes	37	Same as Planned
CULTURAL RESOURCES					
Cultural Resources Located in all Areas of Potential Effect	acre	NA	No changes	No Changes	No Changes
AIR QUALITY					
Permitted Emission Sources	number	18	28	30 to 32	57
Nonradioactive Emissions Rates (excluding the Glass Furnace)					
Nitrogen Oxides	kg/yr	4,000	4,000	4,520	6,120
Carbon Monoxide (CO)	kg/yr	300 to 400	300 to 400	339 to 452	459 to 612
Particulate Matter	kg/yr	NA	NA	NA	NA
Sulfur Dioxide	kg/yr	NA	NA	NA	NA
Nonradioactive Emissions Rates (Glass Furnace design parameters)					
Nitrogen Oxides	lbs/hr	0	0.3 to 1.5	0.3 to 1.5	0.3 to 1.5

Table 3-4. Comparison of Parameters Used to Analyze Sandia National Laboratories, California under the No Action, Planned Utilization and Operations, and Maximum Operations Alternative

RESOURCE AREA	UNITS	FY 2000 ^a	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
AIR QUALITY					
Carbon Monoxide	ppmv	0	<10	<10	<10
Particulate Matter	lbs/hr	0	0.25 to 0.5	0.25 to 0.5	0.25 to 0.5
Sulfur Dioxide	lbs/hr	0	0.35	0.35	0.35
Volatile Organic Compounds	ppmv	0	<1	<1	<1
Radioactive Emissions		None	None	None	None
CONSTRUCTION-RELATED CARBON MONOXIDE EMISSIONS^c					
DISL, LTF, Hazardous Waste Storage Facility ^d	tons/yr	NA	2.3	Same as No Action	Same as No Action
New Badge Office	tons/yr	NA	Not Part of This Alternative	2.3	Same as Planned
Building 916 Replacement and New Building Similar to CRDL	tons/yr	NA	Not Part of This Alternative	Not Part of This Alternative	4.6
Soil Hauling, Inbound Material Haulings and Related Improvement Tasks ^e	tons/yr	NA	Not Part of This Alternative	2.25	Same as Planned
TRANSPORTATION (Normal Operations)					
Material (Annual Shipments Radioactive, Chemical, and Explosives)	trip (one way)	33	33	37	50
Waste (Includes Hazardous and Radioactive)	shipment	76	76	86	116
Sanitary Waste	shipment	52	52	59	80
Site-Related Traffic - Total Daily traffic	vehicle	700 to 1,000	700 to 1,000	791 to 1,130	1,071 to 1,530
SNL/CA Weekly Hazardous Materials Transports (Excluding Waste)	outbound shipment	1 to 3 (Total of 33)	1 to 3 (Total of 33)	1 to 3 (Total of 37)	1 to 3 (Total of 50)
Supplier Weekly Hazardous Material Transports	inbound shipment	1 to 3 (Total of 100)	1 to 3 (Total of 100)	1 to 3 (Total of 113)	1 to 3 (Total of 150)
Soil Transports ^{a,c}	shipment	NR	Not Part of This Alternative	2,000 to 2,500 over 10 Years	Same as Planned
Incoming Material (Rock, Soil, Concrete) ^b	shipment	NR	Not Part of This Alternative	1,500 to 3,000 over 10 Years	Same as Planned
Paved and Unpaved Roads	mi	6.2	6.2	9.7	9.7
Pedestrian Malls	acre	4	4	6.24	6.24

Table 3-4. Comparison of Parameters Used to Analyze Sandia National Laboratories, California under the No Action, Planned Utilization and Operations, and Maximum Operations Alternative

RESOURCE AREA	UNITS	FY 2000 ^a	NO ACTION ALTERNATIVE	PLANNED OPERATIONS ALTERNATIVE	MAXIMUM OPERATIONS ALTERNATIVE
TRANSPORTATION (Normal Operations)					
Paved Service Areas	acre	5.5	5.5	8.6	8.6
Paved Parking Areas	acre	12.7	12.7	19.8	19.8
WASTE GENERATION (Site-Wide includes Balance of Operations)					
Radioactive Waste					
LLW	kg/yr	5,288 ^f	5,308	5,998	8,121
LLMW	kg/yr	451 ^f	451	510	690
Chemical Waste					
RCRA Hazardous Waste	kg/yr	22,616 ^f	23,395	25,556	34,602
TSCA (PCBs and Asbestos)	kg/yr	38,383 ^f	39,706	43,372	43,372
Biohazardous	kg/yr	551 ^f	580	623	843
California Toxic Waste	kg/yr	25,914 ^f	26,807	29,282	39,648
Total Hazardous	kg/yr	87,464 ^f	90,488	98,833	118,465
Municipal Solid Waste	metric tons	247.5	247.5	279.7	378.7
NOISE					
SNL/CA Estimated Noise		CNEL L _d 7-am to 7 pm	CNEL L _d 7-am to 7 pm	CNEL L _d 7-am to 7 pm	CNEL L _d 7-am to 10 pm
SOCIOECONOMICS					
Employment	Workforce	1,100	1,043 – 1,317	1,222 – 1,496	1,657 – 1,931
Operating Budget	dollar	131 M	131 M	170 M	262 M

Source: TTNUS 2002a
^aFY 2000 data were used as a baseline unless otherwise stated in Chapter 5.
^bThe Arroyo Seco and Habitat improvement projects were assumed to be spread over the next 10 years since regulatory agency approvals may require a phased approach. Since estimates included deliveries of trees, plants, pipes, and other materials (mulch, hay, seed, top soil, etc.) new material quantities were doubled.
^cAssumed to be one-year projects excluding soil hauling, which was assumed to continued for 10 years.
^dAssumes Hazardous Waste Storage Facility-related emissions are very small.
^eTo bound the analysis, soil hauling assumes total offsite management although current planning includes onsite soil management.
 Large quantities in FY 2000 include removal of Building 913.
 LLW: low-level waste
 LTF: LIGA Technologies Facility
 M: million
 mi: mile
 MWh/yr: megawatt-hours per year
 NA: not applicable/not available
 NFA: No Further Action
 NIR: Not Reported
 PCBs: polychlorinated biphenyls
 ppmv: parts per million per volume
 RCRA: Resource Conservation and Recovery Act
 SNL/CA: Sandia National Laboratories, California
 TBD: to be determined
 TSCA: Toxic Substances Control Act
 yr: year

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CHAPTER 4

Affected Environment

4.1 INTRODUCTION

Understanding the affected environment is necessary for understanding potential impacts from operations at Sandia National Laboratories, California (SNL/CA). This chapter describes the existing conditions that comprise the physical and natural environment within SNL/CA, the Region of Influence (ROI), 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 three alternatives. The discussion is categorized by resource area to ensure that all relevant issues are included. This chapter is divided into the following thirteen resource areas that support the impact assessment discussed in Chapter 5:

- Land Use and Visual Resources
- Geology and Soils
- Water Resources and Hydrology
- Biological Resources
- Cultural Resources
- Air Quality
- Infrastructure
- Transportation
- Waste Generation
- Noise
- Human Health and Worker Safety
- Socioeconomics
- Environmental Justice

The information in this chapter comes primarily from the SNL/CA *Environmental Information Document* (EID) (SNL/CA 2002a) and from the comprehensive environmental monitoring and surveillance programs that the United States (U.S.) Department of Energy (DOE) maintains at SNL/CA. Data for 2000 are presented where available; data for 1996, 1997, 1998, and 1999 are also included where necessary to present trends. Other relevant information is summarized and incorporated by reference.

Each resource and topic area includes a discussion of the ROI—the area that may be affected by SNL/CA operations. The ROI establishes the scope of analysis and focuses the discussion on relevant information. Because resources and topic areas are often interrelated, one section may refer to another.

Regions of Influence

Each ROI—the area that SNL/CA operations may reasonably affect—is delineated by its resource. ROIs are determined based on characteristics of SNL/CA and the surrounding area. The ROI limits may be natural features or political boundaries. Other ROIs are delineated using industry-accepted norms for the resources.

Materials released from SNL/CA can reach the environment and people in a number of ways. The routes that materials follow from SNL/CA to reach the environment and subsequently people are called transport and exposure pathways. SNL/CA conducts environmental monitoring to determine whether radioactive and nonradioactive materials were potentially released into the environment. Environmental monitoring also assesses the potential for people to encounter these materials by any route of exposure. Sampled media include ground-water, storm water runoff, and wastewater discharge. SNL/CA publishes an annual site environmental report that contains details on these sampling programs (SNL 1996a, 1997a, 1998a, 1999a, 2000a).

4.2 GENERAL LOCATION

SNL/CA is located about 40 miles (mi) east of San Francisco at the southeast end of the Livermore Valley in eastern Alameda County. The City of Livermore's central business district is located about 3 mi to the west. SNL/CA occupies a 410-acre site adjacent to and south of Lawrence Livermore National Laboratory (LLNL).

4.3 LAND USE AND VISUAL RESOURCES

4.3.1 LAND USE

4.3.1.1 Definition of Resource

Land use describes the condition of a particular area and the activities that take place in that area. It is a critical element in site operations decision-making, especially when determining the feasibility of siting new programs and facilities at SNL/CA, and identifying conflicts between existing or projected operations and the potential for new operations. DOE Policy 430.1, *DOE Land Use and Facility Policy* (DOE P 430.1), governs DOE's management of its land and facilities, based on the principles of ecosystem management and sustainable development.

4.3.1.2 Region of Influence

The ROI includes the entire SNL/CA site and the nearby surrounding areas. This includes the main campus of the site, all open spaces, the buffer zone located between the inner and outer boundary fences, the area between the boundary fence and the four surrounding main streets (Vasco, Tesla, Greenville, and East), and the areas adjacent to these roads.

4.3.1.3 Affected Environment

Sandia National Laboratories, California Location and Setting

SNL/CA is located approximately 40 mi (65 kilometers [km]) east of San Francisco, adjacent to Livermore, California. The site comprises 410 acres owned by DOE, and is bounded by the City of Livermore to the west, LLNL to the north, and privately-owned rural and agricultural land to the south and east. The far western edge of SNL/CA is bounded by Vasco Road (formerly known as Las Positas Avenue), the far eastern edge by Greenville Road and the South Bay Aqueduct, and the northern edge by East Avenue, which separates SNL/CA from LLNL on the north side of the road. South of the southern end of the site is Tesla Road.

The general project area is situated at the southeast corner of the Livermore Valley in Alameda County, California. The valley, an east-west trending topographic and structural depression cuts the Diablo Range of central California. The majority of the 410-acre site is situated on relatively flat terrain, although the southern portion is hilly with gentle to steep slopes as it extends into the Altamont Hills, which are located to the south and east of the site. The elevation of the site ranges from 615 feet (ft) above mean seal level (MSL) in the northwest to approximately 850 ft MSL at the highest point in the south. One watercourse is present on the site. Arroyo Seco (formerly Muddy Creek) traverses the site from southeast to northwest. The area is characterized by perennial grasses and scattered oak woodland. Riparian vegetation is present along Arroyo Seco, a seasonal stream (Busby *et al.* 1990).

Historical Land Use at Sandia National Laboratories, California

SNL/CA is situated within the Chochenyo territory of the Ohlone/Costanoan Indians. Linguistic data suggest that these people moved to the Bay Area approximately A.D. 500. Historical accounts of the Ohlone/Costanoan from the 1770s to 1790s describe a people conducting seasonal rounds of hunting and gathering activities in the area. During the Hispanic Period, the Livermore area was part of Mission San Jose, established in 1797.

This area was likely used for livestock grazing, as raising cattle for tallow and hides was a major economic pursuit

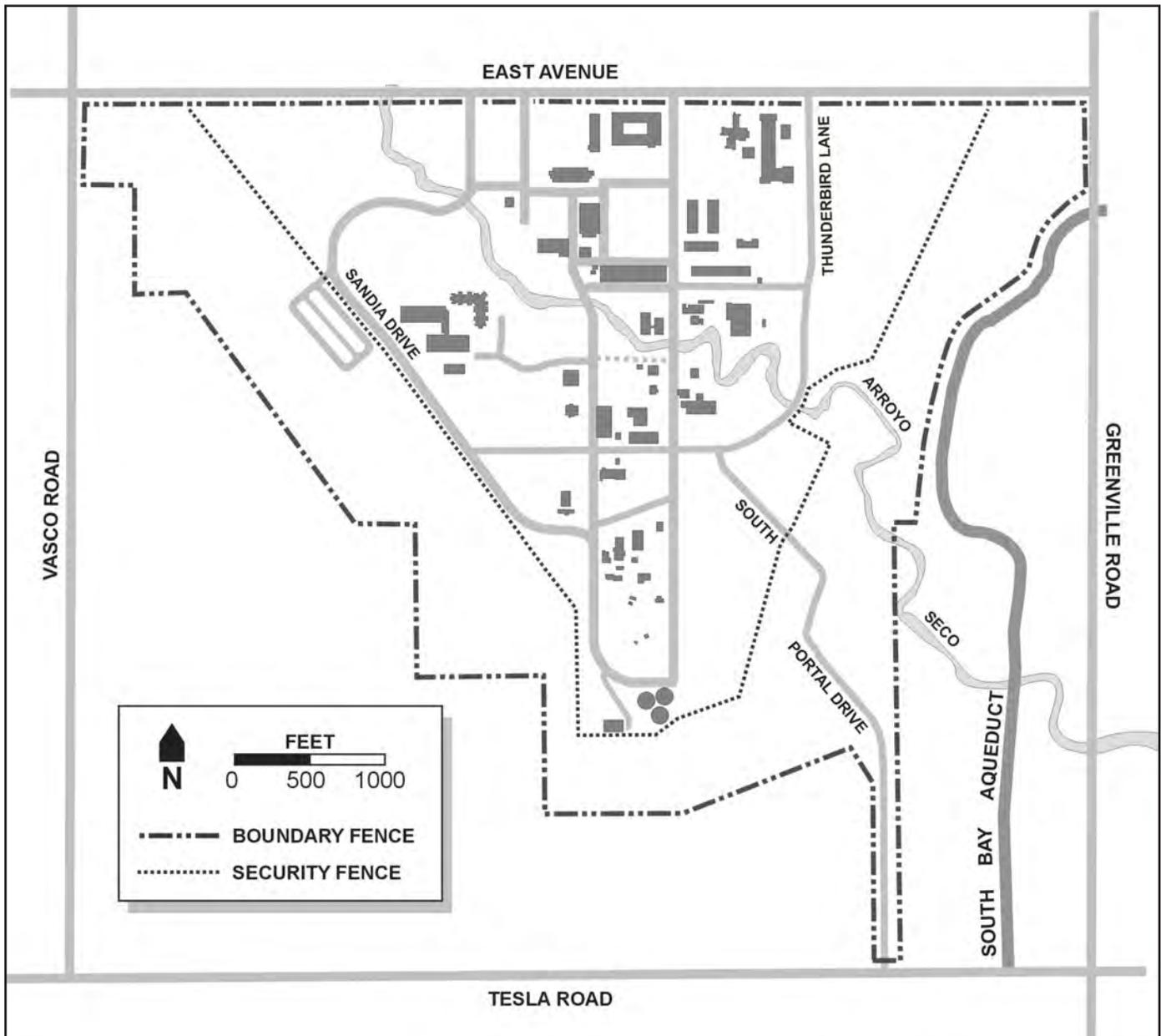
at that time. The far northwest corner of SNL/CA was included in the land grant Rancho Las Positas. This land grant was confirmed to Robert Livermore in the second half of the 19th century and was used for vineyards, orchards, and raising cattle. William Mendenhall established a city next to a railroad in 1869 and named it after Robert Livermore (Busby *et al.* 1990, SNL/CA 2002b).

The agrarian use of the site continued through World War II. LLNL was established on the site of the abandoned Livermore Naval Air Station in 1949. In March 1956, SNL/CA was established on 75 acres, formerly the Naval Air Station's barracks and gunnery range, and farmland, to support the nuclear weapons research being conducted at LLNL. An additional 86 acres of land were acquired in 1970, 24 acres in 1979, and 228 acres in 1986 to 1987, bringing the total to 413 acres. In 1998, the DOE exchanged land with a neighboring property owner to straighten out the west property boundary—the neighbor received approximately three more acres than did DOE, bringing the total to 410 acres (Busby *et al.* 1990, SNL/CA 2002b, SNL 2001d).

Current Land Use at Sandia National Laboratories, California

Primary land use at SNL/CA fits into the category of industrial/research park uses, although not all facilities are industrial in nature (for example, administrative offices). Land use at the site includes buildings and structures, infrastructure systems (water, sewer, gas, and electrical), a firing range, roadways, parking areas, and landscaping. Spaces between buildings are landscaped or used as paved service areas, roads, or sidewalks. Parking areas are positioned along the perimeter of the developed area and cluster along East Avenue. Open space within the developed area is set aside for future construction use, with the exception of Arroyo Seco. A security buffer surrounding the western, southern, and eastern edges of the developed area ranges in width from 600 to 1,200 ft and represents 175 acres. This zone is located between the security fence and the outer boundary fence. The buffer zone has a dual purpose, ensuring that an adequate safety zone exists for the physical protection of the public and providing facility security. East Avenue lies at the north end of SNL/CA, separating SNL/CA from the LLNL site. East Avenue is a paved two-way street, with four lanes at the west end and two lanes at the east end and walking/bike lanes the entire length. Three roads are located on the site but outside the developed area. These are Sandia Drive on the west, Thunderbird Lane on the east, and South Portal Drive to the south, which provides emergency access to and egress from the site (SNL/CA 2002b) (Figure 4-1).

SNL/CA has 72 buildings used for administrative offices, laboratories, shops, storage, or technical support. These buildings provide approximately 740,000 adjusted gross



Source: Original

Figure 4-1. The Sandia National Laboratories, California Site, Occupying 410 Acres, is owned by the U.S. Department of Energy

Lawrence Livermore National Laboratory is located adjacent and north of East Avenue.

square feet (gsf) (SNL/CA 2002b). Section 4.9 provides discussion of site infrastructure.

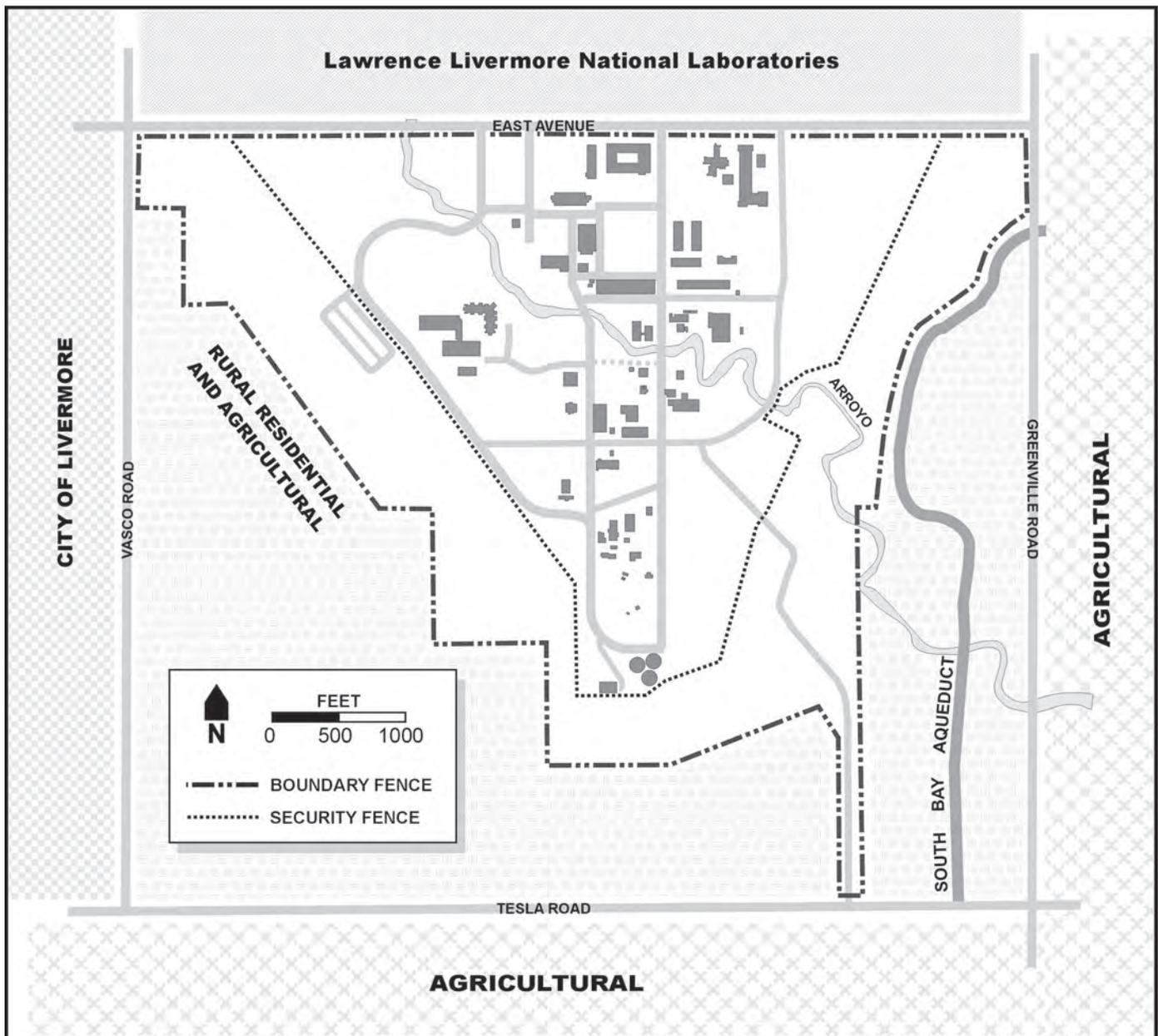
There are three private utility easements on SNL/CA, all of which cross the site at the southern end. Chevron-Texaco Corporation has an easement for an underground oil pipeline. Pacific Gas and Electric Company (PG&E) has easements for an overhead high-voltage electric power transmission line and an underground high-pressure gas pipeline (SNL/CA 2002b).

Land Use Surrounding Sandia National Laboratories, California

Land use in the region surrounding SNL/CA is a result of city and county planning and zoning regulations. The City of Livermore and the County of Alameda do not have planning jurisdiction over SNL/CA. SNL/CA is situated within the sphere of influence of the City of Livermore, but not within the incorporated area of the city. The area to the west of the site, including Vasco Road, is within the City of Livermore (SNL/CA 2002b).

To the north across East Avenue is LLNL, which encompasses approximately 821 acres and has land uses similar to those at SNL/CA (Figure 4-2). To the east and south is agricultural. East of SNL/CA are Greenville Road and a hilly area used for cattle grazing. The South Bay Aqueduct is located between the SNL/CA boundary and Greenville Road. A private residence is located near the southeastern corner of the site, between the aqueduct and the site boundary fence. The area south of the site is primarily vineyards with residences or buildings that are used for activities such as wine tastings, parties, and dining. West of SNL/CA is the City of Livermore and Vasco Road. Various private landowners own the property on this side

of the site. In the area between Vasco Road and the west boundary of SNL/CA is a mix of rural residential and agricultural use, including an elementary school, Steivers Academy. This area is currently zoned as single-family residential with construction to start in 2002. With this new residential development, the area will no longer be rural residential. The National Nuclear Security Administration (NNSA) is currently negotiating with the property owner a “Grant of Easement and Agreement” to establish conditions, limitations, and provide disclosures. To the west of Vasco Road, the present and proposed uses are residential and light industrial (SNL/CA 2002b).



Source: Original

Figure 4-2. Land Use in the Areas Adjacent to Sandia National Laboratories, California
Sandia National Laboratories, California occupies 410 acres and is adjacent to East Avenue.

Sandia National Laboratories, California Land-Use Trends

SNL/CA land use will not change significantly in the near future. In accordance with the *Sandia National Laboratories Sites Comprehensive Plan* (SNL 2001c), land use at SNL/CA will remain consistent with industrial/research park uses (SNL/CA 2002b).

Surrounding Land-Use Trends

The area surrounding SNL/CA is transitioning from agricultural/open space to residential/light industrial/commercial uses. Residences are encroaching on SNL/CA's western border, promoted by the city's and county's designation of this area for such uses. The areas south and east of SNL/CA are zoned agricultural and it is expected that these areas will remain agricultural. LLNL, located north of SNL/CA, is in stable, long-term use as a DOE facility.

4.3.2 VISUAL RESOURCES

4.3.2.1 Definition of Resource

Visual resources are those aspects of an area that pertain to its appearance and to the manner in which people view it. This resource area provides a means to review the aesthetic qualities of landscapes and their modifications, associated perceptions and concerns of people, and the physical or visual relationships that influence the visibility of any proposed landscape modifications.

Scenic values are identified as views (typically from publicly accessible areas) where there are natural landforms, man-made structures or elements (such as landscaping), and/or a panorama or distinctive composition of the location or area (SNL/CA 2002b). Individuals may hold these views as distinctive because of the visual character present. Expansive bodies of natural objects and colors, such as hills, grassland, and open space, tend to have a peaceful and calming effect on the viewer. Repetitive patterns also tend to have a calming effect. Buildings, urban elements, and other man-made structures often appear as abrupt and thus can provide an unwelcome visual diversity in the view field. However, buildings and structures that exhibit high artistic value, such as historic buildings, can also provide an aesthetically pleasing view.

4.3.2.2 Region of Influence

The ROI is similar to that for land use. It consists of the area in and adjacent to SNL/CA, where SNL/CA operations may influence the landscape and associated visual characteristics.

4.3.2.3 Affected Environment

One of the goals for SNL/CA is to create a campus-like atmosphere at the site. To achieve this goal, SNL/CA

developed the *Sandia National Laboratories California Site Visual Quality Guidelines & Landscape Master Plan* (Royston *et al.* 1993). Important aspects of the plan that pertain to development of the site are to maintain view corridors, to cluster buildings to create sheltered spaces, to close connections between buildings, and to situate service access in unobtrusive areas.

Views from Within Sandia National Laboratories, California

The views from within SNL/CA tend to fall into two categories: views of buildings and associated landscaping and paved surfaces (parking and service areas, sidewalks, and roads), and views of open spaces that are either landscaped or natural. The latter views include spaces within the built-up area of the campus, open areas along the arroyo or in the buffer zones of the site, and more distant open spaces such as the hills that are visible to the south and east (near distant) and to the north and west (far distant). Visibility of these open spaces is facilitated by the low building density of the site and the moderate height of the buildings. The site has 72 buildings used for offices, laboratories, facilities, and storage. Views of SNL/CA from within these buildings consist primarily of landscaping, other buildings, and paved surfaces, though some distant views of open spaces are visible from taller buildings. Views seen while walking, biking, or driving on SNL/CA are the same. From some areas of the site, views are of the built areas located adjacent to SNL/CA, namely LLNL to the north and the City of Livermore at Vasco Road to the west. While many parts of SNL/CA could provide an aesthetic value of relaxation and attractiveness due to the campus-like atmosphere and the presence of mature landscaping, the site as a whole would not likely be considered of high scenic value due to the buildings and paved surfaces (SNL/CA 2002b).

Views of Sandia National Laboratories, California from Surrounding Areas

SNL/CA is situated on mostly flat terrain that provides little or no public views of the site from locations a mile or more away. Views of the site are limited to immediately adjacent areas.

The view of SNL/CA from East Avenue consists of the built portion of SNL/CA in the middle and the buffer zones at the west and east ends. The view of the built portion of the site is screened in many places by mature trees and other landscaping. At the west end of the road, views of distant open spaces to the south are available, though views to the distance in the east, north, and west are blocked by SNL/CA, LLNL, and the City of Livermore respectively. At the east end of the road, distant views to the east, south, and north are present, though views to the west are blocked by SNL/CA, LLNL, and the City of Livermore. From all portions of the road, LLNL's built area is

in view and the City of Livermore is adjacent to the west end of the road.

The view of SNL/CA from Vasco Road includes the northwest portion of the buffer zone and at one point, a view of the Micro and Nano Technologies Laboratory's (MANTL's) building shape, roof, and exhaust stacks. Along most of the road, the view east includes rural residential areas and the distant open spaces beyond. To the west and adjacent to the road is the City of Livermore, which encompasses the entire view. To the north is LLNL, which dominates the view, though at the south end of the road distant hills to the north can be seen beyond LLNL. The view to the south is of distant hills.

The view of SNL/CA from Tesla Road includes South Portal Road and the gated entrance, and the water towers on the hills at the south end of the site. These hills effectively block any other view of the site from this road. On either side of the gated entrance are pastureland and vineyards, which encompass the view from the road to the north. Because Tesla Road is somewhat higher in elevation, the distant open spaces to the north can still be seen. To the south and east are views of agricultural areas and distant hills. At the west end of the road, the area is still agricultural, but the view west includes the City of Livermore and distant open spaces.

Greenville Road is on terrain higher than SNL/CA, but there are hills between the road and the site. Thus, views of the site are available from the road only between these hills. The view of the site from the northern end of the road includes the buffer zone and the eastern edge of the built area of the site, and the buffer zone and water tanks at the southern end. Also included in the western view are LLNL, the City of Livermore, and distant open spaces to the west, south, and north. Views south and east from the road are of agricultural open space and distant hills. The view north includes LLNL and agricultural open space, with hills in the distance.

The City of Livermore and the County of Alameda have identified certain scenic routes where an effort is being made to maintain the scenic view corridors (SNL/CA 2002b). While the city and county have no jurisdiction to enforce any requirements on SNL/CA, it is useful to note that of the eight roads identified as scenic routes, Greenville, Tesla, and Vasco are the only ones from which SNL/CA is visible. As explained above, the views of SNL/CA from these three roads are very limited.

4.4 GEOLOGY AND SOILS

4.4.1 DEFINITION OF RESOURCE

The discussion of geology and soils includes general geology, geological resources, geological hazards (seismology), and soils. General geology refers to topography, structural geology, and stratigraphy. Geological resources include

aggregate deposits, fossil occurrences, and oil production. Geological hazards include seismology (which refers to the geology below the soil layer that is relevant to the occurrence, frequency, and magnitude of earthquakes) and slope stability. The discussion of soils briefly describes soils present at the site and contaminated soils.

4.4.2 REGION OF INFLUENCE

The main concern of seismic activity is the effect on onsite facilities, specifically, whether damage from earthquakes could result in a contaminant release. Therefore, the ROI would be the extent of environmental or human health effects from such a release. Soil contamination could potentially result at or near the point of release. Thus, the ROI is limited to SNL/CA. Potential migration of soil contaminants into groundwater or surface water is addressed in Sections 4.5.1.3 and 4.5.2.3.

4.4.3 AFFECTED ENVIRONMENT

4.4.3.1 General Geology

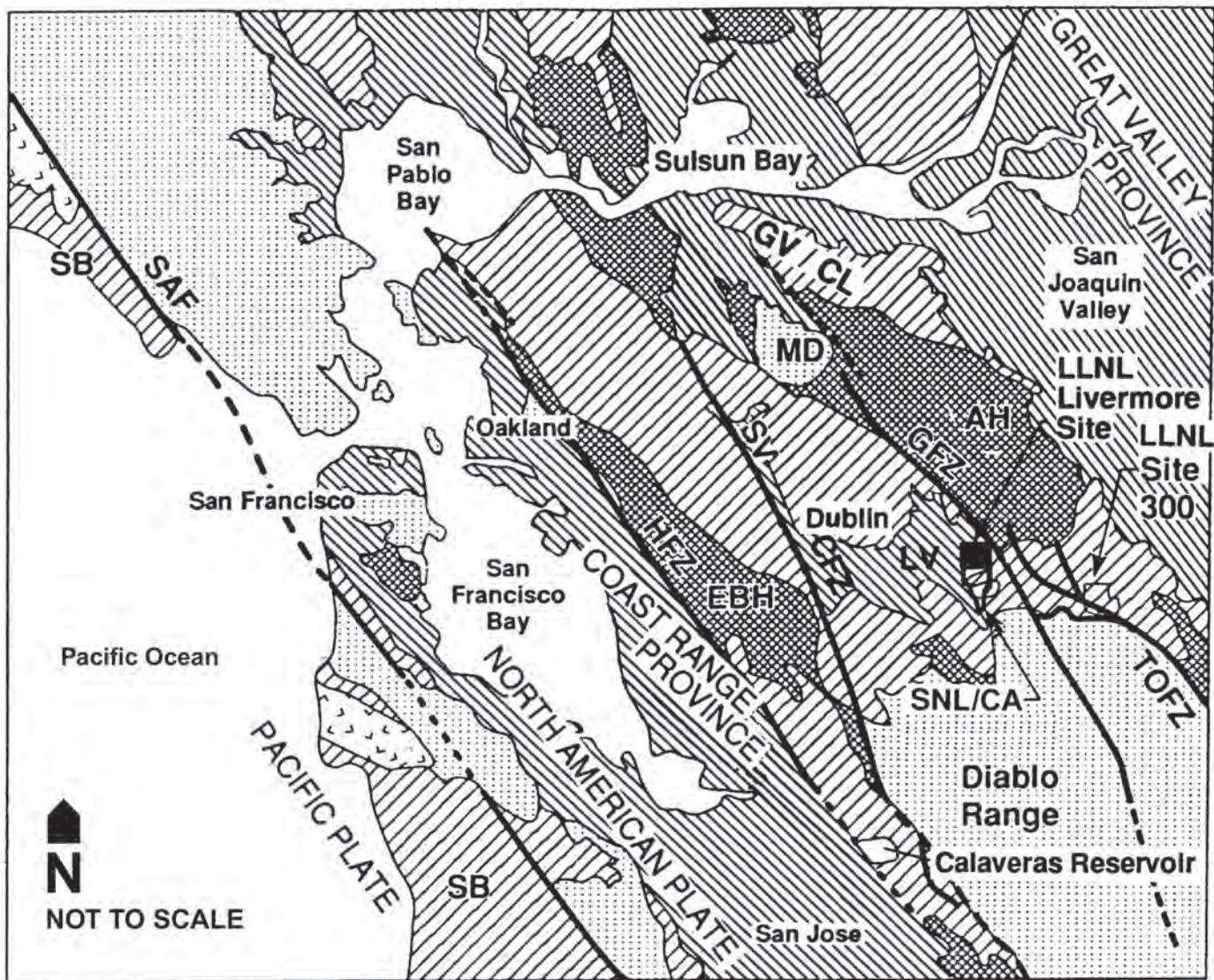
Topography and Geomorphology

SNL/CA is located in the California Coast Ranges geologic province (DOE 1992a, SNL/CA 2002b) characterized by low rugged mountains and relatively narrow intervening valleys. Figure 1-1 shows the location of SNL/CA relative to the surrounding area. Specifically, SNL/CA is located in the southeastern portion of the Livermore Valley. The valley forms an irregularly shaped lowland area about 16 miles-long east-to-west and 7 miles-to 10 miles-wide north-to-south. The floor of the valley slopes to the west at about 20 ft per mile.

In general, the site consists of relatively flat foothills that have low relief and slope gently northwest and north. Slopes at SNL/CA vary from 1 to 3 degrees. The southern area of SNL/CA is situated on the north side of a ridge (the Altamont Hills) approximately 150 ft above the surrounding land. The SNL/CA property ranges in elevation from 849 ft above MSL at the south end of the SNL/CA ridge top to 615 ft MSL at the northwest corner of the site.

San Francisco Bay Area Structural Geology

A generalized map of the regional structural geology and physiography of the San Francisco Bay Area is presented in Figure 4-3. The Diablo Range, which includes the Altamont Hills, is part of the northwest-trending Coast Ranges, and parallels three major faults in the area (DOE 1992a, SNL/CA 2002b). These include 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 are not exposed in the area shown in Figure 4-3). These faults can generally be considered to define three different lithologic blocks. The



LEGEND

-  Late Tertiary-Quaternary Alluvium and Continental Sediments
-  Tertiary Sediments and Volcanics (Locally Non-marine) Including Plio-Pleistocene
-  Jurassic-Cretaceous Great Valley Sequence
-  Franciscan Complex
-  Mesozoic Granite

KEY

- SB = Salinian Block
- SAF = San Andreas Fault
- HFZ = Hayward Fault Zone
- EBH = East Bay Hills
- CFZ = Calaveras Fault Zone
- MD = Mount Diablo Complex
- GFZ = Greenville Fault Zone
- SV = San Ramon Valley
- GV/CL = Green Valley/Clayton Fault System
- AH = Altamont Hills
- TOFZ = Tesla-Ortogonalita Fault Zone
- LV = Livermore-Amador Valley

Source: DOE 1992a

Figure 4-3. Generalized Geologic Map of the San Francisco Bay Area Illustrating the location of Sandia National Laboratories, California

westernmost block is the Salinian Block, which lies west of the San Andreas Fault shown in Figure 4-3. This 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.

SNL/CA Site Fault Zones

The two regional northwest-southeast trending fault zones located closest to SNL/CA are the Greenville fault zone and the Tesla-Ortigalita fault zones, both shown in Figure 4-3. To the west, the San Ramon Valley fault is located approximately 10 mi. Figure 4-4 shows the South Branch Las Positas fault, which traverses the southern most section of SNL/CA. The North Branch Las Positas fault cuts through the center of the SNL/CA site.

A geologic map showing general geologic structures including faults mapped near SNL/CA is presented in Figure 4-4.

Stratigraphy

Stratigraphic units exposed in the Livermore Valley and adjacent areas may be discussed in terms of three general groupings: Jurassic and Cretaceous igneous and metamorphic rocks; a sequence of primarily marine sedimentary rocks; and primarily continental rocks and alluvial deposits (see Figures 4-3 and 4-4). A generalized schematic stratigraphic column for the Livermore Valley is presented in Figure 4-5.

4.4.3.2 Geologic Resources

The geologic resources found near SNL/CA include aggregate deposits, fossil occurrences, and petroleum. These resources are described below.

Aggregate Deposits and Other Mineral Resources

The potential stone and aggregate resources of the eastern Livermore Valley and western San Joaquin County were assessed in 1987 and 1988. Mineral Resource Zones (SNL/CA is a Mineral Resource Zone 1) have been established that identify sand, gravel, and stone source areas. Within the eastern Livermore Valley, several deposits have been identified as recoverable and marketable resources (DOE 1992a). According to a report developed by the California Department of Conservation, Division of Mines and Geo-

What Does Mineral Resource Zone 1 Mean?

Mineral Resource Zone 1 is defined as an area where adequate information indicates that no significant mineral deposits are present or where it is judged that there is little likelihood of their presence.

logy, 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 (M) tons; however, much of the area is currently developed for other land uses (SNL/CA 2002b).

Several occurrences of other potentially economically valuable mineral deposits are within a 10-mi radius of SNL/CA. These include deposits of manganese, chromium, clay, gemstones, pyrite, dimension stone, sand and gravel, and natural gas.

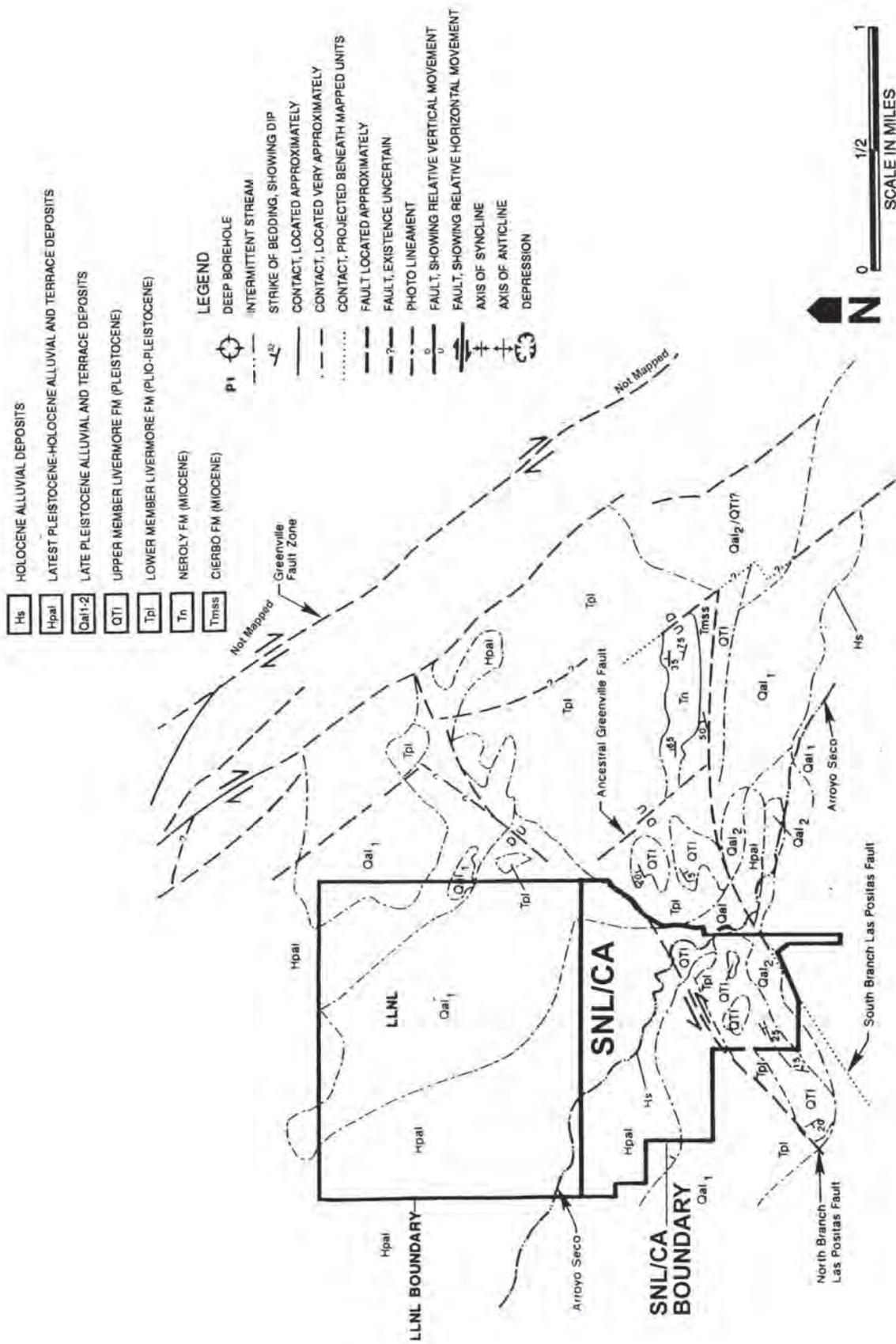
Fossil Occurrences

Fossils in the eastern Livermore Valley and the hills to the east are principally found in unconsolidated and poorly consolidated Cenozoic deposits. The primary fossil-bearing units are the Miocene Neroly and Cierbo formations, and some younger units of Pleistocene age (DOE 1992a). In the mid 1990s, excavation for the National Ignition Facility located on LLNL unearthed mammoth and horse fossils. Those fossils that would be affected by construction were excavated and curated at the University of California Museum of Paleontology at Berkeley (DOE 1999a, SNL/CA 2002b).

Other vertebrate fossil deposits near SNL/CA are in the Quaternary deposits of the surrounding low hills of the east Livermore Valley, but the fossils are few in number and quite scattered. They have been tentatively identified as Rancho La Brea and Blancan in age (Pleistocene) and consist of bone fragments of the mammoth and giant sloth (SNL/CA 2002b). Invertebrate shells and leaf and stem fossils have also been found. These appear to be randomly dispersed, mainly within the Neroly Formation. No invertebrate or botanical fossil deposits of significance are believed to be present in the eastern Livermore Valley (DOE 1992a, SNL/CA 2002b).

Petroleum and Natural Gas Production

The Livermore oil field just east of SNL/CA 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 ten producing wells. These wells are located northeast of SNL/CA. Production is primarily from

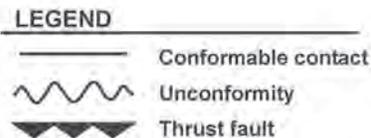


Source: DOE 1992a

Figure 4-4. Generalized Geologic Structures Including Faults Mapped in the Vicinity of Sandia National Laboratories, California

GENERALIZED COLUMNAR SECTION

ERA	Age	Formation	Column	Thickness	Description
CENOZOIC	Quaternary	Alluvium and landslide debris		?	Gravels, sands, silts, clays
		Older alluvium			
	Pliocene	Tulare and non-marine sedimentary rocks		100'+	Continental deposits of gravels, sands, clays
				4000'	
	Upper Miocene	Neroly	Upper	2000'+	Shales, blue sandstone, tuffs
			Lower	50'-700'	Blue sandstone, andesitic conglomerates, tuffs
		Cierbo		100'-500'	Granuliferous white sands, buff sands, tuffs, conglomerate, coal
Middle Eocene	Tesla		2000'	Buff sand, white sands, clays (marine) Buff sands, chocolate shales, coal (brackish-water)	
MESOZOIC		Moreno		650'	Buff sandstone at top locally. Siliceous, argillaceous, and sandy shales, limestone concretions, sandstone beds
	Upper Cretaceous	Panoche		10,000+	Concretionary and massive sandstone, argillaceous and silty shales, conglomerate
	Cretaceous and Jurassic	Franciscan Assemblage		15,000'?	Sandstone, shales, chert lenses, conglomerate Pillow basalt Glaucophane schist Serpentine, diabase, diorite-gabbro



Source: DOE 1992a

Figure 4-5. Generalized Schematic Stratigraphic Column for the Livermore Valley

Miocene Cierbo Formation sandstones at depths of 900 to 2,000 ft. In 1992, the Livermore oil field was operated by the American Exploration Corporation. Of the original ten wells, five were producing an average of seven barrels of oil per day; one well was plugged and abandoned; three wells have been shut in; and one well was used for salt-water injection. Reserves were thought to be approximately 132,000 barrels and production was declining (DOE 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 (CADC 2002a).

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

4.4.3.3 Geological Hazards

Seismology

SNL/CA is located near the boundary between the North American and Pacific tectonic plates, and the area is characterized by the San Andreas Fault system, which trends southeast northwest. Three principal components of the San Andreas Fault system, 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 SNL/CA facilities.

In most cases, Calaveras fault earthquakes in the Livermore Valley region have occurred on strike-slip faults, generally indicating north-south-oriented compression. The fault segment nearest SNL/CA may be capable of generating a magnitude 6 to 6.5 earthquake (DOE 1992a).

Slope Stability

SNL/CA consists of two different types of terrain separated by the north branch of the Las Positas fault. The area north of the fault (north of Arroyo Seco) consists of a relatively smooth land surface that gently slopes downward to the northwest. Because of the very low relief, the potential for slope instability on the northern portion of SNL/CA is remote. The terrain south of the Las Positas fault, however, contains greater relief and steeper slopes

that increase the potential for slope instability. The potential for slope instability in the southern portion of SNL/CA is considered moderate.

4.4.3.4 Soils

Typically, surface soils and arroyo sediments cover the site. The soils beneath the site are formed primarily upon sediments deposited by local streams (Figure 4-5). Most of the deposits in the eastern part of the valley are relatively young, and thus soils are only moderately developed. These soils (generally loam) have minimal horizon, or development of layers, and can be several meters thick locally. Three soils cover most of SNL/CA: Rincon clay loam, Positas gravelly loam, and Livermore gravelly loam (SNL/CA 2002b).

Environmental Restoration Program

The Environmental Restoration Program activities began in 1984. By 1991, 23 solid waste management units were identified at SNL/CA. Of these locations, nine were identified for further investigation. The largest site, the Navy Landfill, is 2 acres in size. Investigation of these sites is regulated under the *Resource Conservation and Recovery Act* (RCRA). As of February 2002, ER activities at SNL/CA have progressed through a series of remedial and closure actions to the point where most sites have attained closure and active environmental monitoring is continuing on three sites: Fuel Oil Spill, Navy Landfill, and the Trudell Auto Repair Shop site. SNL/CA is working with the State on full closure requests and monitoring requirements.

4.5 WATER RESOURCES AND HYDROLOGY

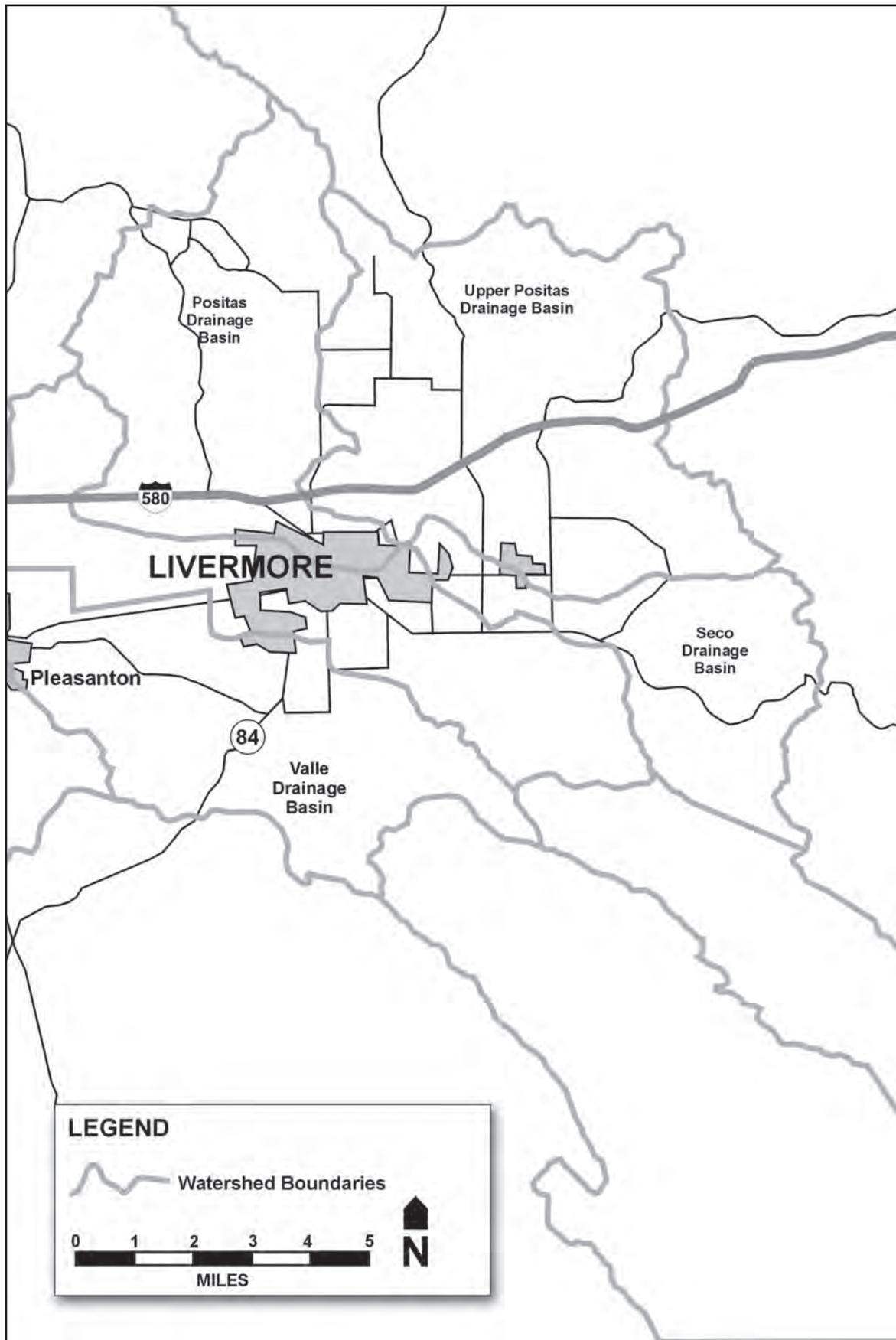
4.5.1 GROUNDWATER

4.5.1.1 Definition of Resource

Groundwater in the SNL/CA area occurs within saturated unconsolidated geologic material. The Livermore Valley has been divided into 12 groundwater subbasins based on the location of faults, topography, and other hydrogeological barriers that affect groundwater occurrence, movement, and quality. Figure 4-6 shows four drainage basins and numerous watershed boundaries.

4.5.1.2 Region of Influence

SNL/CA is situated primarily within the Spring and Mocho I subbasins. The water-bearing sediments in the Livermore Valley include late-Pleistocene to Holocene-age alluvial sediments, generally less than 200 ft thick, which overlie Plio-Pleistocene alluvial and lacustrine Livermore Formation sediments up to 4,000 ft thick. The Livermore Formation consists of beds of gravel, sand, silt, and clay of varying permeabilities. Sandy-gravelly layers alternate with fine-grained, relatively impermeable layers, and



Source: DOE 1992a

Figure 4-6. Four Drainage Basins and Watershed Boundaries in the Livermore Valley

groundwater can be both confined and semiconfined (DOE 1992a).

4.5.1.3 Affected Environment

Water-bearing units beneath SNL/CA are composed of shallow heterogeneous, unconsolidated alluvium and deep fluvial and lacustrine sediments. The permeable sediments are separated by low-permeability silt and clay layers, generally 15 to 60 ft thick. These silt and clay layers may constitute a regional confining layer. The confining layer slopes westward and varies in depth from about 60 ft to 400 ft. Shallow groundwater is located in a layer of sand, silt, and gravel at a depth of about 98 to 112 ft beneath the fuel oil spill site in the central developed portion of SNL/CA (SNL/CA 2002b). Shallow groundwater is continuous throughout the site and has a saturated thickness of about 6 to 8 ft. Beneath this layer of sand, silt, and gravel is about 12 to 18 ft of stiff clay that acts as an aquiclude (a formation that contains water but cannot transmit it rapidly enough to furnish a significant supply). Below this aquifer are two other water-bearing units that are probably local and not part of the underlying aquifer.

The general direction of groundwater flow in the shallow aquifer is from the southeast to the northwest, with a hydraulic gradient of about 0.005 ft per foot, a hydraulic conductivity of 0.4 to 14.9 ft per day and a porosity of about 0.30. Given the maximum recorded groundwater flow velocity, 340 ft per year, it would take 12 years for groundwater to naturally flow from the SNL/CA fuel oil spill site to the nearest downgradient domestic groundwater well 3,400 ft away (SNL/CA 2002b).

Since 1996, SNL/CA has monitored as many as 30 wells. In June 1998, six wells were closed because the wells no longer were needed for their original purpose. In August 1999, 11 additional wells were closed. For 12 wells, the average depth to water ranged from 77.03 ft (monitoring well [MW]-406) to 107.79 ft (MW-11) from 1996 to 2000. The remaining well's (AS-4) average depth to water was 16.34 ft from 1996 to 2000 (SNL/CA 2002b). This large variation in groundwater measurements (as much as 120 feet) indicate that groundwater levels drop precipitously on the valley side of a fault zone that runs along the base of the hills east of the SNL/CA site. Figures 4-7 and 4-8 show the locations of the groundwater monitoring wells. Current depth of groundwater at SNL/CA varies from approximately 12 ft below ground surface at well AS-4 (located on the south side of the North Branch Los Positas fault [see Figure 4-4]) to 126 ft at well MW-11 on the northeast side of the site (north side of the fault zone).

Groundwater Quality

Groundwater near SNL/CA is generally suitable for use as a domestic, municipal, agricultural, and industrial

supply; however, industrial and agricultural uses of some shallower groundwater may be limited by marginal quality. Furthermore, groundwater less than about 300 ft deep is usually unsuitable for domestic use without treatment.

Groundwater monitoring wells were sampled at SNL/CA for background water quality. Typical parameters used to judge ground water quality are total dissolved solids, hardness, and naturally occurring organics. Water quality data for the past five years (1996-2000) for wells screened in the upper aquifer system under SNL/CA are presented in the EID. Water quality data are managed in the Environmental Operations Database.

SNL/CA compares groundwater constituents to maximum contaminant levels (MCLs) for informational purposes in annual reports. The MCLs apply only to drinking water sources. None of the aquifers sampled are used as a source of drinking water.

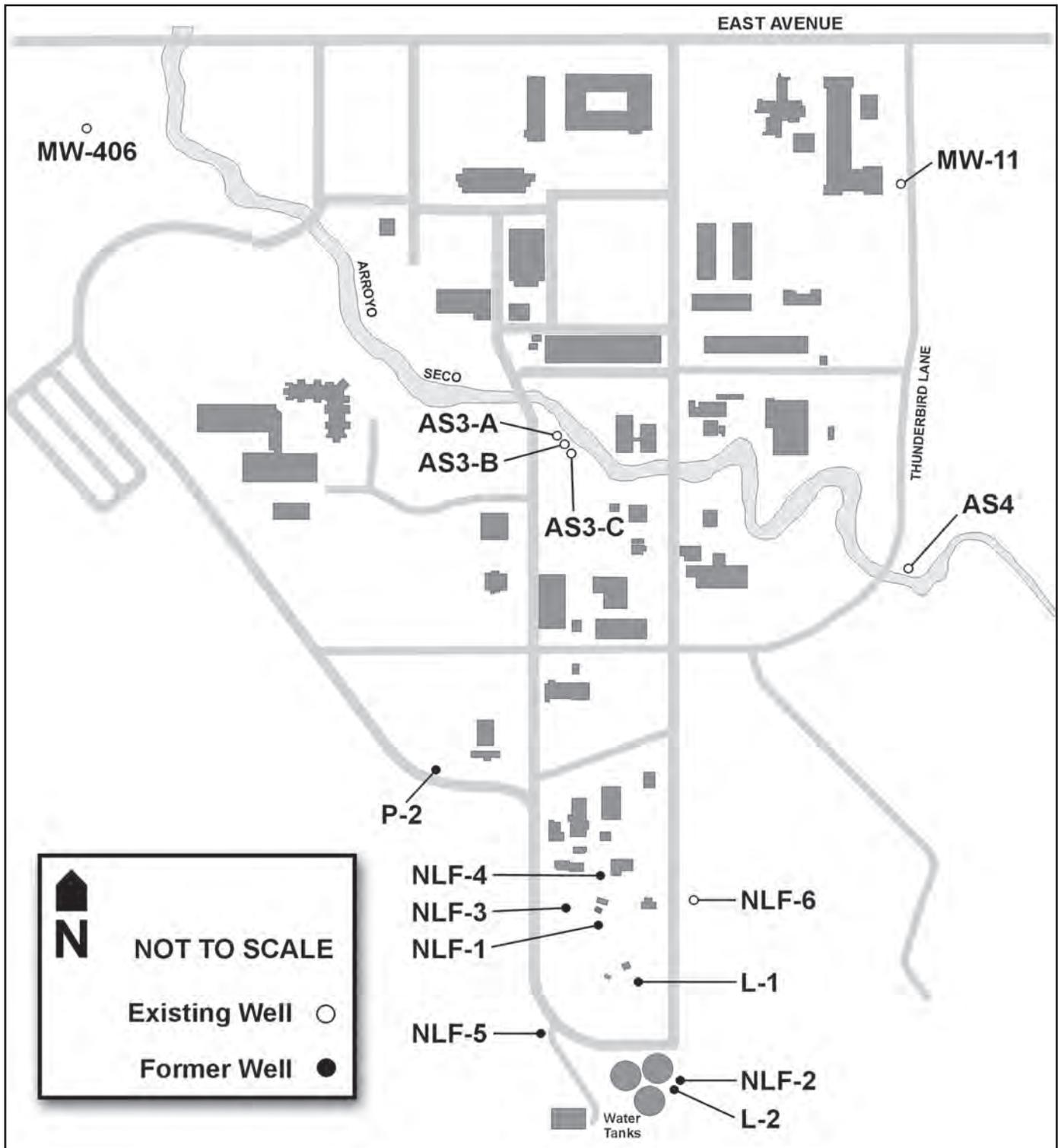
Recent reports (constituents of concern) include detection of carbon tetrachloride in well NLF-6, fuel and fuel constituents in wells at the former fuel tank location, and tetrachlorethylene and several metals in MW-406. SNL/CA continues to monitor according to DOE and State of California requirements.

Locations of Potential or Known Groundwater Contamination

SNL/CA has been conducting quarterly groundwater monitoring since 1986 in response to several environmental remediation projects onsite. These projects—Navy landfill closure, the Trudell Auto Repair Shop closure, and the fuel oil spill site closure—are described in further detail in Chapter 13 of the EID.

Groundwater monitoring wells were sampled at SNL/CA for background water quality. Typical parameters used to judge groundwater quality are total dissolved solids, hardness, and naturally occurring organics. Water quality data for the past five years (1996-2000) for wells screened in the upper aquifer system under SNL/CA are presented in the EID. Water quality data are managed in the Environmental Operations Database.

Groundwater levels range from about 555 to 650 ft MSL near Arroyo Seco to about 661 to 696 ft MSL at the Navy landfill site. Groundwater elevation data are available in the SNL/CA *Groundwater Investigation Quarterly Reports* (1996-2000). Groundwater beneath the eastern Livermore Valley has generally been rising because there has been a decrease in the volume being pumped for agricultural uses. As a result of abnormally low rainfall from 1987 through 1991, groundwater levels stopped rising and declined in many monitoring wells at SNL/CA. In response to normal rainfall in recent years, water levels are once again rising.



Source: Original, SNL/CA 2002b

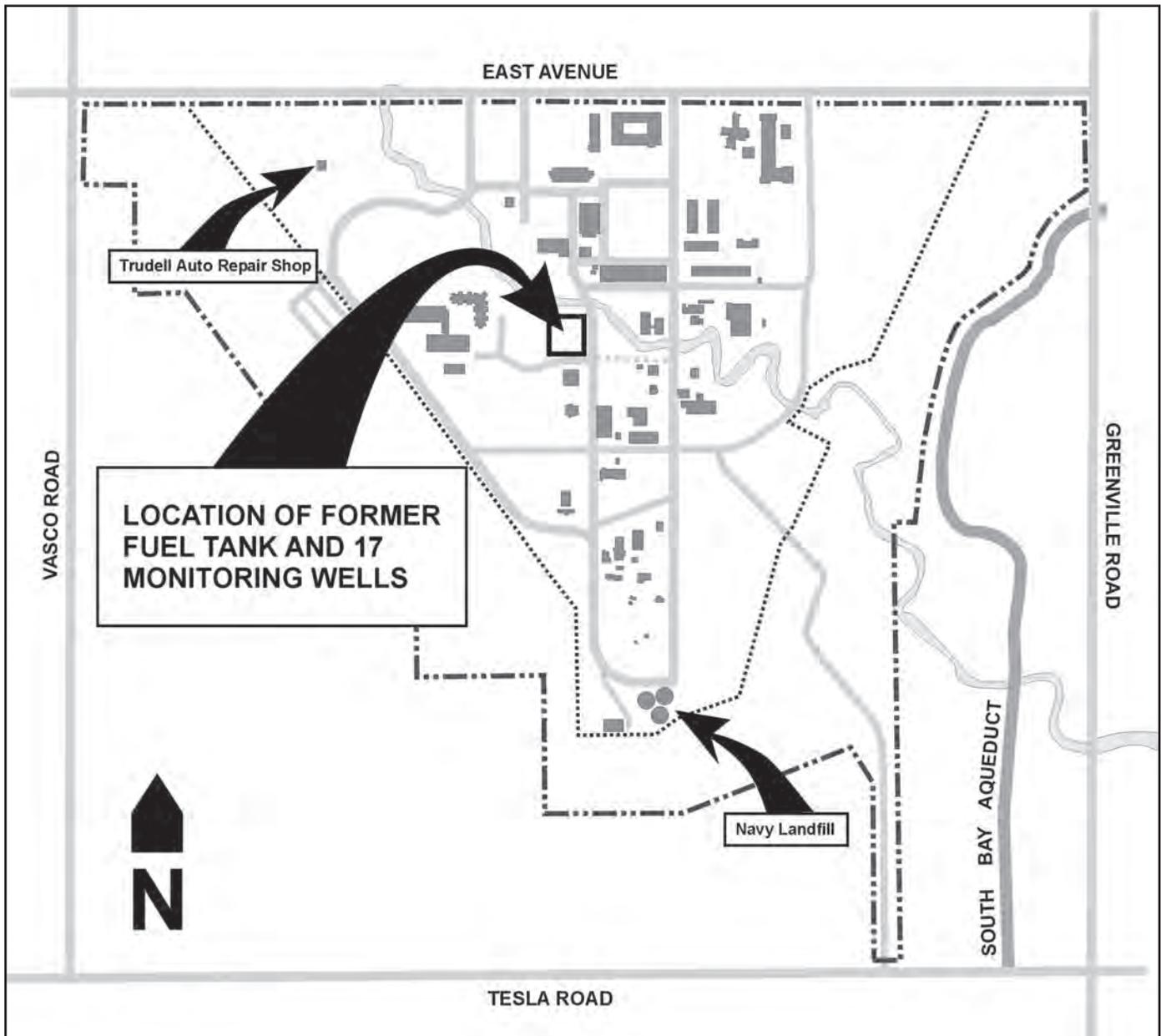
Figure 4-7. Existing and Former Groundwater Monitoring Well Locations excluding Fuel Oil Spill Wells

A network of monitoring wells is used to collect samples for environmental monitoring.

Total petroleum hydrocarbons (TPH)-Diesel continues to be a parameter of concern for SNL/CA because of the fuel oil spill site remediation. However, this site has been remediated, and the TPH-Diesel concentrations there continue to decrease.

Groundwater Quantity

The Livermore Valley groundwater basin is recharged from natural stream percolation; artificial stream percolation; aquifer storage; and recovery well, rainfall, applied water and subsurface groundwater inflow from adjacent



Source: Original

Figure 4-8. Fuel Oil Spill Groundwater Monitoring Well Locations

The former fuel tank is located south of Arroyo Seco. The Trudell Auto Repair Shop and Navy Landfill sites are located to the northeast and south, respectively.

groundwater basins. Stream recharge (natural and artificial) may contribute up to 65 percent by volume of recharge to the basin. At SNL/CA, Arroyo Seco provides recharge to the groundwater basin. The majority of the basin recharge would occur in the undeveloped uplands east and southeast of SNL/CA.

In general, most groundwater in the basin flows toward the west central portions of the valley. Groundwater generally moves east to west within the Livermore Valley; groundwater near the center of the valley moves toward the Amador subbasin and terminates in a large groundwater depression near gravel mining areas west of the

city of Livermore. This depression is created by extraction of groundwater for drinking water use and dewatering for gravel mining. Pumping groundwater for agricultural uses has historically accounted for the major withdrawal of groundwater from the Livermore Valley basin. As the valley has become increasingly urbanized, the amount of pumping for municipal use and gravel quarrying has exceeded agricultural withdrawals. Municipal use accounts for approximately 52 percent. Numerous in-use domestic supply wells and public water supply wells are located near SNL/CA. The total volume of agricultural water use has decreased from 1,420 acre-ft in 1990 to 203 acre-ft in 1999 (SNL/CA 2002b).

4.5.2 SURFACE WATER

4.5.2.1 Definition of Resource

The surface water system on SNL/CA is a reflection of the dry climate of the area. There are no perennial streams or other natural surface water bodies at SNL/CA. The Arroyo Seco, an ephemeral and intermittent stream, diagonally traverses the site, entering along the southeast border and leaving the site along the northwest corner. The arroyo flows only in very wet years and for short periods of time after significant storm events. Along the eastern part of the Arroyo, however, an area designated as a wetland is wet well into June and sometimes July. This wetland may supply a small contribution to ground-water recharge, as do other streams in the general area.

4.5.2.2 Region of Influence

The ROI for surface water is Arroyo Seco and the watershed downstream from SNL/CA. Surface water flowing in Arroyo Seco and subject to SNL/CA influences can affect LLNL and the City of Livermore.

Surface Drainages

The major surface drainage of SNL/CA is Arroyo Seco (Figure 4-8). The arroyo flows only in very wet years and for short periods of time after significant storm events. Along the eastern part of the Arroyo, however, an area designated as a wetland is wet well into June and sometimes July. Several locations in the Arroyo are wet year-round because of irrigation runoff from landscaped areas. Storm drains from the developed portions of the site discharge roof and parking lot runoff into the creek channel at various locations. For the most part these flows are of short duration—creating some in-channel flow that fills pools and may run down the channel for some distance—and are generally rapidly absorbed by the alluvial material (GMA 2001a).

The peak discharge of the Arroyo Seco for a 2-year flood is estimated to be 100 cubic ft per second (cfs). The peak discharge of a 100-year flood is estimated to be 2000 cfs. A more detailed hydraulic analysis of the Arroyo can be found in the *Arroyo Seco Improvement Project Progress Report* (GMA 2001b). The SNL/CA storm water conveyance system transports surface runoff to the Arroyo Seco or to a ditch along East Avenue (Figure 4-9). The channel along East Avenue is predominantly dirt, and runoff eventually infiltrates into the ground or evaporates. During heavy storms, the water in the channel flows west and eventually discharges to the Arroyo Seco via an under-ground-corrugated pipe.

The arroyo and the East Avenue channel are monitored during the wet season as part of the SNL/CA storm water program. Monitoring includes determining the arroyo

water quality as it enters the site, at various points within the site, and as it leaves the site.

No regulatory limits have been set for pollutants in storm water runoff. No pollutants were detected at levels that would be a cause for concern during previous fire years. Storm water quality data for the past five years (1996-2000) are presented in the EID.

Floodplains and Wetlands

All of SNL/CA drains to the Arroyo Seco. During the rainy season, from October to April, the arroyo is a potential source of flooding onsite. It has a drainage length of approximately 12 mi and a watershed area of approximately 8,960 acres upstream of SNL/CA. The channel is narrow and shallow as it enters the site from the east and reaches a depth of 20 ft further downstream as it leaves the site to the northwest. Storm water from the site is collected and channeled to the arroyo through gutters, culverts, and open ditches. Open ditches and storm drains at the site are designed for a 10-year storm and may experience local flooding during the rainy season.

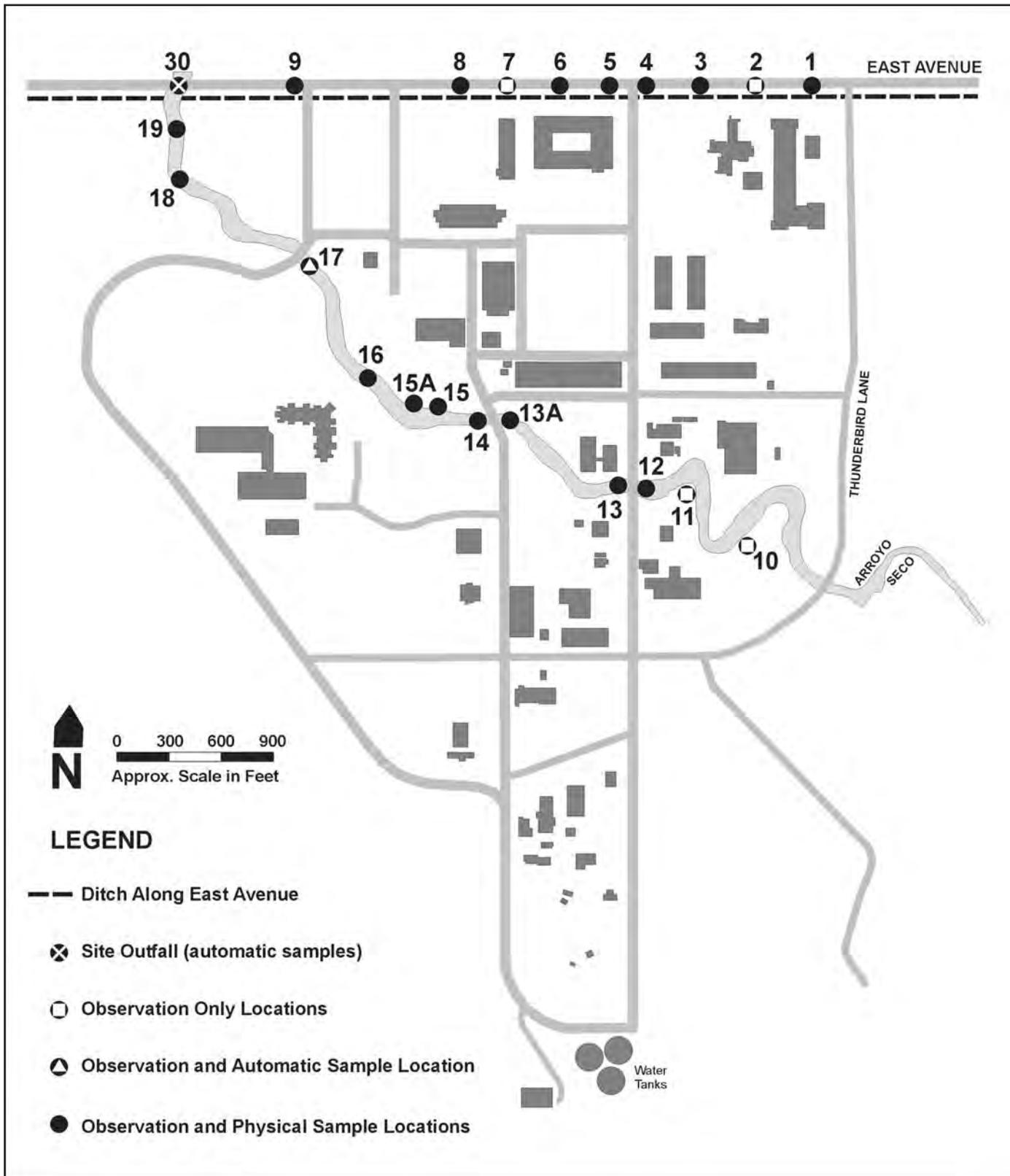
Upstream, in the upper two-thirds of the wetland, there is a functional floodplain. In the lower one-third, the effects of channel incision become apparent as both banks are elevated 6 to 10 ft above the channel and there is no functional floodplain. Floodplain maps indicate that along most of the channel on SNL/CA property, the entire 100-year discharge is contained within the existing channel. Between A Street and Thunderbird Lane, however, FEMA mapping indicates that flood flows would spill out of the channel; this likelihood appears to be associated primarily with the culverts at a manmade land bridge,

What is a Floodplain?

A floodplain is defined as the valley floor adjacent to a streambed or arroyo channel that may be inundated during high water. Flood insurance studies were performed for the Federal Emergency Management Agency (FEMA) to determine flood hazards in the Alameda County area and to identify the approximate limits of the 100-year floodplain.

What is a Wetland?

The *Clean Water Act* defines wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs.



Source: SNL/CA 2002b

Figure 4-9. Storm Water Outfall Locations
Storm water flow through Arroyo Seco is to the northwest.

which was in place when the FEMA study was conducted. In 1998, during a period of heavy flow, the discharge did spill out of the channel at this location (GMA 2001a).

The wetland area of SNL/CA is approximately 1,370 ft of the Arroyo Seco channel starting several hundred ft east of Thunderbird Lane and extending east to the property boundary. The wetland is approximately 8 ft wide except near the property boundary where it averages 20 to 30 ft wide; it occupies 0.44 acres (SAIC 1998a). The wetland area is a seasonal marsh. Vegetation is discussed in Section 4.6.3.3.

In 1998, SNL/CA proposed a project to restore a portion of the arroyo embankment and streambed at the east buffer zone fence crossing and at the east buffer zone trash rack and to remove the manmade land bridge within the main SNL/CA site area. All three project sites are designated flood zones, and the fence crossing and trash rack are within the wetland. The *Floodplain/Wetlands Assessment for Proposed Embankment and Streambed Restoration Project in the Arroyo Seco* (SNL/CA 1999a) assessed project impacts. Based on the assessment and to mitigate disturbance to the wetland area caused by maintenance activities performed there, the wetland area was replanted in December 1999. Plugs of native wetland plants were collected from the Arroyo Seco and replanted in the disturbed areas. Additionally, the bank of the arroyo was reseeded with a mixture of native grasses. The growth of the plantings was monitored, successful, and reported to the California Department of Fish and Game (CDFG). SNL/CA is required by CDFG to monitor the replanted wetland for three years.

Surface Water Quality—Storm Water Runoff

SNL/CA has a Storm Water Pollution Prevention Plan (SWPPP), as required by the State Water Quality Control Board's General Industrial Activities Storm Water Permit (General Permit). The SWPPP discusses the site's storm water drainage system, the rationale for choosing discharge observation locations, and the rationale for choosing storm water sampling locations; it identifies best management practices to reduce pollutant contact with storm water.

Pollutants may be picked up by storm water runoff. If a storm event lasts long enough there may be sufficient runoff to transport the pollutant to the Arroyo Seco before the runoff evaporates or infiltrates into the ground. The amount of runoff is a function of the permeability of the ground surface or cover material. Approximately 12 percent of the site's 410-acre drainage to the Arroyo is impervious (buildings, roads, parking lots, etc.) (SNL/CA 2002b).

The current SNL/CA storm water runoff-monitoring program includes visually inspecting 22 locations and sampling nine locations, shown in Figure 4-10. No pollutants were detected at levels that would be a cause

of concern during 1995 to 1999 (SNL 1996a, 1997a, 1998a, 1999a, 2000a).

Authorized Nonstorm Water Discharges

The General Permit allows specific nonstorm water discharge that does not exceed quantities of pollutants. Best management practices have been developed to prevent or reduce the contact of nonstorm water discharges with materials of concern or equipment and to minimize the flow volume of the nonstorm water discharges. Authorized nonstorm water discharges onsite include air conditioning condensate, fire auxiliary building system and hydrant testing, safety wash testing, landscape irrigation, and emergency deionized water release. These discharges are not sampled but are inspected quarterly as part of the quarterly nonstorm water discharge visual observations of the site.

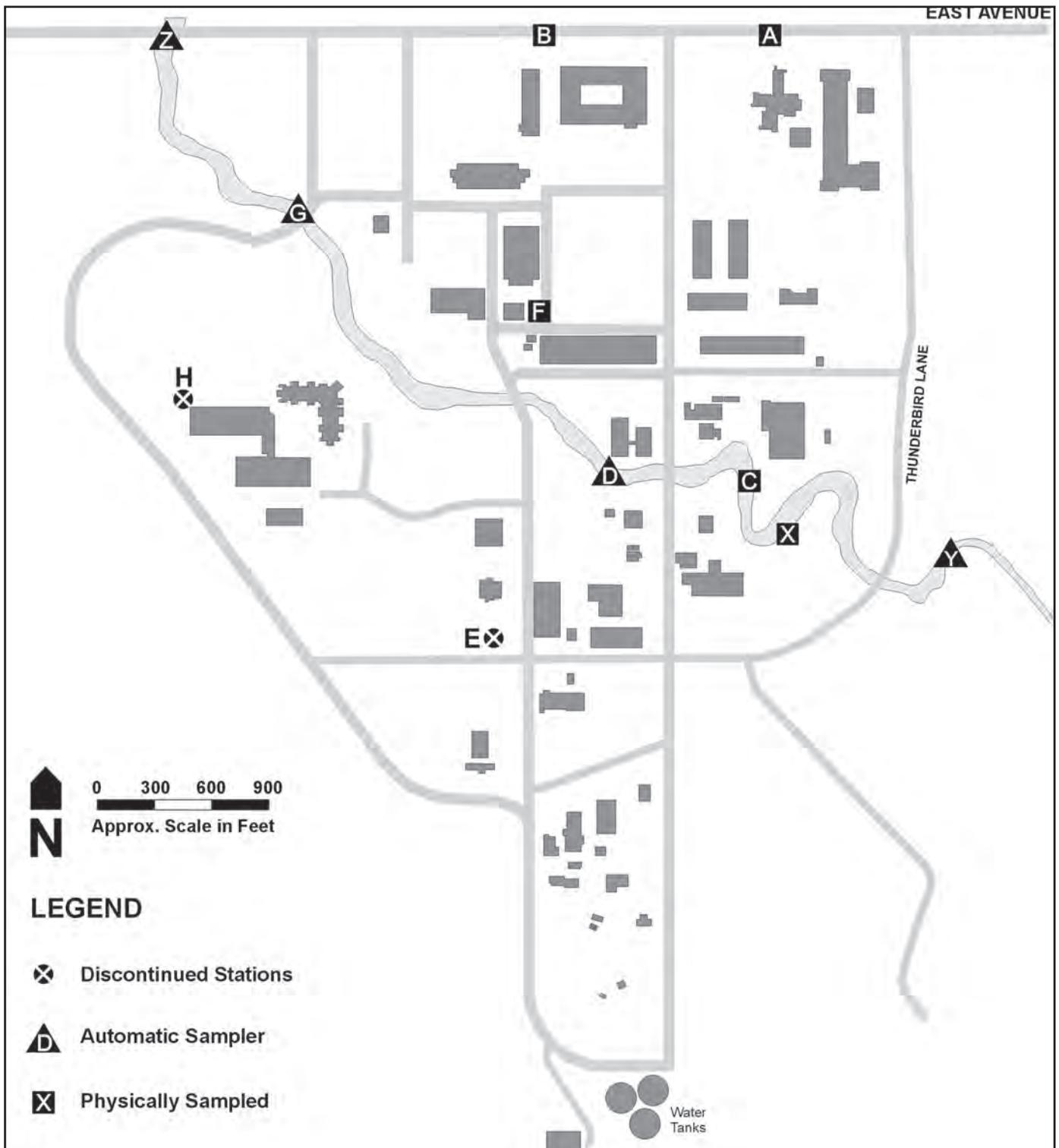
Sanitary Sewer Discharges

The DOE Sandia Site Office (SSO) and SNL/CA maintain a wastewater discharge permit issued by the City of Livermore. This permit regulates SNL/CA sanitary and industrial effluent, which is discharged to the city's sewer system, and enforces the requirements of the Federal *Clean Water Act* (CWA). The permit is renewed annually. It contains discharge limits for the site sanitary sewer outfall and for processes subject to U.S. Environmental Protection Agency (EPA) pretreatment standards. The permit also contains liquid effluent monitoring and reporting requirements.

The sanitary sewer effluent from SNL/CA must comply with the site outfall discharge limits for regulated physical parameters, radionuclides, and EPA priority organic pollutants. Two SNL/CA operations are subject to the EPA's pretreatment standards for point sources: one metal finishing and one semiconductor manufacturing operation. Another metal finishing operation is a closed loop process and does not discharge to the sanitary sewer; no sampling of this process is required.

Sanitary fixtures, serving office and work space for over 1,000 employees (including contractors), generate most of the wastewater discharged from SNL/CA. Laboratory and research processes produce only small and intermittent flows. These nonsanitary flows are generated by many independent sources, such as small-scale research and development (R&D) laboratories, throughout the site. SNL/CA's Wastewater Management Program tracks and documents potential sources of pollutants for both regulated and unregulated constituents.

SNL/CA policy prohibits the discharge of regulated chemical wastes to the sanitary drains. This policy is backed up by the Waste Management Program onsite and by ongoing site-wide education. The Wastewater Management Program participates in laboratory planning activities so that



Source: Original

Figure 4-10. Storm Water Sampling Locations

Surface water flows are primarily during winter storms.

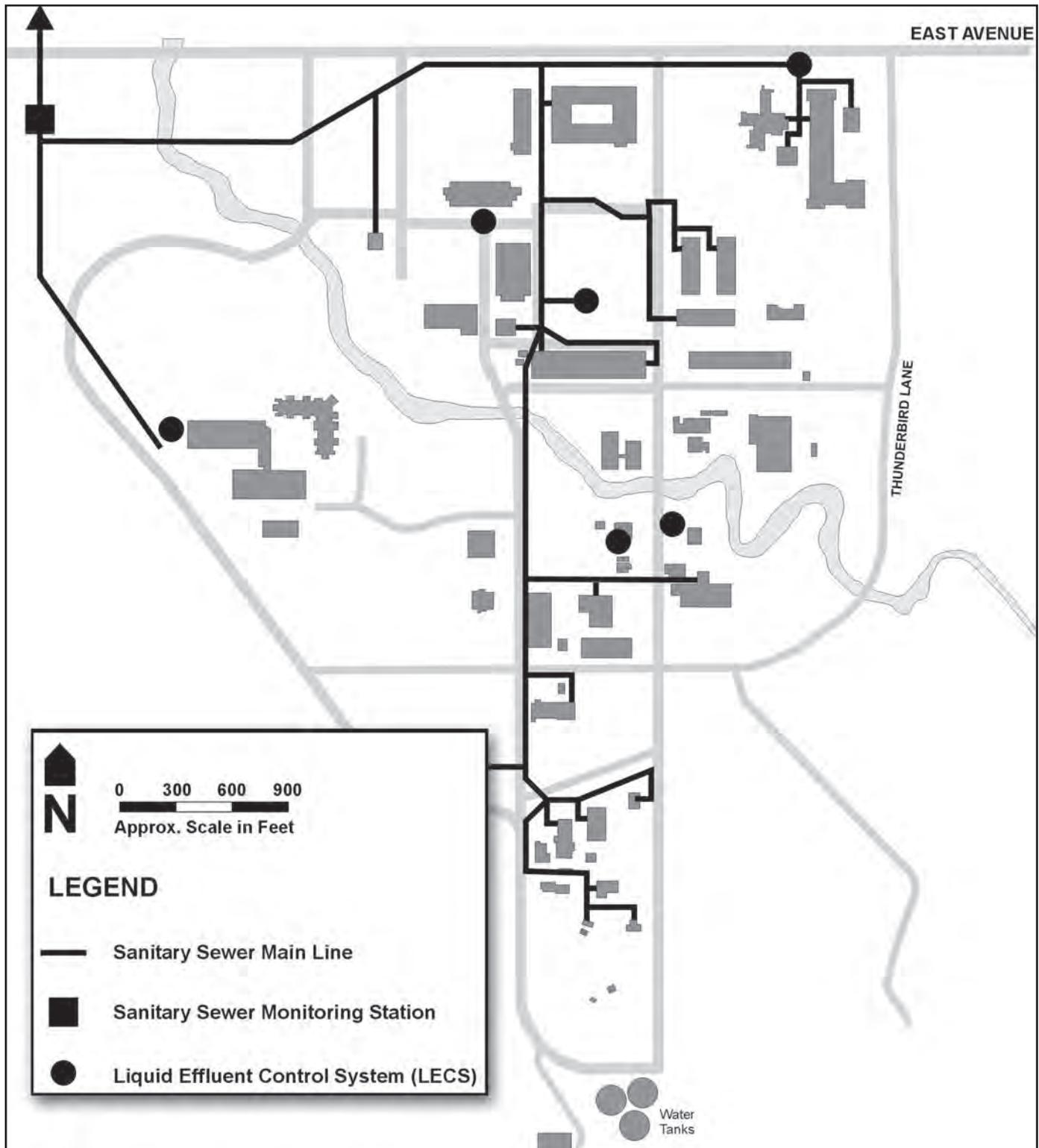
proper wastewater disposal practices are implemented when the processes go online.

The site operates a wastewater management control system whereby potentially contaminated laboratory wastewater is routed to retention tanks for analysis and proper

disposal. The Liquid Effluent Control System (LECS) provides a fail-safe mechanism for preventing any release of regulated materials from reaching a site outfall. Six LECS units currently serve the site's most active laboratories and research processes. Each LECS unit consists of one or more 2,000- to 5,000-gallon (gal) tanks. The con-

tents of the tanks are sampled and analyzed for metals and relative acidity (pH) before being discharged to the site’s sanitary sewer system. Figure 4-11 shows the LECS and the site sanitary sewer system.

SNL/CA maintains a wastewater monitoring station in the site’s northwestern security buffer area. The sewer discharges to the LLNL sewer system across East Avenue. SNL/CA maintains a flow meter, a pH meter, and two



Source: Original

Figure 4-11. Site Sanitary Sewer System and the Liquid Effluent Control System Locations
Sandia National Laboratories, California manages six Liquid Effluent Control Systems.

automatic samplers to comply with monitoring requirements. The liquid effluent from the SNL/CA sanitary sewer outfall is monitored for regulated physical parameters, metals, and EPA priority organic pollutants. The wastewater must comply with the site outfall discharge limits. Some slight exceedances have occurred, but these have had no impact on the receiving wastewater treatment plant (SNL 1996a, 1997a, 1998a, 1999a, 2000a).

Potable Water Use

SNL/CA purchases potable water from the adjacent LLNL. LLNL 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, Zone 7. The San Francisco Water District and Zone 7 are responsible for monitoring the quality of the incoming water. SNL/CA neither treats nor samples the drinking water. LLNL maintains the drinking water distribution system for both sites. Maintenance includes water quality screening analyses. In 2000, SNL/CA used approximately 53 million gallons (M gal).

4.6 BIOLOGICAL RESOURCES

4.6.1 DEFINITION OF RESOURCE

Biological resources at SNL/CA considered in this section are terrestrial resources, aquatic resources, wetlands, and protected and sensitive species.

4.6.2 REGION OF INFLUENCE

For biological resources, the affected environment consists of the plant and animal species within the boundaries of SNL/CA. Where appropriate, mention may be made of the proximity of protected or sensitive species that are not present at the site, but have been reported in the surrounding area.

4.6.3 AFFECTED ENVIRONMENT

4.6.3.1 Terrestrial Resources

Vegetation

SNL/CA is located on 410 acres, with approximately 130 acres currently developed for use as research facilities, offices, support facilities, roadways, and parking areas (SNL/CA 2002c). Undeveloped areas on the east, south, and west sides of the facility provide a security buffer zone and areas for future development. The following three terrestrial habitat areas have been identified in the undeveloped areas: grassland, coyote brush scrub, and riparian woodland (SNL/CA 2002b). The location of these habitats is presented in Figure 4-12.

Grasslands

Grasslands comprise 226 acres at SNL/CA and represent the predominant habitat in the open, undeveloped areas.

Although both native and nonnative species are present, nonnative species are dominant. Common nonnative grasses include ripgut brome (*Bromus diandrus*), soft chess (*B. hordeaceus*), wild oats (*Avena* sp.), and Mediterranean barley (*Hordeum marinum*). Common nonnative herbs include red maids (*Calandrinia ciliata*), bur clover (*Medicago polymorpha*), and cheeseweed (*Malva* sp.). Scattered patches or individual native wildflowers can be observed in the grassland habitat including Brodiaea (*Brodiaea* sp.), California poppy (*Escholzia californica*), blue dicks (*Dishelostemma capitatum*), and farewell to spring (*Clarkia purpurea*) (SNL/CA 2002b, SAIC 2001a).

Recent botanical surveys have confirmed the presence of mature valley oaks (*Quercus lobata*) in the grassland habitat, with many valley oak saplings identified on the east side of the site (SAIC 2001a). The locations of these sites are indicated in Figure 4-12 (SNL/CA 2002b). The presence of valley oak saplings at SNL/CA was considered noteworthy by the survey team. Several saplings that may be northern California black walnut (*Juglans californica hindsii*) were observed, but positive identification may not be possible for another several years (SAIC 2001a, SNL/CA 2002b).

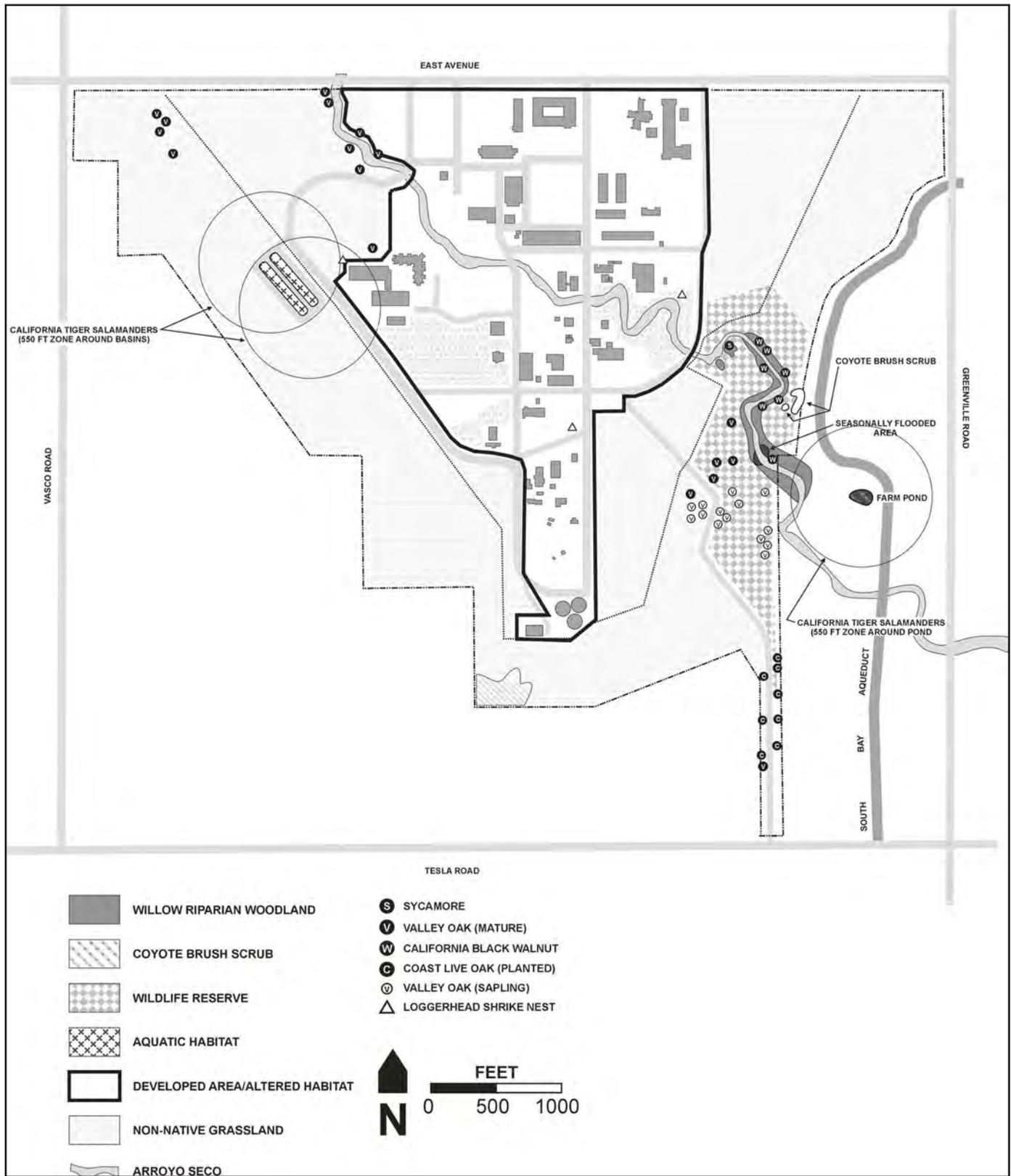
Eleven invasive exotic plant species have been identified at SNL/CA: bindweed (*Convolvulus arvensis*), bull thistle (*Cirsium vulgare*), Italian thistle (*Carduus pycnocephala*), mayweed (*Anthemis cotula*), Mediterranean mustard (*Hirschfeldia incana*), medusa head (*Taeniatherum caput-medusae*), milk thistle (*Silybum marianum*), pampas grass (*Cortaderia* sp.), pepperweed (*Lepidium latifolium*), purple star thistle (*Centaurea clacitrapa*), and yellow star thistle (*Centaurea solstitialis*) (SNL/CA 2002b, SAIC 2001a).

Coyote Brush Scrub

Two small areas of coyote brush scrub occur onsite. One is in the southwest corner of SNL/CA and the second is near the Arroyo Seco on the eastern property boundary. The total coyote brush scrub habitat is approximately 1.5 acres in size. It is located in steep and generally inaccessible areas where disturbance from site activities would be unlikely (SNL/CA 2002b).

Riparian Woodland

At SNL/CA, willow riparian woodland of approximately 2.4 acres is present along the eastern portion of the Arroyo Seco. This habitat has increased from just a few isolated patches in 1975 to a more dense and uniform cover along the arroyo (SNL/CA 2002b). A recent survey determined that dominant species include Goodding's black willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), and narrow-leaved willow (*Salix exigua*). Other common plant species include Fremont cottonwood (*Populus fremontii*), western sycamore (*Platanus racemosa*), and valley oak. A few immature trees were tentatively identified as northern California black



Source: SNL/CA 2002b

Figure 4-12. Wildlife and Habitat at Sandia National Laboratories, California, as of May 2001

walnut, although positive identification will not be possible for several years (SNL/CA 2002b, SAIC 2001a).

Wildlife

Wildlife species that have been recorded at SNL/CA include three amphibians, two reptiles, 58 birds, and 14 mammals. These animals have not been grouped by habitat, due to the relatively small size of the installation (0.64 square miles [sq mi] [1.66 square kilometers]) and mobile nature of most of the observed wildlife species (SNL/CA 2002b).

Two amphibians and two reptiles without *Endangered Species Act* (ESA) protection have been observed at SNL/CA. These include the western toad (*Bufo boreas*), Pacific chorus frog (*Pseudacris regilla*), western fence lizard (*Sceloporus occidentalis*), and gopher snake (*Pituophis melanoleucus*). An additional species not protected under the ESA, the California tiger salamander (*Ambystoma californiense*), has been observed at SNL/CA. Information on the California tiger salamander (*Ambystoma californiense*), a Federal candidate species, is provided in Section 4.6.3.4.

Birds are the most abundant group of vertebrates present at SNL/CA. Some of the bird species observed include the mallard (*Anas platyrhynchos*), American coot (*Fulica americana*), turkey vulture (*Cathartes aura*), American kestrel (*Falco sparverius*), mourning dove (*Zenaidura macroura*), northern flicker (*Colaptes auratus*), American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), red-winged blackbird (*Agelaius phoeniceus*), brown-headed cowbird (*Molothrus ater*), Brewer's blackbird (*Euphagus cyanocephalus*), white-crowned sparrow (*Zonotrichia leucophrys*), song sparrow (*Melospiza melodia*), house finch (*Carpodacus mexicanus*), lesser goldfinch (*Carduelis psaltria*), and European starling (*Sturnus vulgaris*). None of the observed species have protection under the ESA, although several are protected under the MBTA (see Section 4.6.3.4).

Common mammals that are not protected by the ESA include the fox squirrel (*Sciurus niger*), California ground squirrel (*Spermophilus beecheyii*), and feral cat (*Felis catus*). Additional mammals observed include the desert cottontail rabbit (*Sylvilagus audubonii*), black-tailed jack rabbit (*Lepus californicus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), and opossum (*Didelphis virginiana*). A complete list of wildlife species sighted at SNL/CA since 1994 is provided in the SNL/CA EID (SNL/CA 2002b).

4.6.3.2 Aquatic Resources

Aquatic habitat of about 2.7 acres is present at the LLNL recharge basin on SNL/CA land in the west buffer. The recharge basin consists of two cells (or percolation ponds) to which water can be discharged into one or both cells

simultaneously. Cattail (*Typha* sp.) and rush (*Juncus* sp.) are among the most common plant species in the recharge basin. Much of the vegetation is removed during annual summer maintenance by LLNL when the cells are drained, with plant growth generally returning the following spring (SNL/CA 2002b). A survey in 2001 did not detect any California red-legged frogs (*Rana aurora draytonii*) or California tiger salamanders (*Ambystoma californiense*), but confirmed that the ponds are suitable habitat for both species (see Section 4.6.3.4 for additional information on these two species).

4.6.3.3 Wetlands

Within the riparian woodland habitat are 0.44 acre of seasonal wetlands associated with Arroyo Seco, almost entirely in the east buffer zone. These delineated wetlands are present along 1,370 ft of the arroyo running from the eastern boundary to 200 ft east of the fence surrounding the developed part of the installation (SAIC 1998b). Along this portion of arroyo are a number of obligate (limited to certain conditions) wetland species including Goodding's black willow, willow dock (*Rumex salicifolius*), southern cattail (*Typha domingensis*), and water cress (*Rorippa nasturtium-aquaticum*). Facultative (capable of living under varying conditions) wetland species include arroyo willow, red willow, mugwort (*Artemisia douglasiana*), rush, rabbit's foot grass (*Polypogon monspeliensis*), stinging nettle, and nutsedge (*Cyperus eragrostis*). Pepperweed (*Lepidium latifolium*), an invasive exotic species, is also present (SNL/CA 2002b; SAIC 1998a, 2001a).

For a discussion on surface water (floodplains and wetlands), see Section 4.5.2.

4.6.3.4 Protected and Sensitive Species

Table 4-1 lists Federal and California species with protected or sensitive status that have been reported at or near SNL/CA.

The California red-legged frog (*Rana aurora draytonii*) is the only Federally threatened or endangered species that has been found in close proximity to SNL/CA. The California red-legged frog is known to occur at LLNL and in the farm stock pond on adjacent property on the east side of SNL/CA (SAIC 2001a). It was not sighted during a 2001 survey of the Arroyo Seco drainage and the recharge basin on the west side of the site. This survey concluded that although the recharge basin provides suitable habitat for part of the year, the irregular drainage during the breeding season of the California red-legged frog minimizes the use of this habitat on a year-round basis (SAIC 2001a).

The U.S. Fish and Wildlife Service (USFWS) has designated critical habitat for the California red-legged frog as shown in Figure 4-13 (66 FR 14626, SNL/CA 2002b).

Table 4-1. Federal and California Species With Protected or Sensitive Status Reported At or In the Vicinity of Sandia National Laboratories, California

Common & Scientific Names	Found Onsite ^a	Federal Status ^b	State Status ^b
Amphibians and Reptiles			
California Tiger Salamander (<i>Ambystoma californiense</i>)	Yes ^c	Candidate for listing	Species of special concern
California Red-legged Frog (<i>Rana aurora draytonii</i>)	No ^{d, e}	Threatened	
Alameda Whipsnake (<i>Masticophis lateralis euryxanthus</i>)	No ^d	Threatened	Threatened
Birds			
Western Burrowing Owl (<i>Athene cunicularia</i>)	Yes ^f	MBTA	Species of special concern
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	Yes	MBTA	Species of special concern
White-tailed Kite (<i>Elanus leucurus</i>)	Yes ^f	MBTA	Fully protected
Golden Eagle (<i>Aquila chrysaetos</i>)	Yes	MBTA	Species of special concern
Northern Harrier (<i>Circus cyaneus</i>)	Yes	MBTA	Species of special concern
Cooper's Hawk (<i>Accipiter cooperii</i>)	Yes	MBTA	Species of special concern
Ferruginous Hawk (<i>Buteo regalis</i>)	Yes	MBTA	Species of special concern
Red-tailed hawk (<i>Buteo jamaicensis</i>)	Yes	MBTA	Species of special concern
Mammals			
San Joaquin Kit Fox (<i>Vulpes macrotis mutica</i>)	No	Endangered	Threatened
Mountain Lion (<i>Felis concolor californica</i>)	Yes	None	Special protected mammal

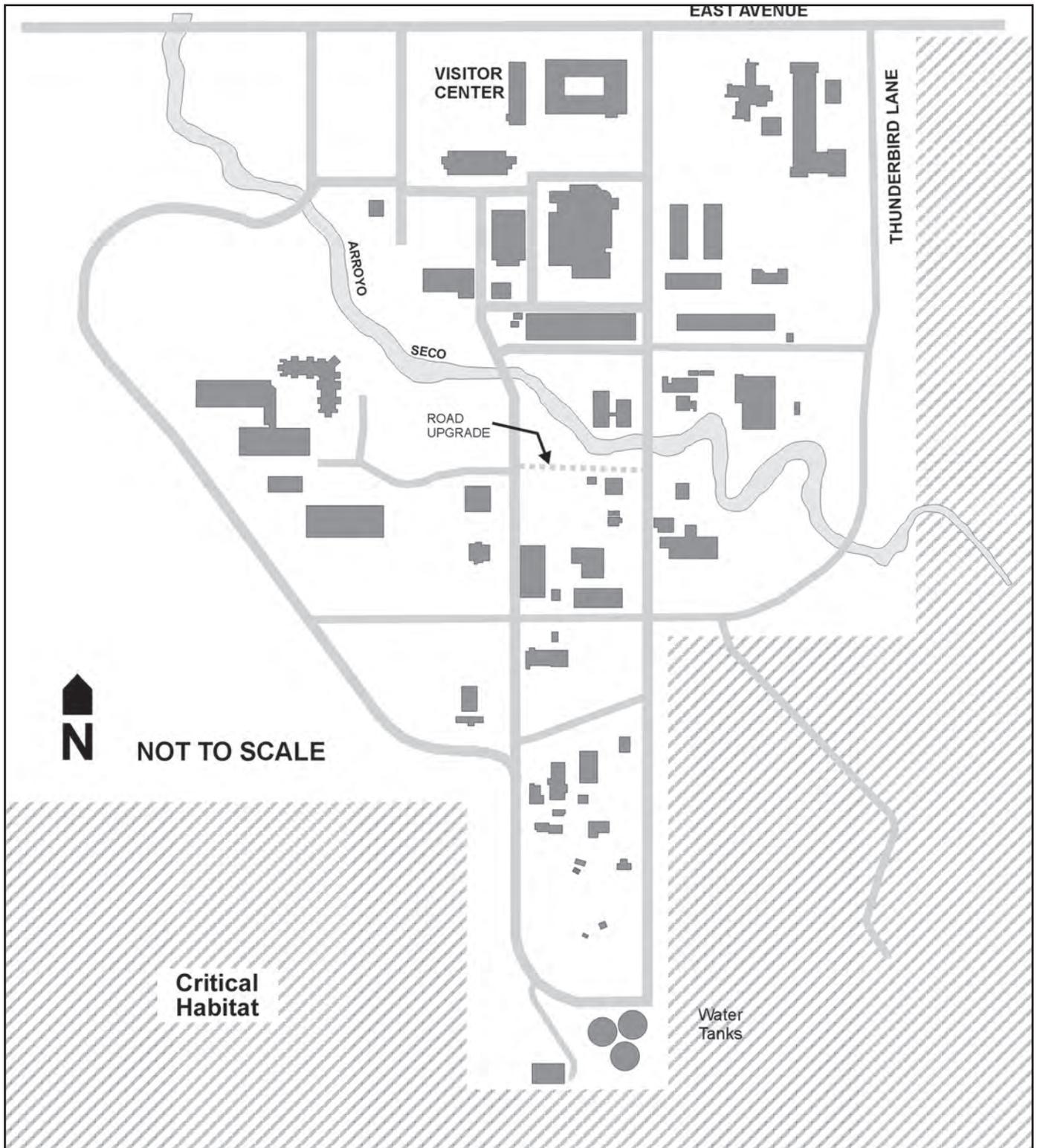
Source: SNL 2001e

MBTA: *Migratory Bird Treaty Act*^aOnsite observation records in the table were made between 1994 and 2001.^bSome species are protected by more than one regulation. Only the most commonly used are listed.^cThis species has previously been observed at SNL/CA, but was not detected during a 2001 protocol survey.^dThis species has not been seen at SNL/CA but is present in the vicinity.^ePortions of SNL/CA have been designated as critical habitat for the California red-legged frog.^fThis species has previously been observed at SNL/CA, but has not been sighted since 1997.

This habitat consists of the undeveloped portion of the east and south buffer zone (SNL/CA 2002a). A protocol survey in 2001 concluded that the Arroyo drainage is marginal habitat for year-round use by the California red-legged frog, but may serve as a travel corridor during the wet season (SAIC 2001a).

In 2001, a CDFG protocol survey was conducted for the San Joaquin Kit Fox (*Vulpes macrotis mutica*), a species with Federal endangered and California threatened status. The survey confirmed that this species is not present at SNL/CA (SAIC 2001a).

In August 2000, a habitat assessment was conducted at SNL/CA for the Alameda whipsnake (*Masticophis lateralis euryxanthus*), another species with Federally threatened status (Swaim 2000a). The investigation concluded that there is no suitable habitat present at SNL/CA for this species (Swaim 2000a, SNL/CA 2002b). The closest documented record of an Alameda whipsnake to SNL/CA appears to be approximately eight miles northwest of the site on Morgan Territory Road (Swaim 2000a). Although no critical habitat has been designated for the Alameda whipsnake at SNL/CA, critical habitat exists just to the south of the site (SNL/CA 2002b).



Source: SNL 2001d

Figure 4-13. Critical Habitat for California Red-legged Frog at Sandia National Laboratories, California

Species that are Federally proposed or candidates for listing as threatened or endangered do not receive legal protection under the ESA (42 U.S.C. §1531). Candidate species include those plants and animals for which the USFWS has on file sufficient information on biological

vulnerability and threat to support issuance of a proposed rule for listing as threatened or endangered. However, the USFWS encourages the consideration of impacts to these species in project planning since their status can be changed to threatened or endangered in the near future.

The California tiger salamander (*Ambystoma californiense*) is a Federal candidate species that does not receive protection under the ESA. However, the DOE implementing regulations require the consideration of candidate species during its NEPA process. In December 2001, the California Fish and Game Commission rejected a petition to list the California tiger salamander as an endangered species under the *California Endangered Species Act* (SNL/CA 2002b). The California tiger salamander has not been seen at SNL/CA in the last two years, although SNL/CA records indicate previous sightings at the recharge basin cells, at water towers, and at Post 15. The recharge basin cells and a farm pond on adjacent property just east of the site provide the most suitable habitat for the California tiger salamander as shown in Figure 4-11 (SNL/CA 2002b, c). A recent radio telemetry monitoring study indicated that California tiger salamanders do not travel more than about 560 ft from surface bodies of water and use mammal burrows such as those of the California ground squirrel (*Spermophilus beechii*) when away from breeding ponds (Trenham 2001, SNL/CA 2002b).

The USFWS species of concern category includes former Category 2 species (such as species possibly appropriate for listing). Species of concern is a term that describes many plants and animals whose conservation status may be of concern to the USFWS, but do not have official status. Two Federal species of concern have been observed at SNL/CA. Several pair of loggerhead shrikes (*Lanius ludovicianus*) were observed at SNL/CA in 2001, with nest locations shown in Figure 4-12 (SAIC 2001a). This bird has also been designated by California as a species of special concern (SNL 2001e). No evidence of the western burrowing owl (*Athene cunicularia*) was detected during a biological survey in 2001. This owl is also a California species of special concern. Two pairs of burrowing owls were observed at SNL/CA in 1995 near the percolation ponds and again in 1996 and 1997 (SAIC 2001a).

For the consultation procedures of the ESA and section 7(c) of the 1978 amendments, the DOE has compiled information on the California red-legged frog, designated critical habitat for the California red-legged frog, and the California tiger salamander to assess possible effects that the proposed action would have on these species and critical habitat. A biological assessment has been prepared and submitted to the USFWS.

A number of species in Table 4-1 receive protection under the *Migratory Bird Treaty Act* (16 *United States Code* [U.S.C.] § 703). The golden eagle, for example, which has been sighted as a transient over the site, is also afforded protection under the *Bald and Golden Eagle Protection Act* (16 U.S.C. § 668). The loggerhead shrike is the only bird species listed in Table 4-1 that is currently nesting at SNL/CA. The ferruginous hawk (*Buteo regalis*) and northern harrier (*Circus cyaneus*) have been occasionally observed at

SNL/CA since 1994 and may use the area for foraging (SAIC 2001a, SNL/CA 2002b).

4.7 CULTURAL RESOURCES

4.7.1 DEFINITION OF RESOURCE

Cultural resources are prehistoric or historic archaeological sites, buildings, structures, districts, objects, or places considered important to a culture or community. Cultural resources are those that have been recommended as or determined to be eligible or potentially eligible for inclusion in the National Register of Historic Places (NRHP), or are religious or sacred sites important to Native Americans.

In order to be included in the NRHP, a resource should retain most, if not all, of seven aspects of integrity: location, design, setting, workmanship, material, feeling, and association. Based on the standards of the National Park Service (NPS), the resource must meet a cutoff date of 50 years in age to be eligible, thereby allowing the historical perspective necessary to evaluate significance. Finally, a resource must meet one or more of the following criteria of importance (36 *Code of Federal Regulations* [CFR] Part 60):

Criterion A—Associated with events that have made a significant contribution to the broad patterns of our history.

Criterion B—Associated with the lives of persons significant in our past.

Criterion C—Embodies the distinctive characteristics of a type, period, or method of construction.

Criterion D—Yielded or may be likely to yield information important in prehistory or history.

4.7.2 REGION OF INFLUENCE

The ROI includes the entire SNL/CA site. The resources include those already identified, as well as those that have not yet been discovered, such as buried archaeological sites and unknown Native American resources. The site currently includes both built areas and undisturbed areas, and the area surrounding the site is a mix. Any changes in land use, such as construction of new buildings, would not change the visual characteristics of the area. Thus, there is no concern for visual impacts to nearby cultural resources and the ROI does not extend off the site.

4.7.3 AFFECTED ENVIRONMENT

4.7.3.1 Overview of Cultural Resource Studies and Results

SNL/CA has conducted two comprehensive studies of cultural resources on the site. In 1990, an assessment of

cultural resources was completed and included a review of literature and official documents, field inventories, and consultation with the California Native American Heritage Commission (Busby *et al.* 1990). The goal of the assessment was to identify any potentially important cultural resources located on SNL/CA, including prehistoric, historic, and Native American resources. The field inventories included all areas outside of the central building compound. Within the compound, the field inventories included all open or otherwise undeveloped areas. An assessment of the existing buildings was also conducted. Finally, the Native American Heritage Commission, and a person knowledgeable of resources important to the tribe that inhabited the area historically, was consulted to identify any religious resources and sacred sites important to Native Americans. The only resources identified on the site were the buildings and structures associated with SNL/CA—no prehistoric resources, Native American resources, or historic archaeological sites were identified. Busby *et al.* (1990) recommended that none of the buildings or structures identified were eligible or potentially eligible for the NRHP.

In October 2001, SNL/CA conducted an in-depth SNL/CA historic building survey (SNL 2001d). The survey provided an historic context within which the buildings would be evaluated for significance under the criteria listed above (SNL 2001f). At the time, there were 70 buildings on the site, of which 45 were included in the survey. These buildings included permanent and semipermanent facilities; temporary and mobile structures were not included. The survey found that none of the buildings were historically significant or eligible for the NRHP. The results of this historic building survey will be sent to the State Historic Preservation Officer (SHPO) for consultation.

4.7.3.2 Unidentified Sites

Despite the apparent lack of important resources on SNL/CA, there remains the possibility for currently unidentified resources to be located there. These unidentified resources would most likely consist of buried archaeological sites. Soils underlying SNL/CA, which were deposited because of alluvial transport, are Holocene in age (deposited in the past 10,000 years) and thus there is the potential for buried sites. No buried archaeological sites have yet been discovered on SNL/CA. These types of resources would only be discovered during construction or other ground-disturbing activities.

4.7.4 CULTURAL RESOURCE PROTECTION AT SANDIA NATIONAL LABORATORIES, CALIFORNIA

Because activities at SNL/CA are conducted by a federal agency or by its contractors, there is a body of legislation applicable to all Federal agencies that protect cultural resources at SNL/CA (see Chapter 7). The DOE has

implementing regulations and policies that follow this legislation. In addition, there are personnel assigned within DOE and SNL with responsibility for overseeing compliance with these regulations and policies. Proposed undertakings at the site undergo review by the DOE to determine if the proposed activity will affect important cultural resources. These determinations are then reviewed by the California SHPO. If there is a potential for impacts to occur, the DOE and the SHPO consult on measures to be implemented to avoid, reduce, or mitigate any potential adverse impacts.

4.8 AIR QUALITY

4.8.1 DEFINITION OF RESOURCE

Measuring or modeling ambient pollutant concentrations and comparing the concentrations to the corresponding standards determine ambient air quality. The EPA has set the National Ambient Air Quality Standards (NAAQS) as directed by the *Clean Air Act* (CAA) of 1970 (42 U.S.C. §§7401-7671q) for several criteria pollutants to protect human health and welfare (40 CFR Part 50). The primary NAAQS are established at levels necessary to protect human health with an adequate margin of safety while the secondary NAAQS specify the levels of air pollution determined appropriate to protect the public welfare from any known or anticipated adverse effects associated with air contaminants. These pollutants include particulate matter less than 10 microns (μm) in diameter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb) and ozone (O_3).

In addition, two additional criteria pollutant standards promulgated by EPA, the 8-hour ozone standard and the standard for particulate matter up to 2.5 μm in diameter ($\text{PM}_{2.5}$), have recently been upheld by the courts with implementation of the standards expected around 2005. The EPA will then determine the attainment or non-attainment status of an area with respect to the new standards and require the states to submit an implementation plan to address any noncompliance.

Enforcement authority of the CAA regulations for non-radiological air emissions has been delegated to the local air quality management districts. SNL/CA is within the Bay Area Air Quality Management District (BAAQMD) that regulates emission sources under the CAA and State Ambient Air Quality Standards (SAAQS).

4.8.2 REGION OF INFLUENCE

Regional air quality is influenced by the quantity of air pollutants emitted to the atmosphere within the region, by the quantity of air pollutants transported into the region, and by local geography, meteorology, and climate. The ROI for SNL/CA air quality is the Livermore Valley basin. SNL/CA is located in the southeastern portion of

the Livermore Valley and is surrounded by hills ranging from 900 to 1800 ft above the valley floor. The topography surrounding SNL/CA helps to channel air pollutants through the valley. A predominant southwesterly wind enters the Dublin gap transporting air pollutants into the basin and then exits the Livermore Valley through the Altamont Pass transporting air pollutants from the valley. A northeast wind component recirculates a portion of air pollutants back into the valley.

4.8.3 AFFECTED ENVIRONMENT

4.8.3.1 Regional Climatology

The climate in the San Francisco region is Mediterranean, characterized by cool, wet winters and hot, dry summers. The microclimates within the region are influenced by the Pacific Ocean. Generally, the coast often experiences fog and moderate temperatures, whereas the inland valleys experience more sunshine and extreme temperatures. In the summertime, it is not uncommon for the Livermore Valley to experience temperatures higher than coastal areas (such as San Francisco). In winter, temperatures in the valley are usually cooler than at the coast.

During the dry season (June through September), days are typically sunny and warm. The regional airflow is dominated by a sea breeze as cooler marine air from the coast passes through the valley to replace the rising warm air in the San Joaquin valley. The marine air enters the valley through the Dublin gap to the west and exits the valley to the east through the Altamont Pass, resulting in strong west-to-southwest winds. Summer thunderstorms are infrequent, and tornadoes and hail are rare. The high temperatures and clear skies are favorable to ozone formation, and the surrounding hills can trap pollutants, leading to high air pollution episodes.

During the wet season (October through May), the climate is dominated by the passage of winter storms. Most of the annual rainfall occurs during this period. The sea breeze is not as prevalent in winter because the differential heating between the coast and San Joaquin valley is minimal. Although the wind direction is predominately from the southwest, there is also a strong northeast wind. Winds are generally lighter during this period; however, very strong winds often occur during winter storm events. Although temperatures can drop below freezing, measurable snowfall is extremely rare. Winter weather conditions combined with the valley topography can create strong surface based inversions, which can trap pollutants at the surface, leading to high air pollution episodes.

The average daily maximum, minimum, and monthly temperatures for Livermore for the period of record 1930 through 2000 are as follows:

- The average daily maximum temperatures range from 56.3 degrees Fahrenheit (F) in January to 89.4 degrees F in July.
- The average daily minimum temperatures range from 36.1 degrees F in January to 54.0 degrees F in July.
- The average daily temperature is 59.2 degrees F.

The Livermore average monthly maximum and minimum rainfall for the period of record from 1930 through 2000 are as follows:

- January is the wettest month with 3.0 inches.
- July is the driest with 0.02 inches.
- The average annual rainfall is 14.5 inches.

4.8.3.2 Sandia National Laboratories, California Meteorology

The Livermore meteorology for 1996 to 2000 has been summarized using data obtained from a meteorological tower located in LLNL and is presented as follows:

- The highest daily maximum of 107.6 degrees F occurred in August 1998.
- The lowest daily minimum of 24.8 degrees F occurred in January 1999 and December 1998.
- The average daily temperature is 59 degrees F.

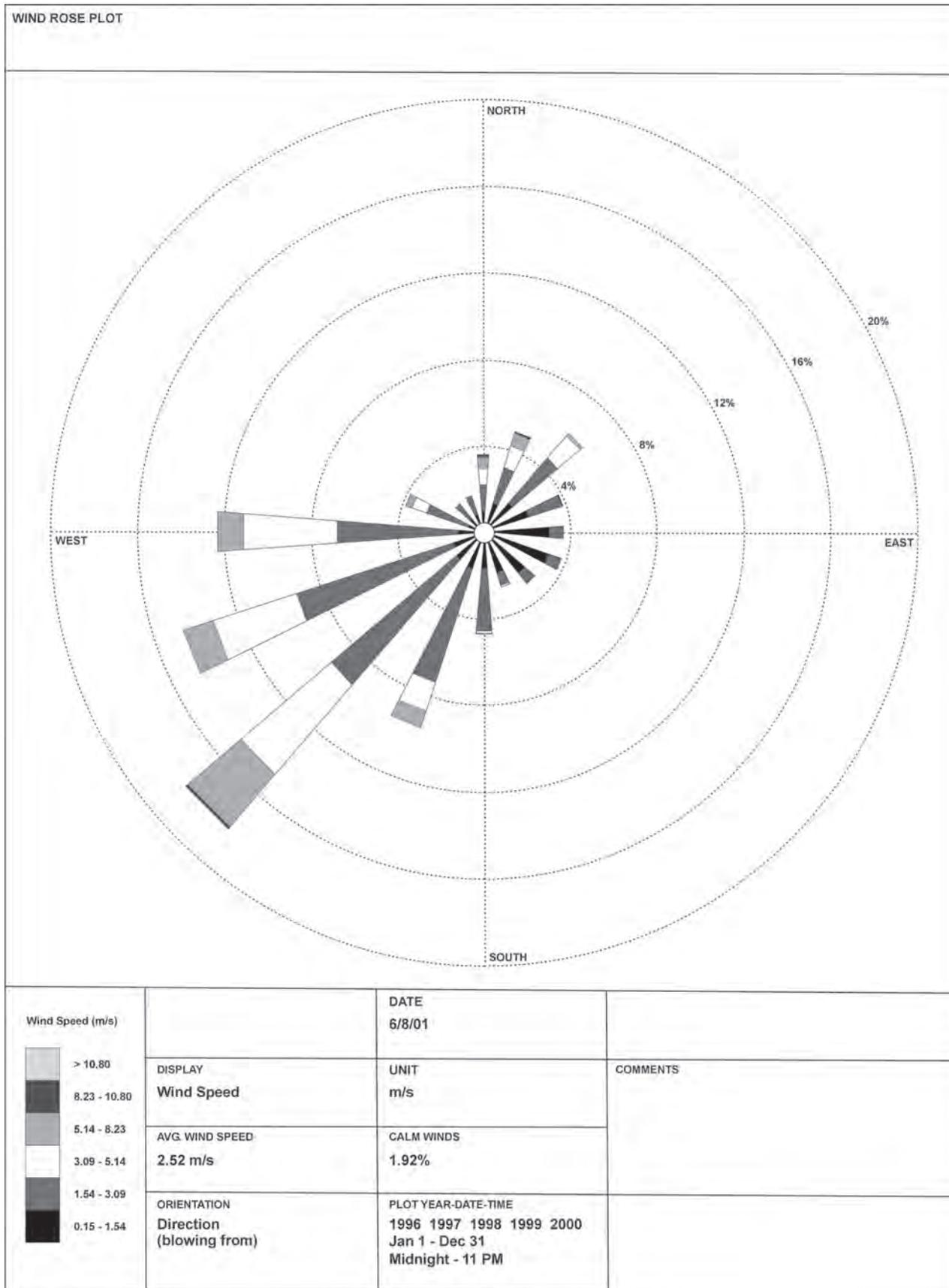
The monthly average rainfall exceeds 0.98 inches from November through March. The rest of the year is relatively dry with monthly average rainfall totals less than 0.98 inches.

- The maximum annual rainfall during the past five years was 20.6 inches occurring 1998.
- The minimum annual rainfall during the past five years was 9.64 inches occurring 1999.
- The average rainfall during the past five years was 12.9 inches.

Figure 4-14 presents a wind rose for 1996 through 2000 depicting wind speed and wind direction frequency. The predominant wind direction frequency is from the southwest and the maximum wind speeds occur from this direction. The windiest months occur in the spring and summer and are dominated by the westerly sea breezes. The winds during the fall and winter are typically lighter and more varied in direction.

- The maximum 1-hour average wind speed was 41.0 feet per second (ft/sec) during February 1997.
- The monthly average wind speed was 8.2 ft/sec.

Atmospheric stability is a measure of the atmosphere's ability to disperse pollutants. Pollutants tend to disperse more rapidly in unstable atmospheres. The atmospheric



Source: SNL/CA 2002b

Figure 4-14. Wind Rose 1996 through 2000

Typically, the wind is from the southwest.

Attainment—What is it?

The EPA designates all areas of the U.S. as having air quality either better than the NAAQS (“attainment”), worse than the NAAQS (“nonattainment”), or “unclassified” (when there is a lack of data for EPA to form a basis of attainment status).

stability is generally neutral due to the persistent winds. Moderately stable or very unstable atmospheres occur throughout the year.

4.8.3.3 Sandia National Laboratories, California Air Quality

The EPA designates all areas of the United States as having air quality better than the NAAQS (“attainment”), worse than the NAAQS (“nonattainment”), or “unclassified.” Pollutants in an area are often designated as unclassified when there is a lack of data for the EPA to form a basis of attainment status. In addition, the severity or magnitude of the exceedance for the criteria pollutants is determined by the amount that ambient air quality measurements are above the NAAQS. Based on the 1990 *Clean Air Act Amendments*, ozone nonattainment areas are classified as marginal, moderate, serious, severe, or extreme. Similarly, carbon monoxide (CO) and respirable particulate matter (PM₁₀) nonattainment areas are classified as moderate or serious (SNL/CA 2002b).

EPA has denoted the ozone classification of the nonattainment status for the criteria pollutant ozone in the San Francisco Bay Area as “Other.” On July 10, 1998, EPA published a final rule (63 FR 37258) redesignating the San Francisco Bay area to ozone nonattainment with the federal 1-hour ozone NAAQS. This redesignation was authorized under the general nonattainment provisions of Subpart 1 of the Clear Air Act. The Bay Area, therefore, does not have a Subpart 2 classification. When comparing to the traditional Subpart 2 classification, the Bay Area’s value is equivalent to that of a moderate area. In simple terms, “Other” is the equivalent of a “Moderate” nonattainment classification for ozone. The San Francisco-Oakland-San Jose area is classified by EPA as a carbon monoxide maintenance area.

California has adopted SAAQS that are more stringent for criteria pollutants than the NAAQS. In addition to the federal attainment designation, each air district has a state attainment designation. The California Air Resources Board (CARB) has designated the San Francisco Bay Area as nonattainment for ozone and PM₁₀ and as in attainment of all other criteria pollutants.

Pollutant monitoring results near SNL/CA indicate that the air quality in the Livermore area has generally been good. Table 4-2 presents a comparison of the NAAQS and SAAQS with criteria pollutant monitoring results for 1996 through 2000 from the closest monitoring stations to SNL/CA. The monitoring data indicate that the 24-hour PM₁₀ state standard was exceeded by the highest maximum concentration during 1997 through 2000 and by the second highest maximum concentration during 1998 through 2000. The 1-hour ozone state standard was exceeded by the highest and second highest maximum concentration for the period 1996 through 2000 while the NAAQS was exceeded by the highest and second highest maximum concentration during 1996, 1998, 1999, and 2000. Concentrations of the remaining criteria pollutants are below the NAAQS and SAAQS. Figure 4-15 shows the location of the monitoring stations from which data presented in Table 4-2 were compiled.

During the past five years, the number of permitted air emission sources at SNL/CA has decreased. However, air emissions from permitted sources have increased. The total pollutants emitted are not considered significant and have a minimal impact on the region’s air quality.

The number of permitted sources onsite has decreased from 29 to 20 (in 2002 the number decreased to 17) during the past five years. Table 4-3 presents each of 17 permitted emission source at SNL/CA and the types of significant emissions reported with the July 1, 2000 to June 2001 Permit to Operate.

Table 4-4 lists the criteria pollutant emissions from permitted sources during the past five years, the estimated emissions for the whole Bay Area, and the percent of SNL/CA emissions relative to district-wide emissions. Criteria pollutant emissions from SNL/CA are much less than one percent of those of the entire Bay Area. Table 4-5 presents the toxic pollutant emissions from permitted sources during the past five years, the estimated toxic emissions for the whole Bay Area, and the percent of SNL/CA toxic emissions relative to district wide emissions. Toxic pollutant emissions from SNL/CA are minor compared to those of the Bay Area.

Table 4-2. Comparison of 1996 to 2000 Criteria Pollutant Monitoring Results with Applicable National and California Ambient Air Quality Standards

Pollutant	Units	Averaging Period	State Standards	NAAQS		Measurements ^e				
						1996	1997	1998	1999	2000
CO ^(a)	ppm	1-hour	20	35	1 st Max	4.9	4.6	4.3	5.2	4.5
					2 nd Max	4.7	4.4	4.1	4.5	4.4
		8-hour	9.0	9	1 st Max	2.5	2.5	2.4	2.9	2.7
					2 nd Max	2.4	2.3	2.3	2.5	2.5
NO ₂ ^(b)	ppm	1-hour	0.25	--	1 st Max	0.086	0.082	0.071	0.094	0.073
					2 nd Max	0.079	0.074	0.069	0.088	0.07
		Annual Arithmetic Mean	--	0.053	--	0.019	0.018	0.019	0.02	0.017
PM ₁₀ ^(a)	µg/m ³	24-hour	50	150	1 st Max	47	55	56	119	70
					2 nd Max	44	48	52	94	55
		Annual Arithmetic Mean	--	50	--	19.8	20.5	17.8	22.7	21.7
		Annual Geometric Mean	30	--	--	--	--	--	--	--
Ozone ^(b)	ppm	1-hour	0.09	0.12	1 st Max	0.138	0.114	0.146	0.146	0.137
					2 nd Max	0.137	0.111	0.139	0.144	0.126

Table 4-2. Comparison of 1996 to 2000 Criteria Pollutant Monitoring Results with Applicable National and California Ambient Air Quality Standards

Pollutant	Units	Averaging Period	State Standards	NAAQS		Measurements ^e				
						1996	1997	1998	1999	2000
SO ₂ ^(c)	ppm	1-hour	0.25	--	1 st Max	0.019	0.038	0.049	0.048	0.02
					2 nd Max	0.019	0.02	0.037	0.037	0.016
		3-hour	--	0.5	1 st Max	0.013	0.018	0.029	0.03	0.014
					2 nd Max	0.013	0.016	0.026	0.025	0.011
		24-hour	0.04	0.14	1 st Max	0.005	0.007	0.009	0.012	0.004
					2 nd Max	0.005	0.006	0.008	0.011	0.004
Annual Arithmetic Mean	--	0.03	--	0.001	0.001	0.001	0.001	0.001		
Lead ^(d)	µg/m ³	30 Days	1.5	--	--	--	--	--	--	
		Quarter	--	1.5	1 Qtr	0.004	0.003	0.01	0.01	NA
					2 Qtr	0.003	0.003	0.003	0.003	NA
					3 Qtr	0.01	0.01	0.02	0.0	NA
					4 Qtr	0.01	0.004	0.01	0.0	NA

Source: SNL/CA 2002b

^a2614 Old 1st St., Livermore station (1996–1999) and 793 Rincon Ave., Livermore station (2000)^b2614 Old 1st St., Livermore station^cConcord station^dFremont station^eMeasurements are from the four offsite locations listed above.

CO: Carbon Monoxide

µg/m³: micrograms per cubic meter

NA: not available/not applicable

NAAQS: National Ambient Air Quality Standards

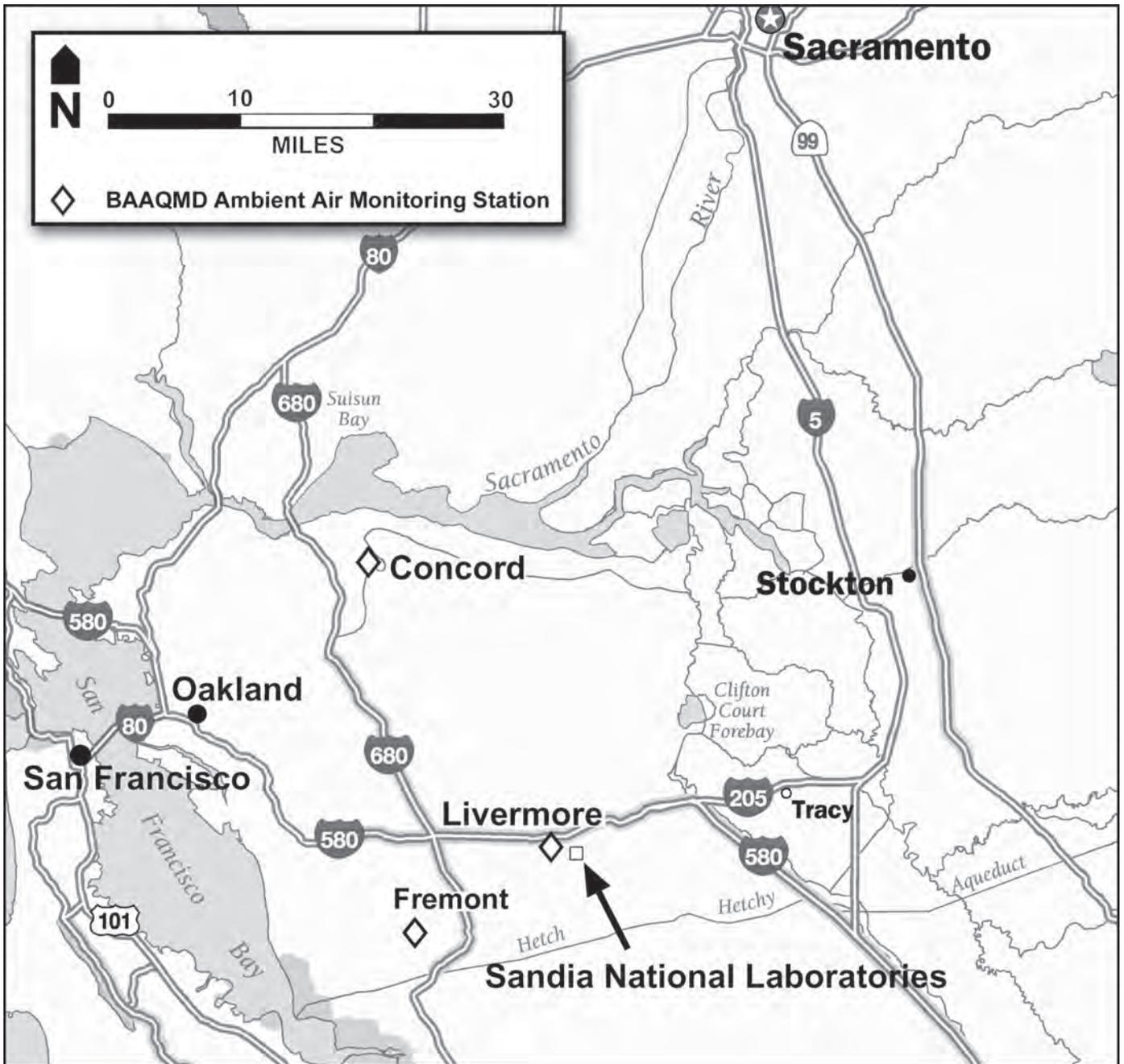
NO₂: Nitrous Dioxide

PM: Particulate Matter

ppm: parts per million

Qtr: Quarter

SO₂: Sulfur Dioxide



Source: SNL/CA 2002b

Figure 4-15. Locations of Bay Area Air Quality Management District Ambient Air Monitoring Stations near Sandia National Laboratories, California

Table 4-3. Sandia National Laboratories, California Permitted Sources and Types of Pollutants Reported

Source Number	Source Description	Source Location	Types of Pollutants Reported ^(a, b)
6	Boiler (5 MM BTU/hr)	Bldg 907	NO _x , Toxics
7	Boiler (5 MM BTU/hr)	Bldg 907	NO _x , Toxics
22	Boiler (1200 K BTU/hr)	Bldg 916	NO _x , Toxics
25	Boiler (3200 K BTU/hr)	Bldg 912 SW	NO _x , Toxics
26	Boiler (3000 K BTU/hr)	Bldg 968	NO _x , Toxics
27	Boiler (3000 K BTU/hr)	Bldg 968	NO _x , Toxics
28	Boiler (3500 K BTU/hr)	Bldg 910	NO _x , Toxics
29	Boiler (3500 K BTU/hr)	Bldg 910	NO _x , Toxics
33	Degreaser	Bldg 910	Toxics
34	Degreaser	Bldg 34	Toxics
55	Misc. Chemical (Decontamination Sink)	Bldg 961	NR
56	Misc. Chemical (Waste Compactor)	Bldg 961	Toxics
60	Misc. Chemical (Drum Crusher)	Bldg 961	Toxics
77	Electroplating	Bldg 943	NR
81	Boiler (7350 K BTU/hr)	Bldg 943	NO _x , CO, Toxics
82	Boiler (7350 K BTU/hr)	Bldg 943	NO _x , CO, Toxics
95	Solvent Use (Wipe Cleaning)	Site-wide	VOC, Toxics

Source: SNL/CA, 2002b

Note: Fugitive toxic emissions (site-wide) are also covered as a permitted source.

^aExempt sources not included^bReport period is July to June

BTU: British Thermal Unit

CO: carbon monoxide

K: kilo

MM: million

NO_x: Oxides of Nitrogen

NR: None reported for 2000-2001

VOC: volatile organic compound

Table 4-4. Criteria Pollutant Emission Rates (kilograms per year)

Pollutant	SNL/CA					Bay Area ^(b)	Percent Contribution from SNL/CA
	Emission Year ^(a, b)					2000	
	96/97	97/98	98/99	99/00	00/01		
Particulates	NA	NA	NA	NA	NA	57,900,000	NA
Volatile Organic Compounds	497	NA	497	662	1656	179,000,000	< 1
Sulfur Dioxide	NA	NA	NA	NA	NA	29,100,000	NA
Nitrogen Dioxide	3,146	3,973	3,311	3,642	3,311	214,000,000	< 1
Carbon Monoxide	165	165	NA	NA	331	995,000,000	< 1

Sources: SNL/CA 2002b

^aBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June.^bAll Bay Area wide emissions except particulates are based on an average summer day multiplied by 365 days. Bay Area particulate emissions are based on an average winter day multiplied by 365 days.

<: less than

NA: Not Available

SNL/CA: Sandia National Laboratories, California

Table 4-5. Toxic Air Pollutant Emission Rates (kilograms per year)

Pollutant	SNL/CA					Bay Area	Percent Contribution from SNL/CA
	Emission Year ^(a)						
	96/97	97/98	98/99	99/00	00/01	1999	
1,1,1-trichloroethane	91.226	39.01	144.24	235.1	96.15	58,968	< 1
1,4-dioxane	4.189	0.00	2.81	5.5	0.54	771	< 1
Ammonia	238.412	205.93	99.79	33.4	1.31	1,406,160	< 1
Benzene	0.31	0.32	0.32	0.32	0.30	28,577	< 1
Carbon tetrachloride	0.006	0.36	0.00	0.00	0.00	1,406	NA
Formaldehyde	3.133	3.4	3.22	3.26	3.12	81,648	< 1
Methyl alcohol	1.821	1.86	0.00	167.22	681.77	276,696	< 1
Methylene chloride	11.027	16.78	49.9	50.2	75.55	49,896	< 1
Perchloroethylene	13.013	24.49	74.84	42.7	73.55	371,952	< 1
Toluene	0.07	0.09	0.09	3.3	43.04	335,664	< 1
Trichloroethylene	66.391	NA	NA	0.00	2.93	21,773	< 1
Xylene	0.015	0.01	0.01	0.002	14.77	276,696	< 1

Sources: SNL/CA 2002b

^aBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June.

<: less than

NA: Not Available

SNL/CA: Sandia National Laboratories, California

4.9 INFRASTRUCTURE

4.9.1 Definition of Resource

Infrastructure consists of buildings, services, maintenance, utilities, material storage, and transportation systems and corridors that support the operations of a facility. Specifically, SNL/CA's infrastructure consists of water, sanitary sewer systems, storm drains, electrical transmission and distribution, communication systems, roads, and parking lots that support operations at the site. For a discussion of land use, see Section 4.3.

4.9.2 REGION OF INFLUENCE

The ROI for infrastructure is within the site boundary. Table 4-6 presents information on the type of utilities and amounts used by SNL/CA, and identifies utility capacities.

4.9.3 AFFECTED ENVIRONMENT

4.9.3.1 Sandia National Laboratories, California Buildings

Buildings within SNL/CA are listed by type and square footage in Table 4-7. Physical attributes such as construction type, gsf, and usage distinguish primary buildings.

4.9.3.2 Sandia National Laboratories, California Services and Maintenance

SNL/CA's management and operations (M&O) contractor is Lockheed Martin Corporation. SNL is organized

into twelve divisions including the California laboratory (SNL/CA). Extensive descriptions of key programs and services are provided in the *SNL Institutional Plan Fiscal Year 2002-2007* (SNL 2001a). SNL/CA has a maintenance program supported by appropriate NEPA review. Routine maintenance and upgrades include the following:

- cleaning, painting, repairing, renovating, and servicing buildings, equipment, vehicles, and utility infrastructure;
- maintaining and extending onsite roads, parking areas, and access control structures;
- replacing, upgrading, and maintaining equipment, tools, and components, such as computers, valves, pumps, filters, monitors, and equipment controls to preserve, improve, and extend the life of the infrastructure; and
- maintaining, replacing, and upgrading environment, safety, and health equipment, controls, and monitoring capabilities.

4.9.3.1 Roadways and Transportation Access

The general road network in SNL/CA area is shown in Figure 4-16. Interstate 580 is the east-west access to the regional Interstate system and is approximately 2 miles north of the SNL/CA boundary. Access to SNL/CA consists of an urban road network maintained by the City of Livermore, and SNL/CA maintained gates and roadways.

Traffic enters SNL/CA through two principal gates off East Avenue. Commercial traffic enters through the East

**Table 4-6. Utility Capacities and Quantities
Used by Sandia National Laboratories, California**

Utility	Usage	
	SNL/CA (2000)	Percent of Capacity
Water	54 M gallons	6 ^a
Wastewater	15 M gallons	19 ^b
Electricity	22,434 MWh	9 ^c
Natural Gas	59 M ft ³	14 ^d

Sources: SNL/CA 2002b, Royer 2002

^aEstimate Based on 14" water main with 8,000 gallons per minute, 8 hours per day, 5 days per week, 48 weeks per year (922 M gallons). A 16" water main is also available.

^bEstimate based on 10" wastewater with 700 gallons per minute, 8 hours per day, 5 days per week, 48 weeks per year (81 M gallons).

^cEstimate based on 27.2 Megawatt feeder, 8760 hours per year, (239,000 Megawatt hours). Another 27.2 Megawatt feeder is also available.

^dEstimate based on 49,140 cubic feet per hour, 8760 hours per year (430 M cubic feet).

M: million

MWh: megawatt

M ft³: million cubic feet

SNL/CA: Sandia National Laboratories, California

Table 4-7. Building Types at Sandia National Laboratories, California

SNL/CA Building Types	Number of Buildings	GSF	Percent of GSF	Parameters
Primary Buildings	33	690,000	91	Buildings > 3,000 gsf permanent, semi-permanent, or wood/steel construction; not leased space
Nonprimary	21	30,000	4	Nonprimary buildings < 3,000 gsf
Temporary	18	40,000	5	Mobile Offices
Total	72	760,000	100	

Sources: SNL 2001b

>: greater than

<: less than

gsf: gross square feet

SNL/CA: Sandia National Laboratories, California

gate because it provides direct access to the SNL/CA shipping and receiving facilities. SNL/CA maintains approximately 6.2 mi of paved and unpaved roads, approximately 4 acres of pedestrian malls, approximately 5.5 acres of paved service areas, and approximately 12.7 acres of paved parking areas (TtNUS 2002a). The roads near SNL/CA experience heavy traffic in the early morning and late afternoon. The principal contributors are SNL/CA staff and LLNL personnel commuting to and from the laboratories.

Survey estimates of employee-related traffic entering SNL/CA are between 700 to 1,000 SNL/CA commuters per day (SNL/CA 2002b). SNL/CA commuters represent approximately 11 percent of commuter traffic near SNL/CA based on an estimated 9,000 LLNL commuters. For a discussion of transportation-related issues such as traffic, see Section 4.10.

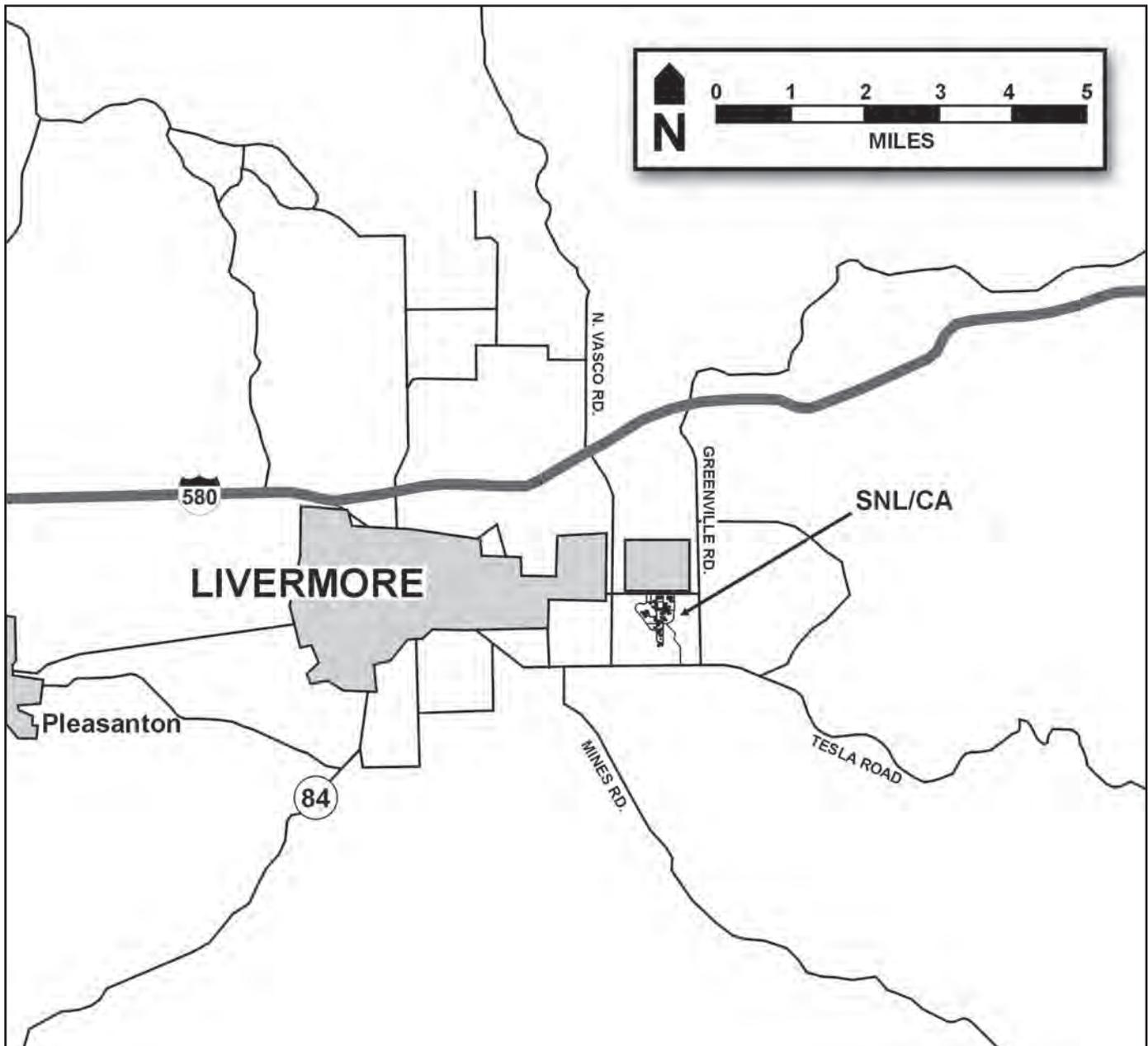
Rail facilities are not available on SNL/CA. Primary air service is provided for the entire region by both the Oakland International Airport and the San Francisco Airport, located approximately 33 mi and 50 mi west, respectively.

4.9.3.2 Water

The water supply system consists of 6.4 mi of piping that, in 2000, provided 54 M gal of water for fire protection, industrial support of SNL/CA's research programs, and sanitary use (Table 4-6). The highest volume user is the Combustion Research Facility (CRF), which generates approximately 160,000 gal of wastewater per year (SNL/CA 2002a). SNL/CA purchases potable water from the adjacent LLNL. LLNL 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 maintains the drinking water distribution system at SNL/CA. Neither the existing water service from LLNL to SNL/CA, nor water to most major SNL/CA facilities, are metered. For a discussion of water resources, see Section 4.5.

4.9.3.3 Sanitary Sewer

In 2000, the sewer system consisted of a 4.4-mi underground pipe network that discharged approximately 15 M gal per year of industrial and domestic wastewater



Source: Original

Figure 4-16. Road Network in the Sandia National Laboratories, California Area

(Table 4-6). The site operates a wastewater management control system whereby potentially contaminated laboratory wastewater is routed to retention tanks for analysis and proper disposal. The Liquid Effluent Control System (LECS) provides a fail-safe mechanism for preventing any release of regulated materials from reaching offsite. Six LECS units currently serve SNL/CA (SNL 2001b).

4.9.3.4 Storm Drain

As part of its storm drain system, SNL/CA maintains approximately 4.3 mi of pipe and 1.6 mi of channel. Existing drainage channels require continuous maintenance to correct erosion problems and remove weeds, sediment, and debris that inhibit proper flow (SNL 2001b).

4.9.3.5 Electrical Transmission and Distribution

SNL/CA maintains approximately 11.9 mi of electrical transmission/distribution lines (SNL 2001b). In 2000, 33 primary facilities/areas used 22,434 megawatt hours (MWh) (Table 4-7) (SNL/CA 2002b).

4.9.3.6 Natural Gas

SNL/CA maintains 1.8 mi of gas line. Natural gas is the primary heating fuel used at the site. Laboratories also use natural gas in many of the buildings for experiments. In 2000, 33 primary facilities/areas used approximately 59 million cubic feet (M ft³) (SNL 2001b; SNL/CA 2002b).

4.9.3.7 Communications

SNL/CA maintains 19.7 mi of communication lines. Surveys indicate that the system may be nearing capacity, however, system upgrades are meeting the current demand for data links (SNL 1997b, 2001b).

4.10 TRANSPORTATION

4.10.1 DEFINITION OF RESOURCE

This section describes current regional and local transportation activities, including descriptions of any highway, rail, air, or marine transportation infrastructure that the DOE uses to support hazardous material and waste movements at SNL/CA. Transportation activities at SNL/CA involve the receipt, shipment, and transfer of hazardous and nonhazardous materials and waste. Receipt refers to material received from an offsite location; shipment refers to material sent to an offsite location; and transfer refers to material moved from one onsite location to another. Actual waste quantities are discussed in Section 4.11.

4.10.2 REGION OF INFLUENCE

The transportation ROI consists of three areas onsite, the major transportation corridors in Livermore, and the routes to DOE facilities and waste disposal sites.

4.10.3 AFFECTED ENVIRONMENT

SNL/CA's transportation system consists of paved and unpaved roads, pedestrian malls, paved service areas, and paved parking areas. The site has 6.2 mi of paved and unpaved roads, 4 acres of pedestrian malls, 5.5 acres of paved service areas, and 12.7 acres of paved parking areas.

Onsite (excluding parking areas) vehicular traffic is comprised of General Services Administration vehicles, such as cars, 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 SNL/CA are permitted around the site when necessary for the performance of the work.

A taxi service is provided for workers needing transport on site. LLNL provides a taxi service that will pick up Sandia workers and transport them to LLNL. Sandia also provides bicycles for personnel to use for onsite transportation.

All entrances to SNL/CA are situated along East Avenue. The primary routes to East Avenue are Vasco Road and Greenville Road. All regional traffic to and from SNL/CA is via I-580, exiting onto Vasco Road or Greenville Road. An emergency access road connects the site to Telsa Road to the south.

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 SNL/CA are I-580 and I-680. Major road projects are underway including an upgrade to the Interstate (I)-580/I-680 interchange in Pleasanton and the addition of high-occupancy-vehicle lanes to I-680 south of Pleasanton (SNL/CA 2002b).

The closest airport to SNL/CA is the Livermore Municipal Airport. This airport is not used for commercial passenger traffic, but DOE/SSO personnel fly into this airport using a small government jet. DOE/SSO typically use the Livermore airport for less than five trips per year (SNL/CA 2002b).

The SNL/CA site is served by three international airports for commercial passenger and airfreight services. These airports are San Francisco (approximately 50 road mi west), Oakland (approximately 33 road mi west), and San Jose (approximately 32 road mi south) (SNL/CA 2002b).

SNL/CA does not receive any direct traffic by rail although some SNL/CA employees do commute by train that stops on Vasco Road approximately 1.5 mi north of the site. SNL/CA receives no direct traffic by ship (SNL/CA 2002b).

4.10.3.1 Responsible Organizations for the Transport of Hazardous and Nonhazardous Material

The organizations responsible for the receipt, shipment, and onsite transfer of hazardous material and nonhazardous material are identified in Table 4-8. Table 4-9 shows all hazardous and radioactive waste shipments from SNL/CA site during calendar year 2000. Other shipments would go to LLNL and Sandia sites including SNL/NM. Approximately 1 to 3 shipments per week come in from offsite suppliers.

Explosives Receipt, Transfer, and Shipment

All incoming explosive material placarded or labeled DOT Division 1.1, 1.2, 1.3, 1.5, or 1.6 is diverted by security directly to the Explosives Storage Area. Division 1.4 materials may be received at either Shipping and Receiving Building or the Explosives Storage Area. Incoming explosives are entered into the Explosives Inventory and Information System (SNL/CA 2002b).

Explosives are delivered only to persons authorized on the destination building's Safe Operating Procedure. Explosives are delivered only to approved facilities. The explosives handler completes a Storage Action Request for Explosives form. Before movement is allowed, a signature must be obtained from the Explosives Safety Engineer. An Explosives Handler, using an approved container and Vehicle transports explosives (SNL/CA 2002b).

Table 4-8. Sandia National Laboratories, California Organizations Responsible for the Transportation of Hazardous and Nonhazardous Material

Organization	Responsibility
Health and Safety Department	Handling, transportation, and use of explosive material and components. Receipt of and preparation for shipment of all explosives.
Environmental Operations Department	Transportation of hazardous and radioactive wastes from generator areas to waste management facilities. Preparation of radioactive, mixed, and hazardous wastes for shipment to approved disposal or treatment facilities.
Logistics and Procurement Department	Ensuring that low-level radioactive waste shipments meet U.S. Department of Transportation (DOT) requirements. Ensuring that all onsite and offsite movements of hazardous material meet DOT requirements.
Material Management Support Team	Movement and delivery of all hazardous material onsite, with the exception of explosives.

Source: SNL/CA 2002b

Explosive Materials

Explosives are any substance or article, including a device, which is designed to function by explosion or which, by chemical reaction within itself is able to function in a similar manner even if not designed to function by explosion (unless the article is otherwise classed under a provision of 49 CFR).

Division 1.1 Explosives: Consists of explosives that have a mass explosion hazard. A mass explosion is one that affects almost the entire load instantaneously.

Division 1.2 Explosives: Consists of explosives that have a projection hazard but not a mass explosion hazard.

Division 1.3 Explosives: Consists of explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

Division 1.4 Explosives: Consists of explosives that present a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5 Blasting Agents: Consists of very insensitive explosives. This division is comprised of substances that have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

Division 1.6 Explosives: Consists of extremely insensitive articles that do not have a mass explosive hazard. This division is comprised of articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

Table 4-9. Waste Shipments during Calendar Year 2000

Disposal Site	Outbound Waste Shipments
EnSCO, Inc., El Dorado, Arizona	4
Chemical Waste Management, Kettleman City, California	11
BFI Stericycle, Inc., San Leandro, California	49
EnSCO West, Inc., Wilmington, California	6
Nevada Test Site, Mercury, Nevada	1
U.S. Filter, Inc., Vernon, California	2
Permafix, Inc., Gainesville, Florida	1
SET Environmental, Houston, Texas	1
Treatment One, Chicago, Illinois	1

Source: SNL/CA 2002b

The Logistics and Procurement Department handles documentation of shipments of explosives offsite. The Explosives Handler in Building 981 prepares the explosives for shipment. The Logistics and Procurement Department also performs inspections of vehicles and provides route maps to the drivers. Two shipments of explosives were sent from SNL/CA during calendar year 2000 (SNL/CA 2002b).

Receipt, Transfer, and Shipping of Nuclear and Radioactive Material and Hazardous Chemicals

All nuclear and radioactive materials and hazardous chemicals are received at Shipping and Receiving Building. The package integrity is verified, and the material is prepared for onsite transport, if required (SNL/CA 2002b).

All onsite transfers of nuclear and radioactive materials and hazardous chemicals are performed by the Material Management Support Team. All personnel performing onsite transfers are trained in accordance with DOT requirements (SNL/CA 2002b).

Documentation for shipments of nuclear and radioactive materials and hazardous chemicals is prepared by the

Logistics and Procurement Department. The Logistics and Procurement Department also inspects vehicles and provides route maps to the drivers. Hazardous waste shipments are the responsibility of the Hazardous Waste Program within the Environmental Operations Department. During calendar year 2000, 109 shipments (including 76 waste shipments) containing hazardous material left SNL/CA (SNL/CA 2002b).

Transportation of Nonhazardous Materials and Waste

Other transportation on site includes the movement of nonhazardous materials (office furniture, computers, mail, etc.). These materials are received and transported to their final destination by the Logistics and Procurement Department (SNL/CA 2002b).

Nonhazardous solid waste is trucked to a local landfill. Waste pickup is performed once per week (SNL/CA 2002b).

4.11 WASTE GENERATION

4.11.1 DEFINITION OF RESOURCE

Waste management activities consist of managing, storing, and preparing for offsite disposal of all wastes in accordance with applicable Federal and state regulations, permits obtained under these regulations, and DOE orders. The waste categories generated onsite under normal operations include radioactive waste (including LLW and LLMW); hazardous waste, which includes RCRA hazardous (chemical and explosives) waste, California Toxic waste, TSCA waste (primarily asbestos and polychlorinated biphenyls [PCBs]) and biohazardous (medical) waste; and nonhazardous solid waste and process wastewater.

4.11.2 REGION OF INFLUENCE

The ROI for waste generation involves SNL/CA and its facilities. The ROI does not include offsite waste disposal facilities because they involve the private sector or other Federal facilities. The transportation of waste to disposal sites is discussed in Section 4.10.

4.11.3 AFFECTED ENVIRONMENT

The generation of the many different waste streams at SNL/CA creates a continuous need for proper packaging, labeling, manifesting, transporting, storing, and disposing solutions.

4.11.3.1 Normal Operations

The affected environment considered under this analysis is limited to those facilities that generate waste under normal operations at SNL/CA. Normal operations encompass all current operations that are required to maintain research and development at SNL/CA facilities.

Waste Categories

Low-Level Waste (LLW)—Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or by-product tailings containing uranium or thorium from processed ore (as defined in Section 11[e][2] of the *Atomic Energy Act* [42 U.S.C. §2011]). Test specimens of fissionable material, irradiated for research and development only and not for the production of power or plutonium, may be classified as LLW, if the concentration of transuranic is less than 100 nanocuries per gram (nCi/g).

Low-Level Mixed Waste (LLMW)—Waste that contains both hazardous waste regulated under the RCRA and low-level waste.

RCRA Hazardous Waste—Any solid waste (definition includes semisolid, liquid, or gaseous material) listed in Subpart D of 40 CFR Part 261, or having the characteristics of ignitability, corrosivity, toxicity, or reactivity, defined by the RCRA.

SNL/CA Hazardous Waste—Waste includes RCRA hazardous waste, California Toxic waste, TSCA waste, and Biohazardous wastes.

Municipal Solid Waste—Waste includes office and laboratory trash.

4.11.3.2 New Operations

Several new operations are currently in the planning stages at SNL/CA. However, they are considered outside of 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. SNL/CA has identified operations at three facilities that fall under this category: LIGA Technology Facility (LTF), Distributed Information Systems Laboratory (DISL), and Glass Furnace and Melting Laboratory.

4.11.3.3 Special Projects

Special projects are limited-duration projects, such as construction, that are considered separately from facility operations. These projects can make a large contribution to the overall waste generation activities at SNL/CA. However, special projects and new programs routinely undergo program-specific assessments to consider any impacts that may result from their inception and are, therefore, not considered in-depth in the SWEA.

Facility maintenance and infrastructure support operations would continue (as outlined in Section 2.3.3) with

refurbishment, renovation, and removal of outdated facilities. SNL *Sites Comprehensive Plan* identifies the specific structures under consideration over the next ten years (SNL 2001c). This program will potentially generate large volumes of TSCA waste, primarily asbestos, and building debris that will increase SNL/CA's disposal needs. Four buildings, accounting for 15,000 gsf (an estimated 100 tons of construction debris), are scheduled for removal within fiscal year (FY) 2002. Future space reduction at SNL/CA will focus on temporary buildings that are beyond their useful lives. These buildings will become vacant after new buildings are built. Eighteen buildings, accounting for 40,000 gsf, are categorized as temporary (SNL 2001c).

Building debris estimates associated with decontamination and decommissioning (D&D) projects are included in the assessments of the waste generated from existing operations (potentially 266 tons of debris). Separate NEPA review may be required in the future depending on the scale and extent of the work involved.

4.11.3.4 Radioactive Waste

Radioactive waste generated at SNL/CA includes LLW and LLMW. SNL/CA does not manage or generate transuranic waste (TRU) or mixed transuranic waste. SNL/CA does not manage or generate high-level waste. LLW and LLMW are produced primarily in laboratory experiments and component tests.

As part of the effort to minimize the total quantity of radioactive waste that is generated at SNL/CA, facilities that generate this type of waste are designated as Radioactive Materials Management Areas (RMMA). 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 location of all RMMAs. Procedures to minimize the generation of radioactive wastes are then developed.

SNL/CA does not maintain the capability to treat or dispose mixed wastes onsite. SNL/CA treats and disposes LLMW offsite under the Federal Facility Compliance Order issued jointly to Sandia Corporation and the DOE (SNL/CA 2002b).

4.11.3.5 Historic and Current Radioactive Waste Generation

Radioactive waste has historically been generated from R&D activities that used radioactive materials. Table 4-10 summarizes historic and current radioactive waste quantities generated onsite from 1996 through 2000.

Table 4-10. Radioactive Waste Generated from 1996 through 2000 (in kilograms)

Radioactive Waste Generated	LLW	LLMW
1996	2,268	0
1997	2,007	0
1998	1,429	7
1999	7,981	80
2000 ^a	12,755	2,167
5 yr Average	5,288	451

Source: SNL/CA 2002b

^aLarge increase in waste in year 2000 can be attributed to the demolition of Building 913

LLW: low-level waste

LLMW: low-level mixed waste

4.11.3.6 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).

4.11.3.7 Historic and Current Hazardous Waste Generation

The hazardous waste generated at SNL/CA is predominantly chemical laboratory trash generated from experiments, testing, other R&D activities, and infrastructure fabrication and maintenance. Table 4-11 contains a summary of hazardous waste generated for all operations from 1996 through 2000. Biohazardous (medical) waste and D&D wastes were included in the totals for all hazardous waste categories.

4.11.3.8 Municipal Solid Waste

Solid waste consists predominantly of office and laboratory nonhazardous trash. Nonhazardous building debris generated from D&D activities may also be considered solid waste. All solid waste is currently disposed of at the Vasco Road Landfill in Livermore, California (SNL/CA 2002b). In calendar year (CY) 2000, SNL/CA generated 247.54 metric tons.

4.11.3.9 Pollution Prevention and Waste Minimization

DOE 5400.1 and Executive Order (EO) 13148 implement a pollution prevention program to comply with DOE requirements (65 FR 24595). The SNL/CA Pollution Prevention Program applies to all pollutants generated by routine and nonroutine operations. The scope of the Pollution Prevention Program includes activities that encourage pollution or waste source reduction and recycling, resource and energy conservation, and affirmative procurement of EPA-designated recycled products.

Table 4-11. Hazardous Waste Generated from 1996 through 2000 (in kilograms)

Hazardous Waste Generated	RCRA	California Toxic ^a	TSCA	Biohazardous	Total All Hazardous Waste
1996	15,003	10,792	15,451	219	41,465
1997	23,294	26,088	55,730	1,773	106,885
1998	23,468	39,841	13,782	296	77,387
1999	22,962	20,084	27,473	248	70,767
2000 ^b	28,354	32,765	79,477	220	140,816
5-year Average	22,616	25,914	38,383	551	87,464

Source: SNL/CA 2002b

^aA non-RCRA waste identified in Title 22 CCR^bExcept for biohazardous, large increases in waste in year 2000 can be attributed to the demolition of Building 913.MWMA: *Medical Waste Management Control Act*RCRA: *Resource Conservation and Recovery Act*TSCA: *Toxic Substance Control Act*

4.11.3.10 Trends and Requirements

In 2000, SNL set goals to reduce routine waste generation by 40 to 50 percent.

4.11.3.11 Waste Minimization

Waste minimization activities are not included in the previous descriptions to bound maximum waste projections for any given year. The following wastes are tracked to determine SNL/CA's effectiveness in reducing wastes: LLW and LLMW, RCRA, state-regulated, TSCA, and sanitary waste. In addition, reductions of resource and energy use are tracked.

Following are the goals to be completed:

- Reduce routine RCRA waste by 14.59 metric tons.
- Reduce routine non-RCRA waste by 10.63 metric tons.
- Reduce routine TSCA waste by 0.37 metric tons.
- Reduce routine LLW by 17.28 cubic meters (m³).

- Reduce routine LLMW by 1.24 m³.
- Reduce routine solid waste by 1,422 metric tons.
- Increase procurement of EPA-designated recycled products to 100 percent in 2005, except where they are not commercially available competitively at a reasonable price or do not meet performance standards.
- Reduce annual energy use per square foot in regular buildings by 30 percent from FY 1985 to FY 2005. Reduce annual energy use per square foot in regular buildings by 40 percent by FY 2010.
- Reduce annual energy use per square foot in energy-intensive buildings by 20 percent from FY 1990 to FY 2005. Reduce annual energy use per square foot in energy-intensive buildings by 25 percent by FY 2010 (SNL/CA 2002b, SNL 2001g).

4.11.3.1 Recycling

Table 4-12 presents CY 2000 recycling information for SNL/CA by material type.

Table 4-12. Material Recycled in Calendar Year 2000 (in kilograms)

Material	Amount	Material	Amount
Coolants	690	Aluminum cans	470
Elemental mercury	9	Construction debris	6,805,170
Fluorescent light bulbs	5,030	Oil filters	240
Glass	0	Paper/cardboard	42,010
Batteries	2,270	Scrap metals	86,790
Transparencies	20	Tires	760
Toner cartridges	750	Used oil	3,340
Yard waste	45,390	Metal drums	210

Source: SNL/CA 2002b

4.12 NOISE

4.12.1 DEFINITION OF RESOURCE

Noise is sound that is undesirable because it interferes with speech, communication, or hearing; is intense enough to damage hearing; or is otherwise annoying. Impulse noise from detonation of explosives is generally considered an annoyance because of “startle” effects. Intense noise requires hearing protection for personnel to protect against loss of hearing.

4.12.2 REGION OF INFLUENCE

The ROI associated with noise generated at SNL/CA may be estimated by measuring the maximum onsite noise, then determining the distance over which the noise attenuates to levels within background. Sound diminishes at the rate of approximately 6 decibel, A-weighted sound levels (dBA) for each doubling of the distance from the source. The maximum measured impulse noise of 96 dBA was measured near the live firing range. The distance at which this sound can be heard depends on the intensity of the initial source, the meteorological conditions, terrain, and background noise levels. At the site boundary located approximately 850 ft southwest of the SNL/CA live firing range, impulse noise ranged from 73 to 82 dBA. At a distance of 6,800 ft the impulse noise level is estimated to range between 55 and 64 dBA, which is within the background levels associated with residential areas. The region of influence for noise generated from SNL/CA extends beyond the site boundary for a distance of about a mile for maximum impulse noise generated onsite.

4.12.3 AFFECTED ENVIRONMENT

The noise generated at SNL/CA is typical of a research and development facility. Ambient noise sources include onsite vehicular traffic and stationary noise sources such as generators, cooling systems, transformers, engines, pumps, and fans, etc. Construction activities also contrib-

ute to ambient background noise levels, as does the live firing range.

EPA guidelines for environmental noise protection recommend an average day-night average sound level of 55 dBA as sufficient to protect the public from the effects of broadband environmental noise in typically quiet outdoor and residential areas (EPA 1974). 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 dBA are compatible with residential land uses and levels up to 75 dBA are compatible with residential uses if suitable noise reduction features are incorporated into structures (14 CFR Part 150).

SNL/CA is not subject to environmental noise regulation by state or local agencies. The County of Alameda does have noise standards for the unincorporated areas of the county, which are applicable to areas northeast, east, south, and southwest of SNL/CA. The standards correlate types of land use with minutes of exposure to various dBA levels by time of day. Noise sources associated with construction are exempted 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. on Saturday or Sunday. Table 4-13 presents the Alameda County noise level standards.

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 SNL/CA (SNL/CA 2002b).

SNL/CA is subject to occupational noise exposure standards established in a Hearing Conservation Program that incorporates the requirements identified in DOE Order 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.

SNL/CA performed onsite community sound level measurements on April 17, 23, and 25, 2001. The noise survey was conducted at the locations shown on Figure 4-17.

Table 4-14 presents the results of the noise survey with an explanation of the sound levels presented. Based upon the survey data, SNL/CA background noise levels at locations 1 and 2 as shown on Figure 4-17 are within the approximate range of 55 to 65 dBA, which is typical commercial areas.

Quantifying the Effects of Sound

The process of quantifying the effects of sound begins with establishing a unit of measure that accurately compares sound levels. The physical unit most commonly used is the decibel (dB). The decibel represents a relative measure or ratio to a reference pressure. The reference pressure is a sound approximating the weakest sound that a person with very good hearing can hear in an extremely quiet room. The reference pressure is 20 micropascals, which is equal to 0 (zero) dB. A-weighted sound levels (dBA) are typically used to account for the response of the human ear. A-weighted sound levels represent adjusted sound levels that are made according to the frequency content of the sound.

Table 4-13. Alameda County Noise Level Standards

Cumulative Number of Minutes in any 1-Hour Time Period	Noise Level Standard (dBA)			
	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: SNL/CA 2002b.

^aNoise-sensitive land uses include residences, schools, hospitals, churches, and public libraries.

dBA: decibel, A-weighted sound levels

Table 4-14. Twenty-Four Hour Onsite Ambient Noise Monitoring

Monitoring Date	Location	CNEL (dBA)	L _{dn} (dBA)	24-Hour L _{eq} (dBA)	CNEL L _d 7 am-7 pm (dBA)	L _{dn} L _d 7 am-10 pm (dBA)	L _e 7 pm-10 pm (dBA)	L _n 10 pm-7 am (dBA)
4/17/01	1	58.9	68.3	59.3	60.2	59.3	0	48.4
4/17/01	2	61.3	67.3	60.8	63.7	62.7	0	46.7
4/23/01	1	54.1	54.2	61.5	57.1	56.2	0	0
4/23/01	2	57.7	59.7	55.5	58.2	57.2	0	38.2
4/25/01	1	60.2	61.3	60.7	63.2	62.2	0	35.6
4/25/01	2	53.5	60.0	63.3	55.8	54.8	0	39.5

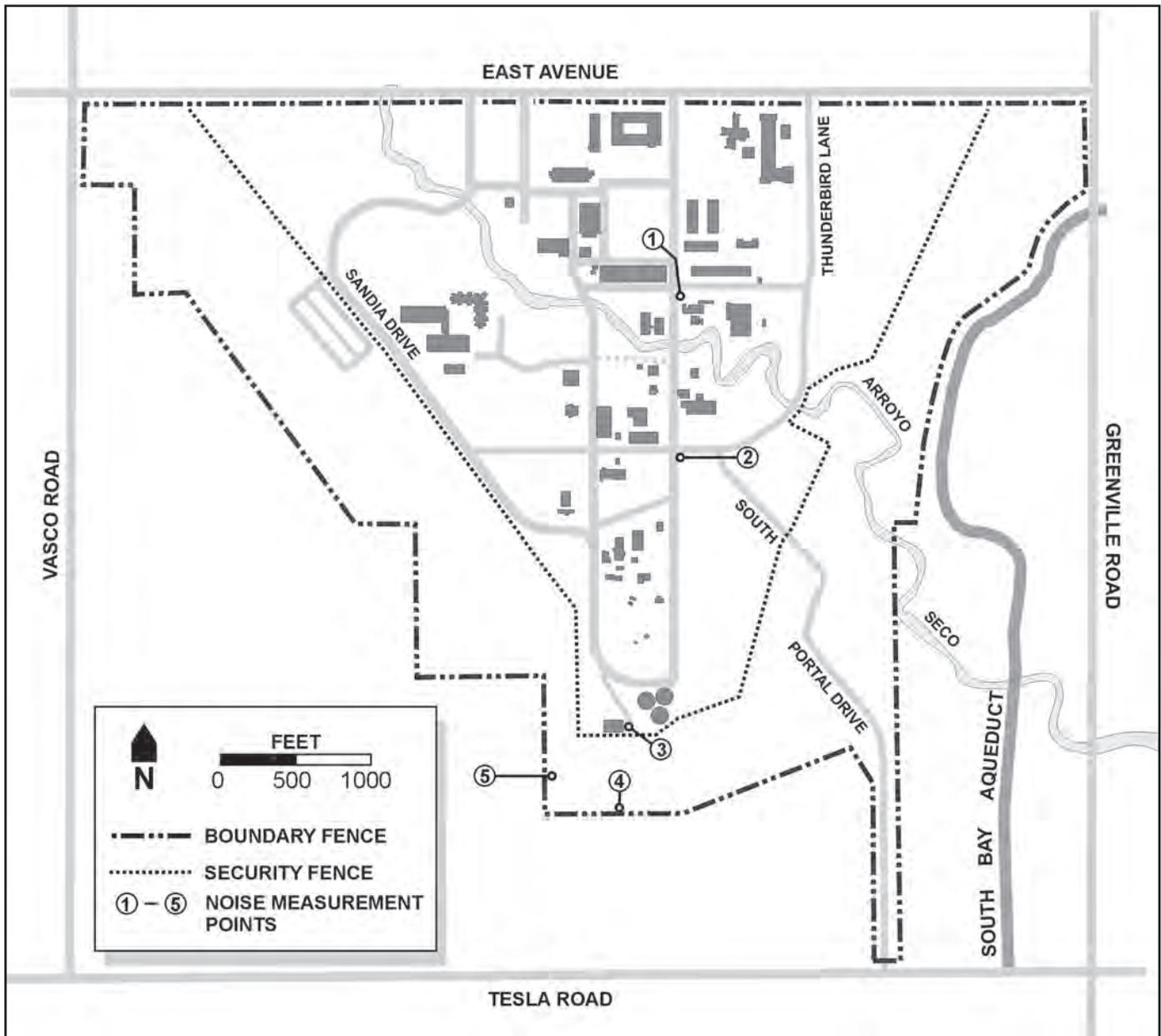
Source: SNL/CA 2002b.

dBA: decibel, A-weighted sound levels

Notes: CNEL is community noise equivalent level. Noise levels for assessing impact on the community are measured over a 24-hour period. Noise is time-weighted to reflect the fact that individuals in the community are more sensitive to loud noises during evening and nighttime hours. The average evening and nighttime noise levels are weighted from 5 to 10 dBA when computing community noise levels. CNEL is an adjusted 24-hour sound level measurement that weights evening noise levels (L_e), occurring between the hours of 7:00 p.m. and 10:00 p.m., and gives maximum weighting to nighttime noise levels (L_n), occurring between 10:00 p.m. and 7:00 a.m.

L_{dn} or day-night average level is identical to CNEL except that the weighted evening term (L_e) is deleted and the daytime period (L_d) is extended to 10 p.m. In other words, L_d is the daytime period that extends from 7 a.m. to 10 p.m. A 10-decibel adjustment weights sound levels occurring during the nighttime hours (10 p.m. to 7 a.m.).

L_{eq} or equivalent sound level is used to describe noise in which loudness varies with time over a wide range of frequencies. This descriptor considers these variations and converts the average sound level to a decibel unit.



Source: Original; SNL/CA 2002b

Figure 4-17. Sandia National Laboratories, California Site Noise Measurement Map 2001

Human sensitivity to nighttime noise events is considered in the noise analysis.

4.13 HUMAN HEALTH AND WORKER SAFETY

4.13.1 DEFINITION OF THE RESOURCE

This section on human health and worker safety describes how existing physical and environmental conditions affect public health and worker health and safety. It includes all individuals who could be affected by radioactive and non-radioactive hazardous materials released from SNL/CA operations. This section compares SNL/CA worker health and safety performance records from 1998 to 2000 to equivalent national, regional, or local health statistics. The current relationship of people to the SNL/CA environment

is assessed by resource area. These assessments constitute the framework for understanding the impacts from the alternatives presented in Chapter 5.

4.13.2 REGION OF INFLUENCE

The ROI for impacts to public health from outbound air emissions are the population living and working near SNL/CA. For worker health, the ROI includes onsite safety related impacts.

4.13.3 AFFECTED ENVIRONMENT

The environment within the ROI includes environmental resources such as air, groundwater, and soil, which, if

affected, could subsequently affect public health and worker health and safety. See the specific resource sections for descriptions of existing conditions of these resources. Any environmental releases due to activities described in the SWEA have the potential to affect the health of people who live around and work at SNL/CA.

4.13.3.1 Public Health and Safety

Prior to 1994, SNL/CA had only one radiological emission source requiring monitoring under the requirements of the National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 CFR 61, Subpart H), the Tritium Research Laboratory. Tritium operations ceased at SNL/CA in 1994. Under an agreement with the EPA, Region IX, SNL/CA continued stack monitoring and ambient air monitoring for tritium for one year after cessation of tritium operations. This monitoring showed no remaining airborne tritium and was discontinued in 1995 with EPA approval. Therefore, there are no SNL/CA sources of radioactive air emissions and thus no exposure to the offsite population from SNL/CA operations.

Table 4-5 presents the toxic pollutant emissions from permitted SNL/CA sources during the past five years. As discussed in Section 4.8, toxic pollutant emissions from SNL/CA and subsequent exposure to members of the public are considered minor.

4.13.3.2 Worker Health and Safety

SNL/CA employs an Integrated Safety Management System (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. SNL/CA also follows specific management processes to ensure 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 (SNL/CA 2002b).

Hazardous materials used at SNL/CA include radioactive material, chemicals, and explosive materials. Hazardous materials are managed at SNL/CA 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

SNL/CA maintains an inventory of radioactive material used in laboratory research and radiation monitoring activities. All radioactive material used by SNL/CA is

obtained from offsite vendors. Individual sources at SNL/CA generally have small quantities of radioactive material and most are sealed. Management of radioactive material at SNL/CA incorporates the principle of as low as reasonably achievable (ALARA). Specific activities at SNL/CA associated with radioactive materials are conducted in accordance with the Sandia Radiological Protection Procedures Manual (RPPM) (SNL 2001h) and 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.

One of the major goals of the RPPM is to keep worker exposures at or below ALARA. To meet this goal, SNL/CA must evaluate both external and internal exposures, and work to minimize the total effective dose equivalent. An effective program also must balance minimizing individual worker doses with minimizing the collective dose of workers in a group. For example, using many workers to perform small portions of a task would reduce the individual worker dose to low levels. However, frequent worker changes would make the work inefficient, resulting in a significantly higher collective dose to all the workers than if fewer had received slightly higher individual doses.

SNL/CA worker doses have typically been well below DOE worker exposure limits. DOE set administrative exposure guidelines at a fraction of the exposure limits to help enforce doses that ALARA. Table 4-15 presents average individual doses and SNL (labs-wide) collective doses from 1998 through 2000.

Chemicals

Because of the wide variety of research activities performed at SNL/CA, the amounts and concentrations of chemical maintained at SNL/CA vary at any given time and from facility to facility. In general, the following chemical types are used and stored at SNL/CA (SNL/CA 2002b):

- 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)
- Asphyxiants (physical asphyxiants are materials capable of physically displacing the volume of air in a given space; chemical asphyxiants are materials that are poisonous when breathed)
- Carcinogens (materials capable of inducing cancer)

Table 4-15. Sandia National Laboratories (Labs-Wide) Radiation Exposure Data (1998 through 2000)

Year	Collective Dose (TEDE) (person-rem)	Number with Measurable Dose	Average Measurable Dose (TEDE) (rem)
1998	9.5	181	0.053
1999	6.4	120	0.053
2000	7.6	105	0.072
Average	7.8	135	0.059

Sources: SNL 1999d, 2000d, 2001g

Note: Data for individual divisions within SNL (for example SNL/CA Division 8000) are not reported. Organization numbers for Sandia personnel sometimes change due to work changes or corporate reorganizations. During any three-month period, monitored personnel may change organizations one or more times. However, actual doses to SNL/CA workforce would be expected to be much lower than presented in this table, because SNL/CA does not operate a reactor.

rem: roentgen equivalent, man

SNL/CA: Sandia National Laboratories, California

TEDE: Total Effective Dose Equivalent

More than 8,000 chemicals may be in use or stored at SNL/CA at any given time. Table 4-16 summarizes the major programs and facilities that use hazardous chemicals at SNL/CA. The primary management strategy for the control and management of hazardous chemicals at SNL/CA is to prevent overexposures to hazardous substances in accordance with the requirements of 29 CFR 1910, Subpart Z. Procedures for chemical management at SNL/CA include personnel training, inventory control and monitoring, safety assessments, and handling. Additionally, standard operating procedures, operating procedures, and operating instructions are prepared for specific activities to establish safe procedures, barriers, controls, and safe work practices with regard to hazardous operations, including chemical use and storage.

As part of the chemical management strategy, SNL/CA maintains a centralized Chemical Inventory System (CIS) for tracking hazardous and nonhazardous chemicals. The CIS requires bar coding of chemical containers as they enter SNL/CA 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 SNL/CA through disposal of the container by the waste management program. The CIS links the bar-coded chemical containers to a location and a location owner, the appropriate hazard and regulatory information, and the material safety data sheets.

The CIS serves as the chemical inventory source used for Federal Emergency Planning and Community Right-to-Know Act (EPCRA) reporting and the California Community Right-to-Know regulations. The EPCRA inventory consists of the location and quantity of any onsite hazardous chemicals at SNL/CA in amounts at or above 10,000 pounds (lb), and of all Extremely Hazardous Substances in amounts at or above 500 lb or the chemical-specific Threshold Planning Quantity, whichever is less. The California Community Right-to-Know regulations are far more stringent than EPCRA. The California Right-to-Know inventory consists of the location and quantity of any onsite hazardous chemicals at SNL/CA in amounts at or above 500 lbs, 55 gal, or 200 cubic feet (ft³).

Explosive Materials

SNL/CA uses explosives in various research, development, 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 Explosives Storage Area is the primary onsite location for explosives storage. This area is located in the southern portion of the developed area and is designated as a “limited area” accessible to approved personnel only. The Explosives Storage Area contains eight earth-covered

Table 4-16. Facilities Containing More than 500 Hazardous Chemicals

Facility	Estimated Number of Chemicals	Process/Activity
Building 941	2,100	Chemical/materials science/ metallurgy research and development
Building 968	1,600	Chemical/biochemical and radiation sensor research and development
Building 942	1,540	Extreme ultraviolet lithograph, plastics research and development
Building 916	1,440	Chemical, physics, and materials science research and development
Building 906	1,340	Combustion research

Source: SNL/CA 2002b

explosive storage magazines, four magazines, a packaging/receiving building exclusive for explosives, a building for storing nonexplosive packaging incidentals, and two transportainer storage units (SNL/CA 2002b).

A Corporate Explosives Safety Program is used to manage explosives at SNL/CA. It provides guidance for evaluating and safely conducting explosives operations. The Sandia Explosives Safety Committee provides continual review, interpretation, and necessary revision to the Corporate Explosives Safety Program. As part of the explosive material management strategy, SNL/CA 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.

4.13.3.1 Occupational Health and Safety

A worker protection program is in place at SNL/CA 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 4-17 presents SNL (lab-wide) injury rates over a 3-year period from 1999 through 2001 (SNL 2001i, 2002a), in terms of total reportable cases (TRC) rate, lost work day cases (LWC) rate, and lost work days (LWD) rate. 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 LWDs 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 4-17, 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 4-17. Sandia National Laboratories, California 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	5.1 (6.3) ^a	1.2 (3.1) ^a	0.8 (1.9) ^a
2000	4.2 (6.5) ^a	0.6 (3.3) ^a	0.3 (2.0) ^a
2001 ^b	2.9	1.1	0.1
3-Year Average	4.1 (6.5) ^c	1.0 (3.2) ^c	0.4 (2.0) ^c

Source: SNL 2001b, 2002a

^aState of California Injury and Illness data is for all industries including State and local government.

^bState of California Injury and Illness data is for 2001 were not available at the time of the Draft SWEA.

^cThree year average for State of California data covers 1998-2000 timeframe.

4.14 SOCIOECONOMICS

4.14.1 DEFINITION OF RESOURCE

This section describes the demographic and economic variables associated with community growth and development that have the potential to be directly or indirectly affected by changes in operations at SNL/CA. SNL/CA and the communities that support it can be described as a dynamic socioeconomic system. The communities provide the people, goods, and services required by SNL/CA operations. SNL/CA operations, in turn, create the demand and pay for the people, goods, and services in the form of wages, salaries, and benefits for jobs and dollar expenditures for goods and services. The measure of the communities' abilities to support the demands of SNL/CA depends on their ability to respond to changing environmental, social, economic, and demographic conditions.

For a discussion of the DOE operations at SNL/CA, see Section 2.1.

4.14.2 REGION OF INFLUENCE

The socioeconomics ROI is defined by the areas where SNL/CA employees and their families reside, spend their income, and use their benefits, thereby affecting the economic conditions of the region. The ROI consists of a three-county area (Alameda [which includes the city of Livermore], San Joaquin, and Contra Costa counties), where approximately 89 percent of SNL/CA employees reside (not including 274 contract employees) (Figure 4-18). The ROI was chosen for the following reasons (SNL/CA 2002b):

- The majority of SNL/CA employees live within Alameda, Contra Costa, and San Joaquin Counties. The combined population of these three counties



Source: Original

Figure 4-18. Most Sandia National Laboratories, California Employees Live in a Three-County Area near the Site

totals nearly three million. The SNL/CA population of just over 1,000 is a very small fraction of this total.

- The combined value of SNL/CA's payroll and purchases was \$131 M during the year 2000. In comparison, the payroll for all persons employed in Alameda County, alone, was over \$29 billion. Also, had the 50-mi ROI been chosen, instead, it would have included (all or portions of) Contra Costa, Santa Clara, San Francisco, San Mateo, Yolo, San Joaquin, Solano, Sacramento, Merced, and Marin Counties.

4.14.3 AFFECTED ENVIRONMENT

4.14.3.1 Demographic Characteristics

The estimated population in the three-county ROI in 2000 was 2,956,155 people, of whom approximately 49 percent (1,443,741) resided in Alameda County. According to the U.S. Census Bureau, the ROI population grew from 2,563,542 in 1990 to 2,956,155 in 2000, which is an increase of 392,613 people or 15.3 percent over the

1990 count (SNL/CA 2002b, Census 2000a) (Table 4-18). Table 4-19 shows population projections to 2010. Alameda County has attracted the highest population growth. However, San Joaquin and Contra Costa Counties have increased at faster rates than Alameda County (Table 4-18). According to population projections calculated by the California State Department of Finance, San Joaquin County is expected to grow the fastest, 2.9 percent, between 2000 and 2010. Alameda County is expected to grow 1.6 percent and Contra Costa is expected to increase at the rate of 1.3 percent (CADF 2001a). The area, including the town of Danville, the cities of Dublin, Livermore, Pleasanton, and San Ramon, and the surrounding parts of Alameda and Contra Costa counties, is one of the fastest growing subregions of the San Francisco Bay Area. It has evolved from a primarily agricultural area in the 1950s, to an area of single-family residential suburbs in the 1960s and 1970s, to a major employment center in the 1980s. The area is expected to grow by another 77 percent in housing units and 83 percent in the number of jobs between 1990 and 2010 (ABAG 1998a).

Table 4-18. Demographic Profile of the Population in the Three-County Region of Influence

Population Parameters	Alameda	San Joaquin	Contra Costa	ROI	State of California
1990 Population	1,279,182	480,628	803,732	2,563,542	29,760,021
2000 Population	1,443,741	563,598	948,816	2,956,155	33,871,648
Population Change from 1990 to 2000	164,559	82,970	145,084	392,613	4,111,627
Average Annual Percent Change (1990-2000)	1.3	1.7	1.8	1.5	1.4

Source: SNL/CA 2002b; Census 2002a.
ROI: region of influence

Table 4-19. Population Estimates and Projections to 2010

Population Parameters	Alameda	San Joaquin	Contra Costa	ROI	State of California
1990 Population	1,279,182	480,628	803,732	2,563,542	29,760,021
2000 Population	1,443,741	563,598	948,816	2,956,155	33,871,648
2005 Population	1,580,200	645,600	1,021,400	3,247,200	37,473,500
2010 Population	1,671,200	727,800	1,071,400	3,470,400	40,262,400

Sources: SNL/CA 2002b; CADF 2001a.
ROI: region of influence

4.14.3.2 Economic Base

The San Francisco-Oakland-San Jose, California Consolidated Metropolitan Statistical Area (CMSA), which includes, among others, Alameda and Contra Costa Counties, is the fifth largest metropolitan area in the U.S. The area contains six Primary Metropolitan Statistical Areas (PMSA), as defined by the U.S. Census Bureau. Three of the six are the San Francisco PMSA, the San Jose/Silicon Valley PMSA, and the Oakland PMSA (Census 2000a). The Oakland PMSA comprises Alameda and Contra Costa Counties. The CMSA is the corporate home for 24 of the nation's Fortune 500 companies. The area is renowned as the worldwide center of high technology, and has been acclaimed as the incubator of biotechnology.

It is also a major multimedia and telecommunications center. SNL/CA is not considered a major employer in the CMSA or in Alameda County (CAMIS 2000a).

Table 4-17 lists employment and income in the ROI. The total number of employed civilian workers in the ROI in 2001 was 1,455,700 (CAMIS 2002a). In 2001, San Joaquin County had the highest unemployment rate (8.7 percent), followed by Alameda and Contra Costa Counties with unemployment rates of 4.5 and 3.3 percent, respectively. The ROI, as a whole, had an unemployment rate of 4.8 percent (Table 4-20) (CAMIS 2002a). Because SNL/CA socioeconomic variables are very small when compared with the surrounding region, employment changes at SNL/CA would not have a

Table 4-20. Employment and Income Profile in the Three-County Region of Influence.

Labor Parameters	Alameda	San Joaquin	Contra Costa	ROI
2001 Annual Average Labor Force Data				
Number of Workers	754,900	264,700	509,800	1,529,400
Employed	721,000	241,600	493,100	1,455,700
Percent Unemployed	4.5	8.7	3.3	4.8
Sandia National Laboratories, California Workforce (April 2002)				
Number of Workers	637	183	108	928
Percent of 2000 Population	.04	.03	.01	.03
Personal Income (2000)				
Total Personal Income (\$1000)	\$55,972,377	\$13,208,972	\$39,194,448	\$108,375,797
Per Capita (\$)	\$38,624	\$23,242	\$41,110	\$36,479

Sources: CAMIS 2002a; BEA 2000b
ROI: region of influence

marked socioeconomic effect on county population or the civilian labor force.

The patterns of employment and income are different among the counties. During 2000 and 2001, employment and per capita income were highest in Contra Costa County, followed by Alameda and San Joaquin Counties (Table 4-20). In 2000, service industries comprised the largest employment sector in Alameda County (312,288 employees or 34.6 percent of total employment). Retail trade accounted for another 14.2 percent, followed by government (13.8 percent) and manufacturing (11.4 percent) (BEA 2000a). Services was the largest employment sector in San Joaquin County in 2000, with 26.2 percent (67,745 employees), followed by the retail trade and government sectors accounting for 16.1 percent and 13.9 percent, respectively (BEA 2000a). The services sector provided the most employment in Contra Costa County (173,520 employees or 36.6 percent), followed by retail trade (16.4 percent), and the finance/ insurance/ real estate sector (12.3 percent) (BEA 2000a).

The total operating and capital budget for SNL/CA for FY 2000 was approximately \$131.3 M (\$57 M for goods and services and \$74.3 M for wages) (SNL/CA 2002b). By comparison, local purchases and payroll expenditures at SNL/CA were \$64 M and \$74.6 M, respectively in 1999 and \$79 M and \$63.4 M, respectively in 1998 (SNL/CA 2002b).

SNL/CA jobs generate indirect and induced jobs in the region. The U.S. Department of Commerce Economics and Statistics Division Bureau of Economic Analysis (BEA) provides multipliers for industrial jobs, income, and earnings (BEA 2002a, b). The BEA uses the RIMS II economic model, which incorporates buying and selling linkages among regional industries to measure the impact of SNL/CA's expenditure of money in the ROI. The model produces three multipliers, two of which are particularly useful. The first multiplier is used to calculate worker earnings, and the second calculates employment. These multipliers provide information needed to estimate SNL/CA's economic impact. Earnings and employment multipliers make possible the identification of not only the direct impacts of an activity on regional income and jobs but also the indirect (business) and induced (household) effects. SNL/CA operations in the ROI have an influence on the economy. The total funding for SNL was approximately \$131.3 M in FY 2000. SNL/CA site workers living in the ROI received approximately \$74.3 M in total wages and salaries in FY 2000. The regional earnings multiplier of 1.64 yields an economic impact of an additional \$121.9 M. For every job at SNL/CA, an estimated additional 0.96 jobs were created in the ROI, which means that the 1,317 average employment level in FY 2002 resulted in an additional 1,264 jobs. In effect, nearly one

Measuring Sandia National Laboratories, California's Economic Impact on the Region of Influence

A multiplier is a factor used to calculate the incremental effect of changes, in dollars spent or jobs created or lost, at SNL/CA. For example, the earnings multiplier is used to calculate the total income generated in the ROI for each \$1 of income paid to workers at SNL/CA. The employment multiplier is used to calculate the total number of generated jobs in the ROI for each job created at SNL/CA. This SWEA identified the following multipliers:

Earnings Multiplier—\$1 income from SNL/CA for workers generates another (\$0.64), for a total impact on income of (\$1.64) in the ROI.

Employment Multiplier—100 jobs created at SNL/CA generates another 96 jobs, for a total impact of 196 jobs in the ROI.

Source: BEA 2002a, b

out of every 564 jobs (or 2,581 out of 1,455,700) in the ROI was created or supported by SNL/CA.

4.14.1.3 Housing and Community Services

Housing

Table 4-18 lists the total number of occupied housing units and vacancy rates in the ROI. In 2000, the ROI contained 1,083,920 housing units, of which 1,049,124 were occupied. The vacancy rate was lowest in Contra Costa County (2.9 percent) and highest in San Joaquin County (4.0 percent). Vacant units in the ROI numbered 34,796, creating an overall vacancy rate of 3.2 percent.

Public Education

In 2001-2002, student enrollment totaled 506,687 in the ROI (Table 4-21) (CADE 2002a). 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-sq mi area that includes the City of Livermore. There is no available information on the number of children of SNL/CA employees that attend district schools. However, the number is estimated to be less than 2 percent (under 200 students) of the total district's total enrollment (SNL/CA 2002b).

Health Care

SNL/CA has an onsite medical facility designed to handle most onsite emergencies and routine physical examinations for safety considerations (such as exams for users

Table 4-21. Housing and Education in the Region of Influence

Parameters	Alameda	San Joaquin	Contra Costa	ROI
Housing (2000)				
Total Units	540,183	189,160	354,577	1,083,920
Occupied Housing Units	523,366	181,629	344,129	1,049,124
Vacant Units	16,817	7,531	10,448	34,796
Vacancy Rate	3.1	4.0	2.9	3.2
Public Education (2002)				
Total School Enrollment	217,591	127,354	161,742	506,687

Source: Census 2000b; CAMIS 2002a

ROI: region of influence

of respirators). In the case of life-threatening injuries, SNL/CA has an arrangement with Valley Memorial Hospital in Pleasanton for emergency services (SNL/CA 2002b).

Fire Protection Services

SNL/CA does not maintain an onsite fire department. Through a memorandum of understanding, the LLNL Fire Station No. 1 will provide the primary emergency response to SNL/CA. The LLNL fire department responds to all alarms at SNL/CA and will respond to calls from SNL/CA's Central Alarm Station (which is manned 24 hours a day, 365 days a year). SNL/CA's fire protection personnel estimate that the LLNL fire department responds to calls at SNL/CA an average of 50 times per year (SNL/CA 2002b).

Police and Security Services

SNL/CA has a security force that is responsible for onsite security. Actions within the purview of the security force include badging and visitor clearances, securing the site and adjacent areas, responding to security threats, supporting building emergency team activities, and assisting in site evacuation. The security force's Security Supervisor is the primary liaison between the LLNL security force, the Alameda County Sheriff's Department, and the Livermore Police Department. The need for police services from the City of Livermore is infrequent, about once per year (SNL/CA 2002b).

4.15 ENVIRONMENTAL JUSTICE

4.15.1 DEFINITION OF THE RESOURCE

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 2002). 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 DOE incorporates environmental justice considerations into both its technical analyses and its public involvement program in accordance with the EPA and CEQ (CEQ 1997).

4.15.2 REGION OF INFLUENCE

The DOE selected the area within a 15-mi radius of the SNL/CA site as the ROI, an area that encompasses the City of Livermore and portions of three counties (Alameda, Contra Costa, and San Joaquin). The City of Tracy, which lies mostly outside of the 15-mi radius, was also included because a substantial number of SNL/CA employees live there. This ROI was selected because a majority of SNL/CA employees live within the three-county area; past analyses of potential impacts of releases of toxic gases and radionuclides showed that concentrations would be "negligible" at or beyond the site boundary; and assessments of the consequences of the worst credible accident at the SNL/CA site suggest that a 15-mi ROI is the appropriate area of analysis for environmental justice impact analysis (SNL/CA 2002b).

4.15.3 IDENTIFYING MINORITY AND LOW-INCOME POPULATIONS

Demographic information from the U.S. Census Bureau website was used to identify minority and low-income populations in the ROI. Information on locations and numbers of minority populations was obtained from the 2000 U.S. Census, while information on low-income populations was developed from the 1997 Economic Census (SNL/CA 2002b).

4.15.4 MINORITY POPULATIONS

Fifty census tracts with a total population of 287,611 lie wholly or partially within the ROI (SNL/CA 2002b). Of these, five census tracts (four of which are in Alameda County) have a higher percentage of minorities than the state of California as a whole (40.5 percent). The ROI has a higher percentage of whites (75.9 percent) than the state of California (59.5 percent). The City of Livermore, which lies in the approximate center of the ROI (the 15-mi radius), has an even higher percentage of whites (81.9 percent), and the City of Tracy, which lies mostly outside of the 15-mi radius has a lower percentage of whites (65.2 percent) than Livermore, but still higher than the state. Conversely, the ROI has a lower percentage of minorities than the state as a whole. The black population of the region of influence is 3.5 percent, versus 6.7 percent for the state of California. The ROI has a much smaller percentage of Hispanics (11.3 percent) than the State of California (32.4 percent). All indica-

tions are that the ROI is less racially diverse than the State of California as a whole, with a higher proportion of whites and a lower proportion of minorities.

4.15.5 LOW-INCOME POPULATIONS

Based on 1997 data, the percentage of the population below the poverty level was 11.8, 8.7, and 18.8 in Alameda, Contra Costa, and San Joaquin Counties, respectively (SNL/CA 2002b). In the State of California, approximately 16.0 percent of the population was below the poverty level. The ROI has a much lower percentage (2.5 percent) of people living below the poverty level than the State of California. These low poverty rates and other socioeconomic data (such as unemployment rates, median family incomes, per capita incomes, and levels of education) are indicative of a prosperous area with a thriving economy and highly-educated workforce, particularly in Alameda and Contra Costa Counties (Census 2000b; SNL/CA 2002b).

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CHAPTER 5

Environmental Consequences

Chapter 5 provides information on the methods of analysis applied in the SWEA and the results of analyses for SNL/CA. The chapter 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, the Planned Utilization and Operations, and the Maximum Operations 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).

5.1 INTRODUCTION

Chapter 5 provides an analytical comparison of the environmental impacts associated with the alternatives. Section 5.2 contains a summary discussion of the methodologies used to assess potential impacts. Section 5.3, No Action Alternative; Section 5.4, Planned Utilization and Operations Alternative; and Section 5.5, Maximum Operations Alternative are formatted so that, within each alternative, the discussion is divided into the following resource and topic areas:

- Land Use and Visual Resources
- Geology and Soils
- Water Resources and Hydrology
- Biological Resources
- Cultural Resources
- Air Quality
- Infrastructure
- Transportation
- Waste Generation
- Noise
- Human Health and Worker Safety (including impacts from accidents)
- Socioeconomics
- Environmental Justice

Section 5.6, Accidents, discusses impacts of accidents for all three alternatives. For comparison, environmental emissions and other potential environmental effects are presented with regulatory standards or guidelines, as appropriate. However, for *National Environmental Policy Act 1969* (NEPA) purposes, compliance with regulatory standards is not necessarily an indication of the significance or severity of the environmental impact.

Several resource-specific evaluations have been performed that address the consequences and risks associated with the National Nuclear Security Administration (NNSA) operations at SNL/CA. Each evaluation has a unique scope and purpose. Figure 5-1 illustrates how the facility-based assessments and specific evaluations and consultations flow into the SNL/CA SWEA.

A comparison of impacts among alternatives is presented in Section 5.7. A discussion of cumulative impacts is presented in Chapter 6.

5.2 METHODOLOGY

5.2.1 LAND USE AND VISUAL RESOURCES

A comparative methodology was used to determine impacts to SNL/CA land use. Facility operations and any construction or other modification activities associated with each alternative were compared to the existing conditions. Impacts were identified related to changes in land use classifications, extent of use, alternative or conflicting uses, and accessibility concerns.

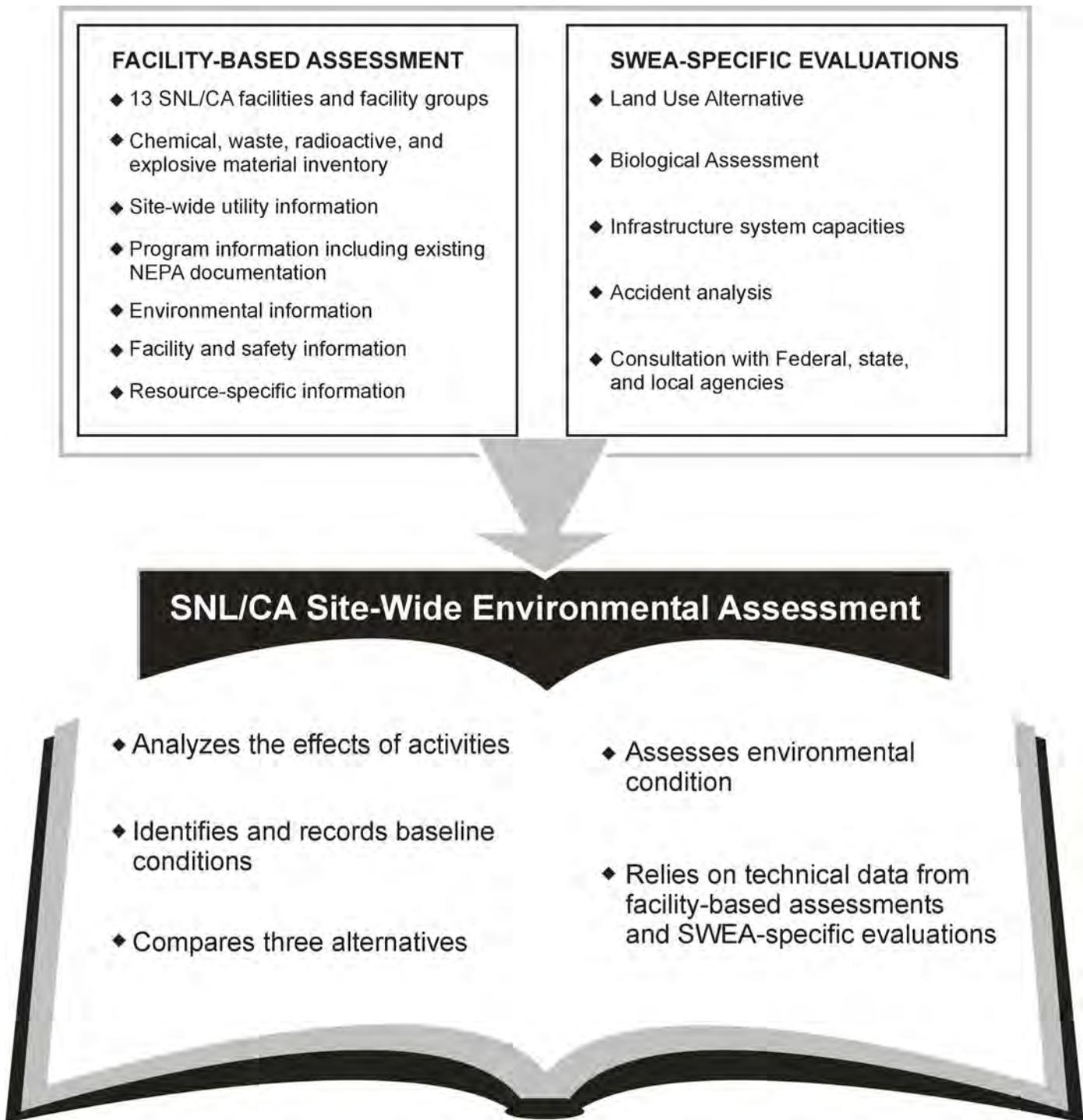
The analysis of visual impacts was also comparative and consisted of a qualitative examination of potential changes in visual resources, scenic values (attractiveness), and view corridors (visibility). Aspects of visual modification examined included site development or modification activities that could alter the visibility of SNL/CA structures or obscure views of the surrounding landscape, and changes in land cover that could make structures more visible.

5.2.2 GEOLOGY AND SOILS

Geology and soils analyses encompassed three distinct areas: seismic, slope stability, and soil contamination. The consequences of seismic activity at SNL/CA are addressed within the accident analysis section (5.6).

The slope stability analysis used a map to locate SNL/CA facilities near areas with potentially unstable slopes (at least 10 percent). The 10 percent value was selected as a conservative screening criterion based on the dry site soil conditions and no previous slope stability problems at SNL/CA. For each SNL/CA facility identified, field observations were conducted to support a qualitative evaluation of the effects of SNL/CA activities on these slopes.

The soil contamination analysis considered the potential for human contact of near-surface (the top 6 inches to 1 foot [ft]) contaminated soils and limitations on future land use of these areas. The analysis examined the characteristics of sites where soil contamination could be present (environmental restoration sites). Soil contaminant



Source: Original

Figure 5-1. Data and Analytical Contributions to the Sandia National Laboratories, California Site-Wide Environmental Assessment

The Site-Wide Environmental Assessment is related to many other Department of Energy and National Nuclear Security Administration resource-specific studies.

concentrations were projected under each alternative and compared with criteria for future designated land use.

5.2.3 WATER RESOURCES AND HYDROLOGY

Water resources and hydrology analyses focused on four distinct areas: groundwater quality, groundwater quantity, surface water quality, and surface water quantity.

The groundwater quality analysis determined to what extent contamination from SNL/CA sites in the unsaturated and saturated zones would limit the potential use of groundwater, particularly as drinking water. Unsaturated zone and groundwater contamination sites that have not been removed, are planned for removal, are final, or are proposed for no further action were characterized in terms of their contaminants, concentrations, and extent.

Groundwater quantity analysis examined future SNL/CA water use projections, evaluating potential impacts of groundwater withdrawal.

The surface water quality analysis examined the potential for future storm water runoff contamination in Arroyo Seco. Arroyo Seco water quality at the point where the arroyo enters the SNL/CA boundary was examined. The analysis examined changes in potential SNL/CA surface water contamination under the three alternatives and the likelihood of these changes affecting regulatory compliance at the downstream exit point of Arroyo Seco.

Effects of SNL/CA facilities on surface water quantity were analyzed based on the incremental contribution of SNL/CA to Arroyo Seco flows from storm water runoff. The current SNL/CA storm water runoff-monitoring program includes visually monitoring 22 discharge locations onsite during storm events and sampling nine locations. The amount of runoff is a function of the permeability of the ground surface or cover material. The percentage of the site's 410-acre drainage to the Arroyo that is impervious (buildings, roads, parking lots, etc.) was estimated for each of the three alternatives.

5.2.4 BIOLOGICAL RESOURCES

Potential impacts are assessed based on the degree to which various habitats or species could be affected by SNL/CA operations. Where possible, impacts are evaluated with respect to Federal and California protection regulations and standards.

Impacts to wildlife and habitat are evaluated in terms of disturbance, displacement, or loss of wildlife. Results of SNL/CA radionuclide monitoring in Livermore Valley released in September 2001 indicated that the average on-site radiation dose was essentially the same as offsite background during calendar year (CY) 2000 (SNL 2001e). The proximity of wetlands to SNL/CA operations was examined. Lists of protected species potentially present at SNL/

Ozone

Ozone (O₃) is a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but at ground level, ozone is created by a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of heat and sunlight.



Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of NO_x and VOC that help to form ozone. Sunlight and hot weather cause ground-level ozone to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of ground-level ozone, but even rural areas are subject to increased ozone levels because the wind carries ozone and pollutants that form it hundreds of miles away from their original sources.

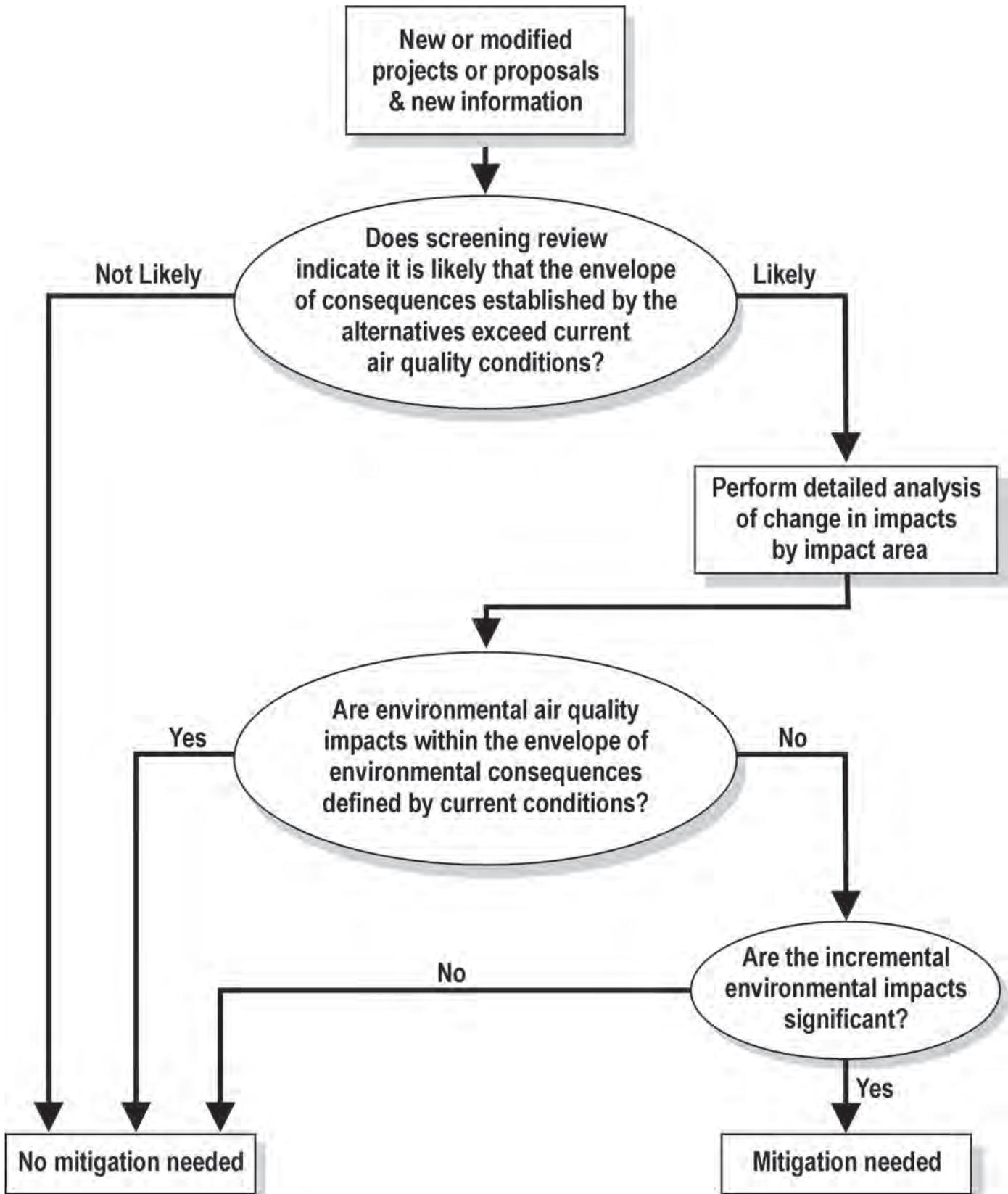
CA were obtained from the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG). These species lists were used to assess whether SNL/CA operations would affect any plant or animal protected by the *Endangered Species Act* or the *California Endangered Species Act*. In accordance with Section 7 of the *Endangered Species Act*, a biological assessment has been prepared to evaluate the effects of continued operation of SNL/CA on federally listed and candidate species. The biological assessment was submitted to the USFWS on July 19, 2002, and is currently under review by this agency.

5.2.5 CULTURAL RESOURCES

Potential impacts to cultural resources were assessed under the three alternatives. Cultural resources included prehistoric, historic, and Native American resources. Information for impact assessment included previous cultural resource assessments (Busby *et al.*, 1990) and surveys (SNL 2001c, 2001f), and a consultation with the California State Historic Preservation Officer (SHPO). Data on potential SNL/CA activities under the three alternatives were used to estimate impacts to resources (SNL/CA 2002b). Because there are no known resources on the SNL/CA site that are eligible or potentially eligible to the National Register of Historic Places (NRHP), the activities evaluated included only those with the potential to impact undiscovered (buried) archaeological resources.

5.2.6 AIR QUALITY

The methodology used to determine environmental impacts of the proposed alternatives on air quality involves a three-step screening analysis as illustrated in Figure 5-2.



Source: Original

Figure 5-2. Methodology for Air Quality Environmental Consequences
Sandia National Laboratories, California facilities were analyzed for potential impacts.

Step 1 performs an initial screening analysis of new or modified projects or proposals, changed circumstances, and new regulations, as described in Chapter 3. The initial screening analysis determines the specific impact areas that may exceed the bounds of the affected environment as described in Section 4.8 Air Quality.

Step 2 analyzed those impact areas that are likely to exceed the air quality ambient background conditions.

Step 3 assessed the air quality to determine the environmental consequences of the increase to the affected area.

The U.S. Environmental Protection Agency (EPA) has established criteria and procedures for demonstrating and assuring conformity of Federal actions to the State Implementation Plans (SIPs) for areas that are designated as nonattainment or maintenance for national ambient air quality standards (NAAQS) for criteria pollutants (40 CFR Parts 6, 51, and 93).

Section 176 (c)(1) of the Clean Air Act (CAA) requires Federal agencies to assure that their actions conform with applicable implementation plans (in most cases the State Implementation Plan) for achieving and maintaining the National Ambient Air Quality Standards for the criteria pollutants, ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, lead, and PM₁₀ (particulate matter with an aerodynamic diameter less than or equal to 10 microns). In 1993, the EPA issued general conformity regulations (40 CFR 51, Subpart W, and 40 CFR 93, Subpart B) that included procedures and criteria for determining whether a proposed Federal action would conform with State implementation plans. In the first phase a conformity review is undertaken to establish whether conformity regulations would apply to a proposed action and alternatives. If such a review determines the proposed actions are in an attainment area, the proposed actions are exempt from conformity requirements, or if in an attainment/maintenance area and the estimated emissions levels for criteria pollutants are less than applicable rates, the proposed actions are also exempt from conformity requirements. The host site for the proposed action at Livermore in the San Francisco Bay Area, is classified as nonattainment (as “Other—equivalent to a moderate nonattainment classification”), as a carbon monoxide maintenance area, and as an attainment area for all criteria pollutants. Hence further review of the proposed actions is required for ozone and carbon monoxide emission estimates from the proposed action from the perspective of the CAA general conformity requirements. Such a review is found in the subsequent subsections 5.3.6, 5.4.6, and 5.5.6 for each of the three alternatives.

The Bay Area Air Quality Management District (BAAQMD), in which SNL/CA is located, is currently in nonattainment for the 1-hour national ozone standard. As required by the *Clean Air Act* (CAA) an Ozone Attainment Plan was submitted to EPA in 1999 to identify a means for the region to attain the national 1-hour ozone standard. This plan was partially disapproved by EPA, requiring revisions that were incorporated into the 2001 Ozone Attainment Plan. When approved by EPA, it will become part of California’s State Implementation Plan (SIP). The 2001 Plan will incorporate into the SIP significant ozone precursor emission reductions designed to enable the region to attain the national 1-hour ozone standard as expeditiously as practicable.

In addition to the existing 1-hour standard, in 1997, EPA published a new national ozone standard-0.08 ppm-averaged over 8 hours (62 FR 38855). In July 2000, based on air monitoring data from 1997 through 1999, the CARB (California Air Resources Board) recommended to EPA a nonattainment designation for the Bay Area for the new 8-hour standard. A plan to attain the 8-hour standard would have been due in 2003. However, a number of issues were litigated in a challenge brought by the American Trucking Association. Certain issues were resolved on appeal to the U.S. Supreme Court, which will probably allow EPA to move forward with setting plan requirements for the 8-hour standard. The schedule for submitting plans for the 8-hour standard has not been set.

In reviewing stationary source measures for possible adoption in the Bay Area, the District employed a *de minimis* standard to ensure the inclusion of measures with potential emission reductions that might help attain the standard while not so minor as to impose administrative burdens that would hinder the effectiveness of the overall effort to adopt measures. The *de minimis* standard is set at 0.1 ton per day. The *de minimis* standard is a level below which the BAAQMD has not proceeded with rule development except to ensure statewide uniformity of local air district rules or for policy reasons unrelated to the efficiency of a measure in reducing ozone. Criteria pollutant emissions from SNL/CA are below the *de minimis* standard and therefore ozone precursor emission reductions are not mandated for SNL/CA (BAAQMD 2001).

The San Francisco Bay Area’s Air Toxics Program integrates Federal and state air toxics mandates with local goals that have been established by the BAAQMD’s Board of Directors. Compounds considered toxic air contaminants that are emitted in excess of minimum trigger levels become subject to the District’s Air Toxics Program. The program consists of several elements that are designed to identify and reduce public exposure to

toxic air contaminants. The three primary control programs are:

- Preconstruction review of new and modified sources
- The Air Toxics “Hot Spots” program
- Air Pollution control measures

The “Hot Spots” program requires facilities to report their air toxics emissions, ascertain health risks, and notify nearby residents of significant risks. Amendments to the “Hot Spots” program further require facilities that pose a significant health risk to the community to reduce their risk through a risk management plan.

5.2.7 INFRASTRUCTURE

Incremental changes to SNL/CA facilities and infrastructure were assessed by comparing the support requirements of the alternatives to current site infrastructure (roads and services) and utility demands (water and electricity) based on projected requirements and available capacities. Impacts were considered to infrastructure, facilities, services, and utilities used by SNL/CA, including infrastructure support provided by Lawrence Livermore National Laboratory (LLNL).

5.2.8 TRANSPORTATION

Transportation impacts were addressed by examining projected onsite and offsite transportation activities involving hazardous materials and wastes (includes radioactive materials and wastes). Regional traffic impacts related to the alternatives also were addressed.

5.2.9 WASTE GENERATION

The waste generation analysis examined impacts associated with potential waste generation activities of SNL/CA, including those for low-level waste (LLW), low-level mixed waste (LLMW), hazardous waste, and process wastewater. Specific facilities or activities that generate waste were evaluated for changes to the five-year (1996-2000) average quantities as a result of the proposed alternatives. SNL/CA waste management facilities capabilities were evaluated for potential impacts to their ability to manage projected waste quantities before transportation to offsite treatment and disposal. The analysis of potential impacts considered physical safety, regulatory requirements, and security measures associated with storage capacity.

Waste quantity projections were a function of individual facilities and projected increases in staffing. The No Action Alternative equaled the five-year average plus the new facilities. The Planned Utilization and Operations Alternative and the Maximum Operations Alternative total (site-wide) waste projections were increased by 13 percent and 53 percent, respectively. Balance of opera-

tion projections were calculated by subtracting facility specific projections from site-wide projections.

5.2.10 NOISE

The methodology used to determine environmental impacts of the proposed alternatives with respect to noise involves a three-step screening analysis as illustrated in Figure 5-3.

Step 1 performed an initial screening analysis of new or modified projects or proposals, changed circumstances, and new regulations, as described in Chapter 3. The initial screening analysis determined the specific impact areas that may exceed the bounds of the affected environment as described in Section 4.12 Noise.

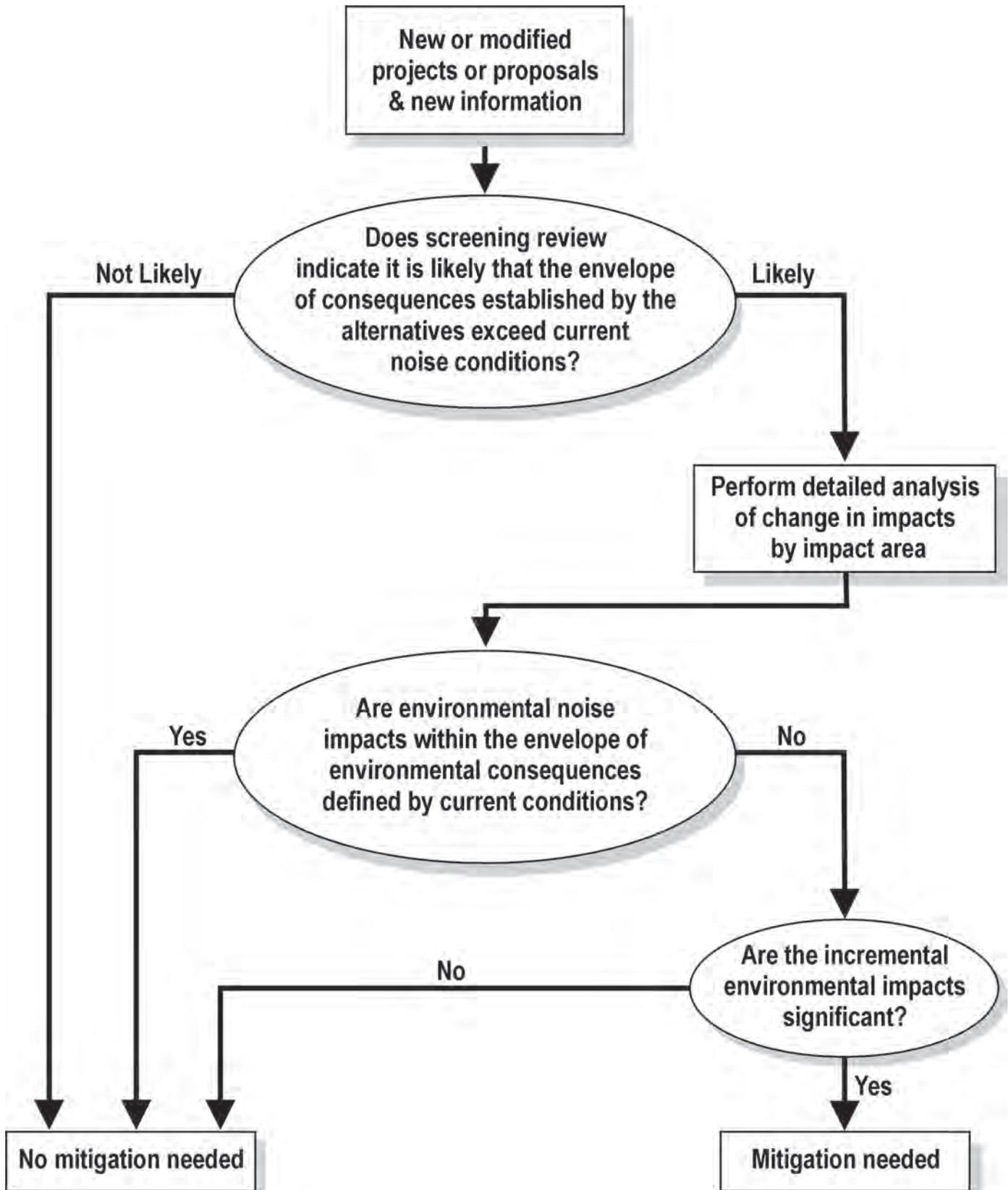
Step 2 analyzed those impact areas that are likely to exceed noise levels defining ambient background conditions.

Step 3 assessed the incremental noise levels to determine the environmental consequences of the increase to the affected area.

The determination as to whether a potential impact is significant with respect to noise is a qualitative assessment of the increase or decrease in noise level experienced by receptors near the source. A subjective response to changes in sound levels based upon judgments of sound present within a short time span indicate that a change of ± 5 decibel, A-weighted sound level (dBA) may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be “barely perceptible.” Changes in sound levels of ± 10 dBA within a short time span may be perceived as “dramatic” and changes in sound levels of ± 20 dBA within a short time span may be perceived as “striking.” Dramatic or striking changes in sound level could be considered significant impacts.

5.2.11 HUMAN HEALTH AND WORKER SAFETY

An analysis of environmental conditions related to SNL/CA routine operations under each alternative and the potential radiological and nonradiological health effects to SNL/CA workers and the surrounding public were completed based on a collective dose and work-related illness and injury rates. There are no SNL/CA sources of radioactive air emissions and thus no radiation exposure to the offsite population from SNL/CA operations. The calculations of radiological health effects focus on the collective dose to site workers involved in implementing each alternative. Occupational health impacts are presented as estimated work-related illness and injury rates associated with each of the alternatives.



Source: Original

Figure 5-3. Methodology for Noise Environmental Consequences

Typically, heating, ventilation, and air conditioning systems contribute to a majority of Sandia National Laboratories, California background noise.

Radiological doses to the radiation worker population were evaluated using the (average values) historic dosimetry data available for 1998 through 2000. The same approach was used to estimate radiation workers' annual workforce collective dose. The estimated annual workforce collective dose was based on the projected changes in the number of radiation workers under each alternative multiplied by the "average" annual workforce collective dose. Annual workforce collective dose was converted to total number of fatal cancers in the radiation worker population from one year's dose.

Sandia National Laboratories (SNL) nonradiological health impacts to workers were evaluated using occupational illness and injury data, occurrence reports, and industrial hygiene investigation reports available for 1999 through 2001. The SNL/CA illness/injury rate per year under each alternative is expected to remain consistent with the average illness/injury rate calculated for 1997 through 2001. The estimated number of illnesses and injuries per year was based on projected changes in the total number of workers under each alternative multiplied by the "average" illness/injury rate.

5.2.12 SOCIOECONOMICS

The socioeconomic analysis estimated the incremental effects from changes in income and employment associated with the three alternatives at SNL/CA. The socioeconomic ROI, as described in Chapter 4, is the three-county region around SNL/CA, including the city of Livermore, where 89 percent of SNL/CA employees and their families live, spend their wages and salaries, and use their benefits.

Earnings and employment multipliers were used to calculate the incremental effect of changes in socioeconomic conditions at SNL/CA. These multipliers were developed by the U.S. Department of Commerce Economics and Statistics Division of Bureau of Economic Analysis (BEA). The selected socioeconomic impact areas examined:

- Demographics
- Economic base
- Housing and community services

5.2.13 ENVIRONMENTAL JUSTICE

The potential for disproportionately high and adverse human health or environmental impacts from the proposed alternatives on minority and low-income populations was examined in accordance with Executive Order (EO) 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629). Both the *Environmental Justice Guidance Under the National Environmental Policy Act* (CEQ 1997a) and the *Guidance for Incorporating Environ-*

mental Justice Concerns in EPA's NEPA Compliance Analyses (EPA 1998a) provide guidance for identifying minority and low-income populations and determining whether the human health and environmental effects on these populations are disproportionately high and adverse.

The environmental justice analysis presents selected demographics and identifies the locations of minority and low-income populations living in the ROI of a 15-mi radius around SNL/CA (see Section 4.15.2).

5.2.14 ACCIDENT ANALYSIS

DOE guidance for accident analysis allows a graded approach that analyzes accidents at a level of detail that is consistent with the magnitude of the potential impacts (DOE 1993b). The DOE requires that potential hazards be considered if they can lead to accidents that are reasonably foreseeable; that is, there is a mechanism for their occurrence and their probability of occurrence is generally greater than one chance in a million per year. Accidents that are less frequent also may be considered if they could result in high consequences and provide information important to decision-making. Although the impacts of all potential accidents are not required, the accident analysis is required to evaluate a sample of reasonably foreseeable accidents, to demonstrate the range of potential impacts. These accidents would include low frequency, high-consequence and high-frequency, and low-consequence events.

Three general areas of accident analysis were considered in this SWEA: natural phenomenon, material accidents, and operational accidents. The accident impacts described in this section were developed from:

- meetings with facility managers; environment, safety, and health coordinators; and/or safety personnel to identify major potential hazards and identify safety documentation applicable to the SWEA;
- facility visits and tours to identify potential hazardous situations, gain an understanding of the mechanisms that could cause an accident, and obtain information for the development of accident scenarios; and reviews of facility safety documentation, including the SNL/CA Facility and Safety Information Document (SNL/CA 2002a), preliminary hazard screenings (PHSs), NEPA checklists, hazardous material databases, and other source documents prepared by SNL/CA.

The information and data obtained during these activities were used extensively for assessing hazards at SNL/CA facilities, developing accident scenarios, and estimating accident impacts.

Ideally, a complete risk assessment would express the total human health risk as a sum of all potential accident scenarios. Since it is impractical to rigorously quantify

all of the terms in the ideal summation, the purpose of the SWEA accident analysis is to identify a subset of representative accidents and describe the related impacts.

Preliminary screenings of SNL/CA activities and operations were conducted to select facilities and operations to be evaluated. The criteria for screening included types and quantities of hazardous material (includes radioactive and explosives) potential for public concern, and accidents analyzed in other NNSA NEPA documents. This initial screening process resulted in the following list of facilities:

- Combustion Research Facility (CRF) (including the Glass Furnace and Melting Laboratory)
- Building 910
- Building 914
- Building 916
- Building 927
- Integrated Manufacturing Technology Laboratory (IMTL)
- Chemical and Radiation Detection Laboratory (CRDL)
- Area 8 Facilities
- Explosive Storage Area (ESA)
- Hazardous and Radioactive Storage Facilities
- LIGA Technologies Facility (LTF)
- Distributed Information Systems Laboratory (DISL)

All of these facilities are categorized as low-hazard, nonnuclear facilities and generally contain standard industrial hazards. Further screening was performed to eliminate low-hazard activities and operations that would result in small consequences to workers or the public. This further screening eliminated the Distributed Information Systems Laboratory from further consideration, as it would contain no radioactive, chemical, or explosive materials.

Several specific accident scenarios were identified and considered for further analysis. The following were considered natural phenomena accident initiators:

- Earthquake initiated accident
- Lighting initiated accident
- Arroyo Seco flooding
- Grass fire

The following were considered material accident initiators:

- No radiological scenarios are postulated because no sources of potential airborne hazards were identified.

- For the purpose of the chemical hazards assessment, a spectrum of events up to and including the “severe” events that would, from a facility design standpoint, be beyond credible (failure of a U.S. Department of Transportation [DOT]-approved steel cylinder) were considered
- For the purpose of the explosion hazard assessment, six events were considered:
 - Explosion initiated by unspecified event during hydrogen tanker filling operations
 - Explosion initiated by unspecified rupture of hydrogen storage tank
 - Explosion due to operational accidents at the Explosive Destruction System (EDS)
 - Explosion due to operational accidents at the Explosive Storage Area (ESA)
 - Explosion due to operational accidents at magazine explosive storage
 - Oxygen enhanced event due to operational accidents associated with Glass Furnace and Melting Laboratory

The following were considered operational accident initiators:

- Fork lift operation
- Overhead crane operation
- Welding
- Chemical exposures
- Other standard industrial hazards

Two accident scenarios (site-wide earthquake and hydrogen tanker truck explosion) are discussed in detail. The impacts of these accidents are meant to characterize the worse case scenario.

Chemical, oil, or hazardous material spills or releases are possible given the variety of materials handled at SNL/CA. Although substantial quantities of hazardous materials (above threshold levels listed in DOE Order 151.1, “Comprehensive Emergency Management System”) are not present on SNL/CA, some buildings use a variety of chemicals, including cylinders of ammonia, hydrogen cyanide, nitrous oxide, hydrogen sulfide, and carbon monoxide. The Hazardous and Radioactive Storage Facilities stores and handles hazardous and radioactive wastes being prepared for shipment offsite for disposal. These facilities are the onsite receiving point for all chemical wastes and thus have the potential for hazardous spills, releases, or fires. Additionally, most of the onsite research laboratories use small amounts of chemicals for research projects.

No chemical inventories are stored onsite in quantities sufficient to result in hazardous conditions outside the facility boundary or offsite (SNL/CA 2001a).

Illness and injury rates from operations are discussed in the Human Health and Worker Safety section of each alternative.

5.3 NO ACTION ALTERNATIVE

5.3.1 LAND USE AND VISUAL RESOURCES

Implementing the No Action Alternative would not affect the existing land use patterns or visual resources at SNL/CA facilities. Sections 5.3.1.1 and 5.3.1.2 discuss the impact of the No Action Alternative to these resource areas.

5.3.1.1 Land Use

No changes to land use would occur at SNL/CA under the No Action Alternative. The extent of DOE land available for use by SNL/CA, 410 acres, would remain the same. SNL/CA operations would remain consistent with industrial research park uses and would have no foreseeable effects on established land use patterns or requirements. The only changes in the use of specific locations on the site would be using current open spaces to construct new facilities. Construction of the DISL, LTF (Figure 5-4), and Glass Furnace and Melting Laboratory facilities would be consistent with established land use and utilization patterns. Because these facilities would be built within the main campus of the site, filling in empty locations between existing facilities, they would not change the extent of use of the site and accessibility would not be a concern (Figure 5-4). Open areas with paved or landscaped surfaces would remain between these new facilities and existing ones, remaining consistent with the design of the rest of SNL/CA. In addition, the functions of these buildings would be consistent with those surrounding them, thus construction and use of these new facilities would not negate consideration of possible alternative uses of areas adjacent to them.

Under this alternative, the Hazardous and Radioactive Storage Facilities at the site would be modified to increase their efficiency and operability. As these changes would occur to an existing building, there would be no changes or impacts to land use.

5.3.1.2 Visual Resources

The No Action Alternative would not adversely change the overall appearance of the existing landscape, obscure views, increase the visibility of SNL/CA structures, or otherwise detract from the scenic views from SNL/CA or from areas adjacent to the site. New facilities would be placed among existing facilities in areas with common scenic quality. Efforts to incorporate consistent campus-style design would continue and guidance provided by the

Site Visual Quality Guidelines and Landscape Master Plan (Royston *et al.*, 1993) would be followed. The guidance covers building massing, facades, colors, building orientation and entries, traffic circulation corridors, standardized signage, and landscaping. Modifications to the Hazardous and Radioactive Storage Facilities would also follow the guidance, thereby having no impact to visual resources.

5.3.2 GEOLOGY AND SOILS

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.

5.3.2.1 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 SNL/CA site include the major regional faults (for example, San Andreas), as well as the local faults including the Greenville, and Las Positas faults (DOE 1992a).

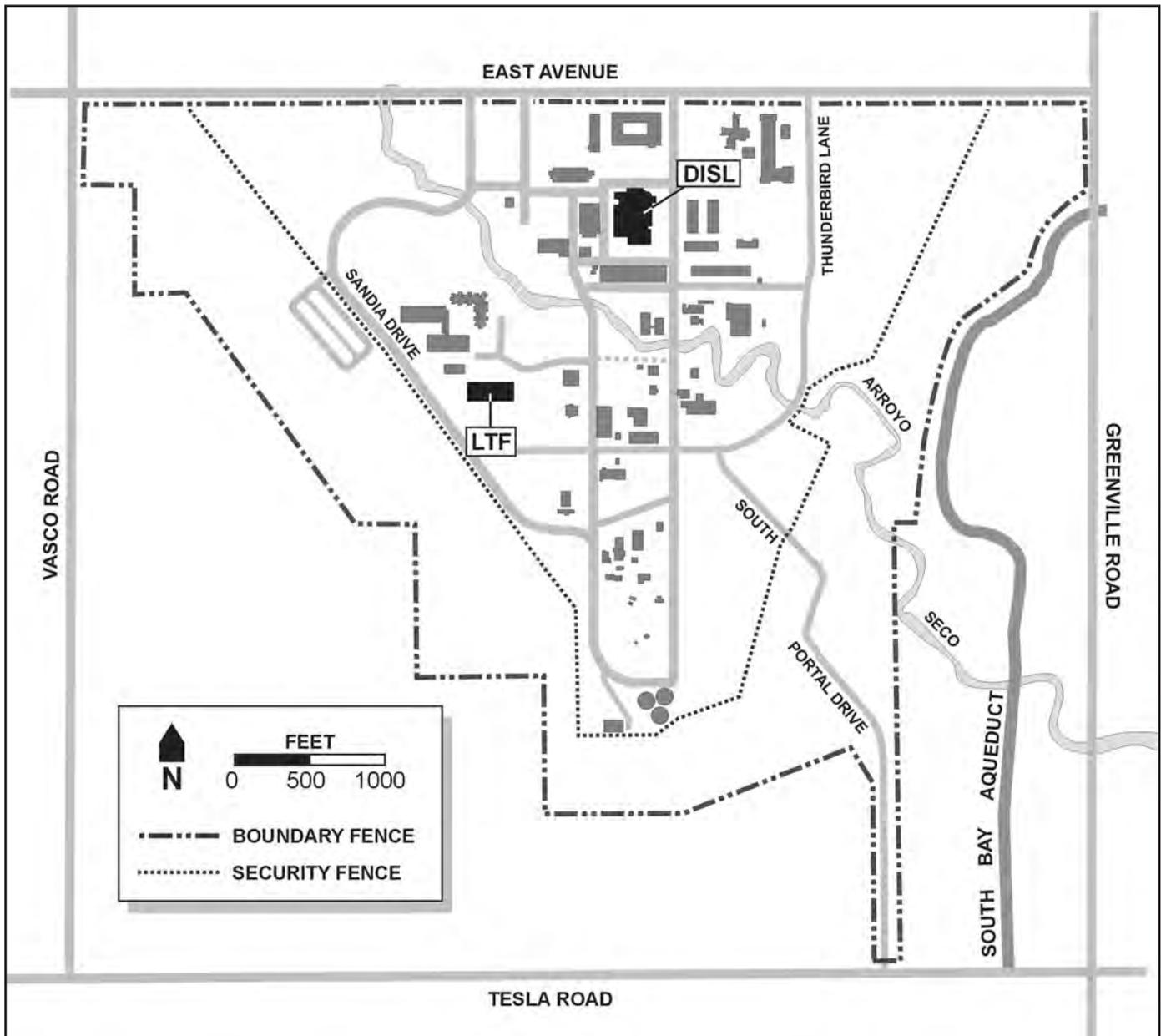
Seismic hazard analyses have been performed for the SNL/CA site. All new buildings and facilities would be built according to established seismic design criteria. Existing facilities continue to be upgraded or replaced to the extent possible (SNL 2001d). Larger earthquakes on more distant faults such as the San Andreas do not significantly affect the hazard estimation for SNL/CA.

5.3.2.2 Slope Stability

At SNL/CA, there is generally little potential for slope instability because the site is situated on gently sloping to nearly flat topography. The exception to this is the extreme southern end of SNL/CA. The hillsides surrounding this area consist of moderately to weakly consolidated sand and gravel, and colluvial and alluvial terrace deposits. The Navy Landfill Site hill has extensive evidence of mass movement (DOE 1992a). There is an increased chance of slope failure during wet years at the dry wash surrounding the Navy Landfill Site. Slope failure at this location would have no effect on SNL/CA facilities.

5.3.2.3 Soils

There could be very minor impacts to the soils due to erosion during construction. Approximately 6 acres of soil would be disturbed because of construction activities associated with building the LTF and DISL facilities. Soil erosion controls (for example, silt fences) would be used to minimize soil erosion.



Source: Original

Figure 5-4. Sandia National Laboratories, California Facilities

Sandia National Laboratories, California footprint would remain consistent with the current design.

Soil contamination at SNL/CA occurred as the result of past operations. The cleanup of these soils is performed to a level that meets the health risk-based standards corresponding to the intended future uses of the site. Analyses indicate no significant risk to the general public (SNL/CA 2002b).

As of August 2002, SNL/CA had identified 23 sites with soil contamination from past operations. Because contamination levels pose no threat to human health or the environment, the DOE has proposed no further action for all 23 sites. Twenty of the No Further Action

proposals have been approved by state regulatory authorities. The remaining three sites are part of a long-term monitoring program. The State, NNSA, and SNL/CA would continue to discuss monitoring and potential cleanup activities, as necessary.

Chemical, oil, or hazardous material spills or releases are possible in the future given the variety of materials handled at SNL/CA; however, industry accepted controls are in place to minimize the potential for soil contamination from any SNL/CA operations.

5.3.3 WATER RESOURCES AND HYDROLOGY

5.3.3.1 Groundwater Quality

Under this alternative, SNL/CA would continue to monitor groundwater quality at several sites: the Fuel Oil Spill (FOS), the Navy Landfill, and the Trudell Auto Repair Shop. Past measurements indicate that some contaminants at these sites have periodically exceeded the maximum contaminant levels (MCLs) in Federal drinking water standards (40 CFR Part 141). However, concentrations at these sites continue to decrease over time (SNL/CA 2002b).

5.3.3.2 Groundwater Quantity

SNL/CA does not use groundwater for any portion of its water supply; therefore, no effects to groundwater quantity would be anticipated under the No Action Alternative.

5.3.3.3 Surface Water Quality

During storm events at SNL/CA runoff is carried by sheet flow, storm drains, or open ditches to the Arroyo Seco or the ditch along East Avenue. The ditch along East Avenue eventually flows into the Arroyo Seco.

Pollutants may be picked up by storm water runoff. If rainfall is sufficient, there may be enough runoff to carry the pollutant to the Arroyo Seco before the runoff evaporates or infiltrates into the ground. The amount of runoff is a function of the permeability of the ground surface or material. Under this alternative, the percentage of the site's 410-acre drainage to the Arroyo that is impervious (buildings, roads, parking lots, etc.) (12 percent) would remain the same (SNL/CA 2002b).

The current SNL/CA storm water runoff-monitoring program includes visually monitoring 22 discharge locations onsite during storm events and sampling nine locations. The discharge locations and sampling stations are shown in Figure 4-9. 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 storm water runoff. During the most recent sampling, no pollutants were detected at levels that would be a cause for concern. No effects to storm water compliance would be anticipated under this alternative.

Cleanup actions planned, underway, or completed at the ER sites at SNL/CA are intended to remove any potential source of surface water contamination, and the cleanup activities themselves are not expected to negatively affect surface water quality. No overall impact to surface water quality from ER Program activities would be anticipated under the No Action Alternative.

5.3.3.4 Surface Water Quantity

The developed (impervious) area of SNL/CA is estimated to be 49.2 acres. Under the No Action Alternative, only minor net changes in building and parking lot areas would be anticipated. Annual variation in SNL/CA 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.

5.3.4 BIOLOGICAL RESOURCES

Impacts to biological resources at SNL/CA as a result of the No Action Alternative would be minimal. Because current operations would continue, the impacts to terrestrial, aquatic, and wetland species, and species would remain negligible. Inventory and management (including compliance with regulations) of the biological resources by SNL/CA would continue to protect the animals, plants, habitats, and protected and sensitive species on SNL/CA.

5.3.5 CULTURAL RESOURCES

The No Action Alternative would have no impacts to cultural resources due to: the apparent lack of prehistoric and Native American resources and historic archaeological sites, the nature of the buildings and structures present, and compliance with applicable regulations and established procedures for the protection and conservation of cultural resources located on lands administered by the DOE.

Buried archaeological sites could be impacted during construction or other ground-disturbing activities. Under the No Action Alternative, these activities would include construction of the LTF and DISL facilities. However, compliance with regulations and procedures would address impacts to any cultural resources discovered during the construction of these facilities, either avoiding, reducing, or mitigating the potential impacts. Some maintenance activities that require ground disturbance could also result in the discovery of buried archaeological sites, but again, compliance with regulations and procedures would address any impacts.

5.3.6 AIR QUALITY

Under the No Action Alternative, ongoing DOE and interagency programs and activities at SNL/CA would continue and several new facilities would contribute to projected emission increases.

During July 2000 to June 2001, sources of criteria pollutant emissions from SNL/CA included 10 permitted natural gas-fueled boilers in six buildings within the facility. Table 5-1 presents natural gas usage during CY 2000 from each of the buildings with permitted boilers.

Table 5-1. Natural Gas Fuel Usage at Sandia National Laboratories, California during Calendar Year 2000

Building	Natural Gas Usage (thousand cubic feet)
907	13,345
910	7,254
912	4,952
916	5,535
927	1,907
940, 941, 942, 943	25,754
968	8,941

Source: SNL/CA 2002a

The No Action Alternative would include 28 nonexempt emission sources:

- 10 boilers
- 1 degreaser
- 1 spray booth
- 8 backup generators
- 1 electroplating operation
- 1 mixer (Glass Furnace and Melting Laboratory)
- 6 miscellaneous sources

Table 5-2 presents emissions attributed mainly to these sources, and other minor sources located throughout SNL/CA as well. SNL/CA criteria pollutant emissions are less than one percent of the Bay Area emissions.

The SNL/CA toxic air contaminant inventory for the period July 2000 to June 2001 included 12 significant pollutants from 18 permitted sources. Methyl alcohol was the maximum reported toxic pollutant based upon a 5-year average emission rate (Table 5-3). SNL/CA air

toxic emissions with Bay Area air toxic emissions are less than one percent of those for the Bay Area.

Construction activities at SNL/CA could have short-term adverse impacts due to emissions of criteria air pollutants from construction worker traffic and construction equipment and from fugitive dust from earth-moving activities. Fugitive dust during construction could exceed particulate matter less than 10 microns in diameter (PM₁₀) 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 PM₁₀ concentrations will be within all applicable standards.

Table 5-4 estimates construction-related carbon monoxide (CO) emissions for one typical project. It is expected that CO emissions will be within all applicable standards.

The estimated number of daily commuter vehicles to SNL/CA during fiscal year (FY) 2001 was 700 to 1000. This number represents the No Action Alternative level of commuter traffic. Future emissions are expected to decrease because new vehicles will have lower emission rates and more stringent inspection and maintenance programs. In addition, the BAAQMD vehicle buy-back program designed to remove 1981 and earlier model vehicles from the road will contribute to the overall reduction in commuter vehicle emissions.

Total carbon monoxide emissions for the No Action Alternative are shown in Table 5-5. Total carbon monoxide emissions for the No Action Alternative are 30 tons per year less than the 2000 baseline, well below the 100-tons per year incremental increase above baseline that would require a conformity determination. 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.

Table 5-2. Criteria Pollutant Emission Rates for the No Action Alternative (kilograms per year)

Pollutant	No Action Alternative	Bay Area ^a	Percent Contribution from SNL/CA
	Emission Year ^b		
	2000/2001	2000	
Particulates	NA	57,900,000	NA
Volatile Organic Compounds	1,656	179,000,000	< 1
Sulfur Dioxide	NA	29,100,000	NA
Nitrogen Dioxide	3,311	214,000,000	< 1
Carbon Monoxide	300 to 400	995,000,000	< 1

Sources: SNL/CA 2002b

^aBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June

^bAll Bay Area wide emissions except particulates are based on an average summer day multiplied by 365 days. Bay Area particulate emissions are based on an average winter day multiplied by 365 days

NA: not available/not applicable

SNL/CA: Sandia National Laboratories, California

Table 5-3. Air Toxic Emission Rates for the No Action Alternative (kilograms per year)

Pollutant	No Action Alternative	Bay Area ^a	Percent Contribution from SNL/CA
	Emission Year ^b		
	1996 to 2001 ^(b)	1999	
1,1,1-trichloroethane	121.15	58,968	< 1
1,4-dioxane	2.61	771	< 1
Ammonia	115.8	1,406,160	< 1
Benzene	0.31	28,577	< 1
Carbon tetrachloride	0.15	1,406	< 1
Formaldehyde	3.22	81,648	< 1
Methyl alcohol	170.5	276,696	< 1
Methylene chloride	40.67	49,896	< 1
Perchloroethylene	45.72	371,952	< 1
Toluene	9.32	335,664	< 1
Trichloroethylene	13.86	21,773	< 1
Xylene	2.96	276,696	< 1

Sources: TTNUS 2002a; SNL/CA 2002b

^aBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June^bBased on 5-year average emission rate (1996 through 2001)

SNL/CA: Sandia National Laboratories, California

Table 5-4. Estimated Carbon Monoxide Emissions Associated with LIGA Technologies Facility Construction Activities

1-Year construction Activity (assumes 21-work day months or 252 days)	Total Annual Hours of Operation	Equipment Emission Factors ^a	Estimated Total Annual Carbon Monoxide Emissions (total pounds per year)	Estimated Total Annual Carbon Monoxide Emissions (total tons per year)
Assumptions for Diesel Vehicles Emissions				
7 Diesel Units (trucks for transportation of materials to site throughout life of construction phase)	3,528 (or 2 hours per day each for 252 days)	0.11	388	0.194
8 Diesel Units (dozers, backhoes, graders, dump trucks to grade and lay foundation)	800 (or 5 hours per day each for 20 days)	0.11	88	0.044
6 Diesel Units (forklifts, crane, front end loader, other equipment for construction of buildings)	10,584 (or 7 hours per day each for 252 days)	0.11	1,164	0.582
Total Diesel units (21)	14,912	N/A	1,640	0.82

Table 5-4. Estimated Carbon Monoxide Emissions Associated with LIGA Technologies Facility Construction Activities

1-Year construction Activity (assumes 21-work day months or 252 days)	Total Annual Hours of Operation	Equipment Emission Factors ^a	Estimated Total Annual Carbon Monoxide Emissions (total pounds per year)	Estimated Total Annual Carbon Monoxide Emissions (total tons per year)
Assumptions for Gasoline Vehicles Emissions				
24 Light Gasoline units (worker personal vehicles, snack wagons, light commercial vans)	6,048 (or 1 hour per day each for 252 days)	0.48	2,903	1.451
2 Hand tampers	160 (or 4 hours per day each for 20 days)	0.48	77	0.38
Total Gas units	6,208	N/A	2,980	1.49
Total Estimated Carbon Monoxide Emissions during LIGA Technologies Facility Construction Phase			4,620 pounds	2.31 tons

Source: DOE 2001f

Note: Distributed Information Systems Laboratory construction would produce similar emissions

^aCarbon Monoxide (CO) emission factors are based on the Environmental Protection Agency (EPA) National Vehicle and Fuel Emission Laboratory (Ann Arbor, Michigan) average emission rates for idling vehicles. CO emissions for light-duty trucks are estimated at 219 grams per hour, for heavy-duty gas vehicles at 245 grams per hour, and for heavy-duty diesel vehicles at 50 grams per hour. Calculations are based on a conversion factor of 0.035 ounce per gram (grams x 0.035) divided by 16 (ounces per pounds.) times hour's operation divided by 2,000 (pounds per ton) to obtain tons per year.

Table 5-5. Carbon Monoxide Emissions from Sandia National Laboratories, California under the No Action Alternative (Tons per Year) and Calendar Year 2000 (Baseline)

Stationary Sources	Mobile Sources	Construction Activities	Total
No Action Alternative			
0.4	184	6.9 ^a	191.3
Baseline			
0.4	214	6.9 ^a	221.3

Source: EPA 1995

Notes: Mobile Source Emission Factors assumptions include the baseline (calendar year [CY] 2000) 24.77 grams per mile, the No Action Alternative (CY 2005) 21.29 grams per mile, 1,000 vehicles, 30 mile trip, average speed 35 miles per hour.

^aAssumed three typical construction projects each year (2.31 tons per project).

As a result, the NNSA has concluded that no conformity determination is required for the No Action Alternative.

5.3.7 INFRASTRUCTURE

Descriptions of important infrastructure services (such as maintenance), utilities (such as electricity), and facilities are provided in the *SNL Sites Comprehensive Plan FY 2001-2010* (SNL 2001d). Potential incremental changes to SNL/CA services, utilities, and facilities were reviewed for each alternative. The analysis focused on incremental changes to site-wide utility demands.

Most SNL/CA facilities do not meter utility use. However, annual site-wide utility demands are known and were used, in part, to make projections (TtNUS 2002a).

Table 5-6 projects the utility usage for the No Action Alternative. Water use would range from 50 to 60 million gallons per year (MGY). SNL/CA would generate 12 to 19 M gal of wastewater per year. Projected utility consumption rates likely would fluctuate annually due to weather. With the addition of the LTF, the DISL and the Glass Furnace and Melting Laboratory electricity and natural gas usage at SNL/CA would increase by 14,000 MWh and 35 M ft³ per year, respectively (FY 2000, Table 4-6).

Under the No Action Alternative, current infrastructure is capable of accommodating facility requirements and no major additional infrastructure facilities are proposed. Buildings, services, communications, maintenance programs (including upgrades, repairs, and limited renovations), roads, material storage, and waste storage

**Table 5-6. Annual Sandia National Laboratories, California
Utility Usage and Capacities under the No Action Alternative**

Utility	No Action Alternative	System Capacity	Usage as Percent of Capacity
Water Use	50 to 60 M gal	922 M gal	5 to 6
Wastewater Discharge	12 to 19 M	81 M gal	15 to 23
Electrical Use	36,934 MWh	239,000 MWh	15
Natural Gas Use	94 M ft ³	430 M ft ³	22

Source: TtNUS 2002a
ft³: cubic feet
gal: gallon
M: million
MWh: megawatt hour

activities would remain compatible with system requirements. SNL/CA maintains an active decontamination and decommissioning (D&D) program that identifies and removes from active service outdated or substandard facilities. An overall reduction in the number of active facilities would reduce the overall impacts to SNL/CA infrastructure. Specific details on these systems and programs are presented in the *SNL Sites Comprehensive Plan FY 2001-2010* (SNL 2001d).

5.3.8 TRANSPORTATION

No additional impacts to transportation would occur under the No Action Alternative. SNL/CA commuter traffic would remain at 700 to 1,000 vehicles per day. Approximately one to three hazardous material shipments (outbound) per week would be expected. Waste shipments would remain at 76 per year. Table 5-7

shows the No Action Alternative transportation-related activities would remain the same as FY 2000.

5.3.9 WASTE GENERATION

The No Action Alternative would not cause major changes in the types of waste streams generated onsite. Waste generation levels at SNL/CA would remain constant or slightly increase. However, existing waste minimization and pollution prevention measures would control the extent of the waste generation increase. Waste projections would not exceed existing waste management capacities.

Wastes from existing operations are considered to be derived from mission-related work. New operations are discussed separately in order to show the maximum likely existing operational increases. Nonoperations wastes are generated from special programs and facility support.

**Table 5-7. Annual Sandia National Laboratories, California
Transportation Activities under the No Action Alternative**

Activity	FY 2000	No Action Alternative
Paved and unpaved road	6.2 miles	6.2 miles
Pedestrian mall	4 acres	4 acres
Paved service areas	5.5 acres	5.5 acres
Paved service parking	12.7 acres	12.7 acres
Material (Annual Shipments Radioactive, Chemical, and Explosives)	33 trips	33 trips
Waste (includes hazardous and radioactive)	76 shipments	76 shipments
Sanitary Waste	52 shipments	52 shipments
Site-Related Traffic - Total Daily traffic	700 to 1,000 vehicles	700 to 1,000 vehicles
Sandia National Laboratories, California Weekly Hazardous Materials Transports (excluding waste)	1 to 3 outbound shipments per week (Total of 33)	1 to 3 outbound shipments per week (Total of 33)
Supplier Weekly Hazardous Material Transports	1 to 3 inbound shipments per week (Total of 100)	1 to 3 inbound shipments per week (Total of 100)

Source: TtNUS 2002a

Waste generation levels for special program waste, such as for new construction, are derived separately.

5.3.9.1 Radioactive Wastes

Existing Operations

Under the No Action Alternative, SNL/CA potentially would generate LLW and LLMW. However, SNL/CA would not generate any TRU waste or high-level waste. Site-wide average annual radioactive waste projections are presented in Table 5-8. Projections for radioactive waste generation at specific facilities from new and existing operations are shown in Table 5-9.

Under the No Action Alternative, SNL/CA anticipates no increase in generation of LLW from existing operations over the next 10 years. LLMW generation would remain constant for all operations through 2012. New operations would not generate LLW and LLMW. There would be sufficient management capacity to accommodate anticipated radioactive wastes. LLW and LLMW would be shipped offsite for final disposal.

New Operations

SNL/CA anticipates no LLW and LLMW would be generated from new operations annually over the next 10 years.

Balance of Operations (Includes Maintenance and Decommissioning and Decontaminating)

SNL/CA anticipates 5,110 kg per year of LLW and 451 kg per year of LLMW would be generated from balance of operations annually over the next 10 years. There would be sufficient management capacity to accommodate projected radioactive wastes. Maintenance and D&D wastes are not expected to impact SNL/CA waste management operations.

Current Capacity

The total radioactive waste generated per year requiring offsite disposal at licensed/approved facilities would not exceed the existing storage and handling capacities at the Radioactive Waste Storage Facility. Projections indicate that radioactive waste throughput would remain constant. SNL/CA routinely ships radioactive waste to various

Table 5-8. Average Annual Radioactive Waste Generation under the No Action Alternative (in Kilograms)

All Waste	Unit	5-Year Average (1996 through 2000)	No Action Alternative
LLW			
Existing Operations	kg	NR	198
New Operations	kg	NR	0
Balance of Operations	kg	NR	5,110
SNL/CA Total LLW	kg	5,308	5,308
Percent Change		0%	0%
LLMW			
Existing Operations	kg	NR	0
New Operations	kg	NR	0
Balance of Operations	kg	NR	451
SNL/CA Total LLMW	kg	451	451
Percent Change		0%	0%
Total All Radioactive Waste			
Existing Operations	kg	NR	198
New Operations	kg	NR	0
Balance of Operations	kg	NR	5,561
SNL/CA Total All Radioactive Waste	kg	5,759	5,759
Percent Change		0%	0%

Sources: SNL/CA 2002b; TtNUS 2002a

CY: calendar year

kg: kilograms

LLW: low-level waste

LLMW: low-level mixed waste

NR: not reported

Table 5-9. Average Annual Generation by Specific Sandia National Laboratories, California Facilities under the No Action Alternative (in Kilograms)

Facility	Calendar Year 2000			No Action Alternative		
	LLW	LLMW	Hazardous ^a	LLW	LLMW	Hazardous ^a
Existing Facilities						
Combustion Research Facility (CRF)	0	0	2,444	0	0	2,444
Building 910	15	0	15,432	15	0	15,432
Building 914	0	0	1,741	0	0	1,741
Building 916	1.5	0	596	1.5	0	596
Building 927	0	0	4,182	0	0	4,182
Micro and Nano Technologies Laboratory (MANTL)	0	0	7,109	0	0	7,109
Chemical and Radioactive Detection Laboratory (CRDL)	13	0	1,169	13	0	1,169
Area 8 Facilities	168	0	814	168	0	814
Explosive Storage Area (ESA)	0	0	0	0	0	0
Hazardous and Radioactive Waste Storage Facility	0	0	0	0	0	0
Subtotals Existing Facilities	198	0	33,487	198	0	33,487
New Facilities						
LIGA Technologies Facility (LTF)	0	0	0	0	0	2,964
Distributed Information Systems Laboratory (DISL)	0	0	0	0	0	0
Glass Furnace and Melting Laboratory (part of the CRF)	0	0	0	0	0	50
Subtotals New Facilities	0	0	0	0	0	3,014
Totals All Facilities	198	0	33,487	0	0	36,501

Sources: SNL/CA 2002b; TtNUS 2002a

^aIncludes RCRA Hazardous, California Toxic, TSCA, and biohazardous (MWMA)

LLW: low-level waste

LLMW: low-level mixed waste

RCRA: *Resource Conservation and Recovery Act*TSCA: *Toxic Substance Control Act*MWMA: *Medical Waste Management Control Act*

offsite governmental and commercial treatment and disposal facilities. All waste is shipped to meet regulatory requirements. Based on these projections and continued operations at specific facilities under the No Action Alternative, the radioactive waste generation impacts would continue to be minimal.

5.3.9.2 Hazardous Waste

Existing Operations

The No Action Alternative total hazardous waste generation would remain constant for existing facilities, with no changes for wastes generated annually. Under the No Action Alternative, SNL/CA anticipates 36,501 kg per year of hazardous waste generated by existing operations through 2012 (Table 5-9). There would be sufficient management capacity to accommodate anticipated existing

operations total hazardous wastes. Projections for all operations by waste type are presented in Table 5-10.

New Operations

SNL/CA anticipates annual generation of 3,014 kg of hazardous waste by new operations over the next 10 years. The majority of the additional waste would be due to the full implementation of LIGA wafer production operations (Table 5-9, 2,964 kg). New SNL/CA operations would increase the annual total hazardous waste at the site by 3.5 percent (Table 5-10).

Balance of Operations

During maintenance and D&D (as outlined in Section 2.3.3), SNL/CA would produce hazardous waste each year. SNL/CA would continue to generate TSCA waste, primarily PCBs and asbestos that are removed from trans-

Table 5-10. Average Annual Hazardous Waste Generated under the No Action Alternative by Waste Type (in kilograms)

All Waste	Unit	5-Year Average (1996 through 2000)	No Action Alternative
RCRA Hazardous Waste			
Existing Operations	kg	NR	8,659
New Operations ^a	kg	NR	779
Balance of Operations	kg	NR	13,957
SNL/CA Total RCRA Hazardous	kg	22,616	23,395
Percent Change		0%	+3.4%
California Toxic Waste			
Existing Operations	kg	NR	9,922
New Operations ^a	kg	NR	893
Balance of Operations	kg	NR	15,992
SNL/CA Total California Toxic	kg	25,914	26,807
Percent Change		0%	+3.4%
TSCA			
Existing Operations	kg	NR	14,695
New Operations ^a	kg	NR	1,323
Balance of Operations	kg	NR	22,365
SNL/CA Total TSCA	kg	38,383	39,706
Percent Change		0%	3.3%
Biohazardous Waste (includes MWMA)			
Existing Operations	kg	NR	211
New Operations ^a	kg	NR	19
Balance of Operations	kg	NR	340
SNL/CA Total Biohazardous	kg	551	580
Percent Change		0%	+3.3%
Total All Hazardous Waste			
Existing Operations	kg	NR	33,487
New Operations ^a	kg	NR	3,014
Balance of Operations	kg	NR	52,654
SNL/CA Total All Hazardous waste	kg	87,464	90,488
Percent Change		0%	3.5%

Sources: SNL/CA 2002b; TtNUS 2002a

^aNew operations include LTF, DISL, and Glass Furnace and Melting Laboratory

CY: calendar year

kg: kilograms

RCRA: Resource Conservation and Recovery Act

TSCA: Toxic Substances Control Act

MWMA: Medical Waste Management Act

NR: not reported

formers and buildings. Projected hazardous waste quantities for these activities are included in Table 5-10 as balance of operations. This work would directly affect the quantity of TSCA waste requiring disposal.

Under the No Action Alternative, the balance of operations would generate 52,654 kg out of a total of 90,488 kg annually of all hazardous waste.

Under the No Action Alternative, four buildings, totaling approximately 15,000 gsf (an estimated 100 tons or 100,000 kg of construction debris) would be demolished.

Current Capacity

The total hazardous waste generated per year requiring offsite disposal at licensed/approved facilities would not exceed the existing storage and handling capacities at the Hazardous Waste Storage Facility. Projections indicate that an increase of 3.5 percent of hazardous waste generation would occur. SNL/CA routinely ships hazardous waste to various offsite commercial disposal facilities. All waste is shipped in less than one year to meet regulatory requirements. Based on these projections and continued operations at specific facilities under the No Action Alternative, the hazardous waste generation impacts would be minimal.

5.3.9.3 All Other Wastes

SNL/CA operations also involve four additional waste management activities discussed below.

Biohazardous (includes Medical Waste Management Act) Waste

Under the No Action Alternative, biohazardous waste generation would increase to 580 kg per year (see Table 5-10). The existing waste handling capabilities would be adequate to accommodate this waste. Additional offsite impacts would be minimal, because offsite disposal capacity would continue to be sufficient.

Construction Waste

The construction of the LTF, DISL, and the Glass Furnace and Melting Laboratory would generate 60 tons, 140 tons, and 8 tons of construction debris, respectively. Since a typical roll off container handles 20 tons of debris, the expected construction waste would be minimal. No additional offsite impacts would occur, because offsite disposal capacity would be sufficient.

Municipal Solid Waste

Site-wide solid waste generation trends at SNL/CA would generally remain a function of total building area and the number of employees. Under the No Action Alternative, an estimated 247.5 metric tons is anticipated. No appreciable onsite impacts to disposal facilities would

occur because existing waste handling capabilities are already in place.

Wastewater

Wastewater would range from approximately 12 to 19 M gal) annually compared to 15 million gallons in CY2000. Sufficient disposal capacity would be available (see Table 5-6).

5.3.10 NOISE

The No Action Alternative consists of the background noise levels presented for the affected environment in Section 4.12 Noise and operational contributions from the following activities:

- LIGA Technologies Facility (LTF)
- Distributed Information Systems Laboratory (DISL)
- Glass Furnace and Melting Laboratory in the CRF
- D&D projects

The acoustical environment in and around SNL/CA may be impacted during construction of these proposed facilities.

Construction activities would generate noise produced by heavy construction equipment, trucks, and power and percussion tools. In addition, construction-related traffic would increase along regional transportation routes. The noise levels would be representative of levels at industrial park sites.

Relatively high and continuous levels of noise in the range 93 to 108 dBA would be produced by heavy equipment operations during the site preparation phase of construction. However, after this time, heavy equipment noise would become more sporadic and shorter in duration. The noise from trucks, power tools, and percussion would be sustained through most of the building construction and equipment installation activities. Construction noise levels would gradually decrease to the ambient background noise levels as construction neared completion, after which ambient background noise levels would return to preconstruction levels (55 to 65 dBA).

Table 5-11 presents peak attenuated noise levels expected during construction. At a distance of approximately 1,700 ft from the source, peak attenuated noise levels from most construction equipment are within the background range of typically quiet outdoors and residential areas.

Construction 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 the

**Table 5-11. Peak Attenuated Noise Levels (dBA)
Expected from Operation of Construction Equipment**

Source	Peak Noise Level	Distance from Source						
		15 m (50 ft)	30 m (100 ft)	61 m (200 ft)	100 m (400 ft)	305 m (1000 ft)	518 m (1,700 ft)	762 m (2,500 ft)
Heavy Trucks	95	84 to 89	78 to 83	72 to 77	66 to 71	58 to 63	54 to 59	50 to 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 to 89	74 to 82	68 to 77	60 to 71	54 to 63	50 to 59	46 to 55
Bulldozer	107	87 to 102	81 to 96	75 to 90	69 to 84	61 to 76	57 to 72	53 to 68
Generator	96	76	70	64	58	50	46	42
Crane	104	75 to 88	69 to 82	63 to 76	55 to 70	49 to 62	45 to 48	41 to 54
Loader	104	73 to 86	67 to 80	61 to 74	55 to 68	47 to 60	43 to 56	39 to 52
Grader	108	88 to 91	82 to 85	76 to 79	70 to 73	62 to 65	58 to 61	54 to 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: DOE 2000e.
ft: foot/feet

Contractor Industrial Hygiene Program (DOE Order 5480.10) and *Occupational Noise Exposure* (29 CFR Part 1910.95).

Worker protection against effects of noise exposure is provided when the sound levels exceed those shown in Table 5-12 when measured on the A scale of a standard sound level meter at slow response. When workers are subjected to sound exceeding those listed in Table 5-11, administrative or engineered controls are used. If such controls fail to reduce sound levels adequately, personal protective equipment (for example, ear plugs) is provided and used to reduce sound levels to within the levels presented in Table 5-11.

5.3.11 HUMAN HEALTH AND WORKER SAFETY

Implementation of the No Action Alternative would result in the human health and worker safety impacts described in the following sections for normal operations and accident conditions.

5.3.11.1 Radiological Health Effects

Radiation can cause a variety of health effects in people. The major effects that environmental and occupational radiation exposures could cause are delayed cancer fatalities, which are called latent cancer fatalities (LCFs) because the cancer can take many years to develop and cause death.

To relate a dose to its effect, DOE has adopted a dose-to-risk conversion factor of 0.0004 latent cancer fatality per

Table 5-12. Permissible Noise Exposure

Duration Per Day, Hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
½	110
0.25 or less	115

Source: 29 CFR Part 1910

Note: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered rather than the individual effect of each. Exposure to impulsive or impact noise should not exceed 140 decibel (dB) peak sound pressure level. dBA: decibel, A-weighted sound levels

person-Roentgen equivalent, man (rem) for workers and 0.0005 latent cancer fatality per person-rem for the general population (NCRP 1993). The factor for the population is slightly higher, due to the presence of infants and children who are believed to be more sensitive to radiation than the adult worker population.

DOE uses these conversion factors to estimate the effects of exposing a population to radiation. For example, in a population of 100,000 people exposed only to background radiation (0.3 rem per year), DOE would calculate 15 LCFs per year caused by radiation (100,000 persons ×

0.3 rem per year \times 0.0005 latent cancer fatality per person-rem).

Calculations of the number of LCFs associated with radiation exposure might not yield whole numbers and, especially in environmental applications, might yield values less than 1. For example, if a population of 100,000 were exposed to a dose of 0.001 rem per person, the collective dose would be 100 person-rem, and the corresponding number of LCFs would be 0.05 (100,000 persons \times 0.001 rem \times 0.0005 LCF per person-rem).

Vital statistics on mortality rates for 1997 (CDC 1998) indicate that the overall lifetime fatality rate in the United States (U.S.) from all forms of cancer is about 23.4 percent (23,400 fatal cancers per 100,000 deaths).

In addition to LCFs, other health effects could result from environmental and occupational exposures to radiation; these include nonfatal cancers among the exposed population and genetic effects in subsequent generations. Previous studies have concluded that these effects are less probable than fatal cancers as consequences of radiation exposure (NCRP 1993). Dose-to-risk conversion factors for nonfatal cancers and hereditary genetic effects (0.0001 per person-rem and 0.00013 per person-rem, respectively) are substantially lower than those for fatal cancers. This SWEA presents estimated effects of radiation only in terms of LCFs because that is the major potential health effect from exposure to radiation. Estimates of nonfatal cancers and hereditary genetic effects can be estimated by multiplying the radiation doses by the appropriate dose-to-risk conversion factors for these effects.

DOE expects minimal worker radiological health impacts from the SNL/CA 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 5-13). Table 5-13 presents estimated radiation doses for the collective population of workers who would be directly involved in implementing the alternatives as well as LCFs likely attributable to these doses.

The estimated number of LCFs listed in Table 5-13 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 1997 (CDC 1998). 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 SNL/CA operations would be small.

Table 5-13. Estimated Radiological Dose and Health Impacts to Sandia National Laboratories, California Workers for the No Action Alternative (Based on 3-Year Average)

Health Impact	No Action Alternative
Collective involved worker dose (person-rem)	0.85 ^a
Estimated increase in number of latent cancer fatalities	3.4×10^{-4}

Sources: DOE 1999d, 2000d, 2001g, TtNUS 2002a

^aSNL/CA involved worker dose estimated at 11 percent of SNL lab-wide totals in Table 4-15. Any increase in estimated radiation doses would be a result of the increase in the number of radiation workers and not the result of different exposure mechanisms or levels.

rem: Roentgen equivalent, man

5.3.11.2 Occupational Health and Safety

Table 5-14 provides estimates of the number of total reportable cases (TRCs) and lost workday cases (LWCs) that could occur under the No Action Alternative. The projected injury rates are based on average historic SNL/CA injury rates over a 3-year period from 1999 through 2001 (SNL 2001, 2002a). 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 alternatives.

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.

5.3.12 SOCIOECONOMICS

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

Table 5-14. Estimated Occupational Safety Impacts to Sandia National Laboratories, California Workers for the No Action Alternative

Worker Safety Parameters	No Action Alternative
Workforce	1,043 – 1,317
Total recordable cases of accident or injury	43 – 54
Lost workday cases	10 – 13

Sources: SNL 2001i, 2002a

5.3.12.1 Demographic Characteristics

The No Action Alternative would not likely result in any noticeable change in existing demographic characteristics within the ROI (Section 4.14.3). Overall expenditures and employment at SNL/CA should remain relatively constant over the next 10 years, which, in turn, would tend to maintain demographic characteristics within the ROI.

5.3.12.2 Economic Base

The No Action Alternative would not likely result in any noticeable change in the existing economic base within the ROI (Section 4.14.3) because employment levels and research and development (R&D) activities are assumed to remain the same as 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.

5.3.12.3 Housing and Community Services

The No Action Alternative would not likely result in any noticeable change in existing housing and community services within the ROI (Section 4.14.3). Overall expenditures and employment at SNL/CA should remain relatively constant, which, in turn, would tend to maintain housing availability, value, and levels of service. Contributory effects from other industrial and economic sectors within the ROI should reduce or mask SNL/CA's current proportional impact.

5.3.13 ENVIRONMENTAL JUSTICE

The No Action Alternative would have no discernible adverse impacts to land use and visual resources, water resources, biological 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 would be anticipated.

As presented in Section 5.3.11, SNL/CA 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. Table 5-15 provides a brief summary of potential impacts to each resource or topic area.

5.4 PLANNED UTILIZATION AND OPERATIONS ALTERNATIVE

5.4.1 LAND USE AND VISUAL RESOURCES

The Planned Utilization and Operations Alternative would include the No Action Alternative plus several additional actions and would not affect existing land use patterns or visual resources at SNL/CA. Sections 5.4.1.1 and 5.4.1.2 discuss impacts to these resource areas from the Planned Utilization and Operations Alternative.

5.4.1.1 Land Use

No impacts would occur to land use patterns at SNL/CA under this alternative. The extent of DOE land available for use by SNL/CA, 410 acres, would remain the same as for the No Action Alternative. SNL/CA operations would remain consistent with industrial research park uses and would have no foreseeable effects on established land use patterns or requirements.

This alternative differs from the No Action Alternative in that improvements would be made to Arroyo Seco. These improvements would meet a number of needs, mainly correcting the effects of past erosion, protecting the SNL/CA site from future erosion and flooding, and improving channel stability and the wildlife habitat. These improvements would occur directly along the arroyo channel and would not change current land use plans. As part of the improvements to Arroyo Seco, storm water drainage infrastructure throughout the site would be improved, but this also would not change any land use at the site. Thirty acres along the arroyo in the east buffer zone would be managed as a wildlife reserve.

Under the Planned Utilization and Operations Alternative, a Grant of Easement and Agreement would be made with the landowner concerning the land along the SNL/CA western boundary. Activities by the landowner would be subject to the agreement, limitations, and disclosures.

Under this alternative, 93 acres of open space adjacent to East Avenue and existing facility areas would be reserved for future construction of offices, facilities, support buildings, associated infrastructure, paved areas (parking areas, services areas, and sidewalks), roads, and for onsite soil management (see Figure 5-5). Onsite soil management would involve placing dirt/fill from the Arroyo Seco improvement, storm water projects, and construction projects in 25 of the 93 acres of open space. Locating future construction projects near existing facilities would minimize effects to land use. Construction in these areas would be consistent with established land use patterns at SNL/CA.

Under this alternative, 122 acres of open space would be identified as undesignated. Construction of the new

Table 5-15. Summary of Potential Environmental Justice Impacts under the No Action Alternative

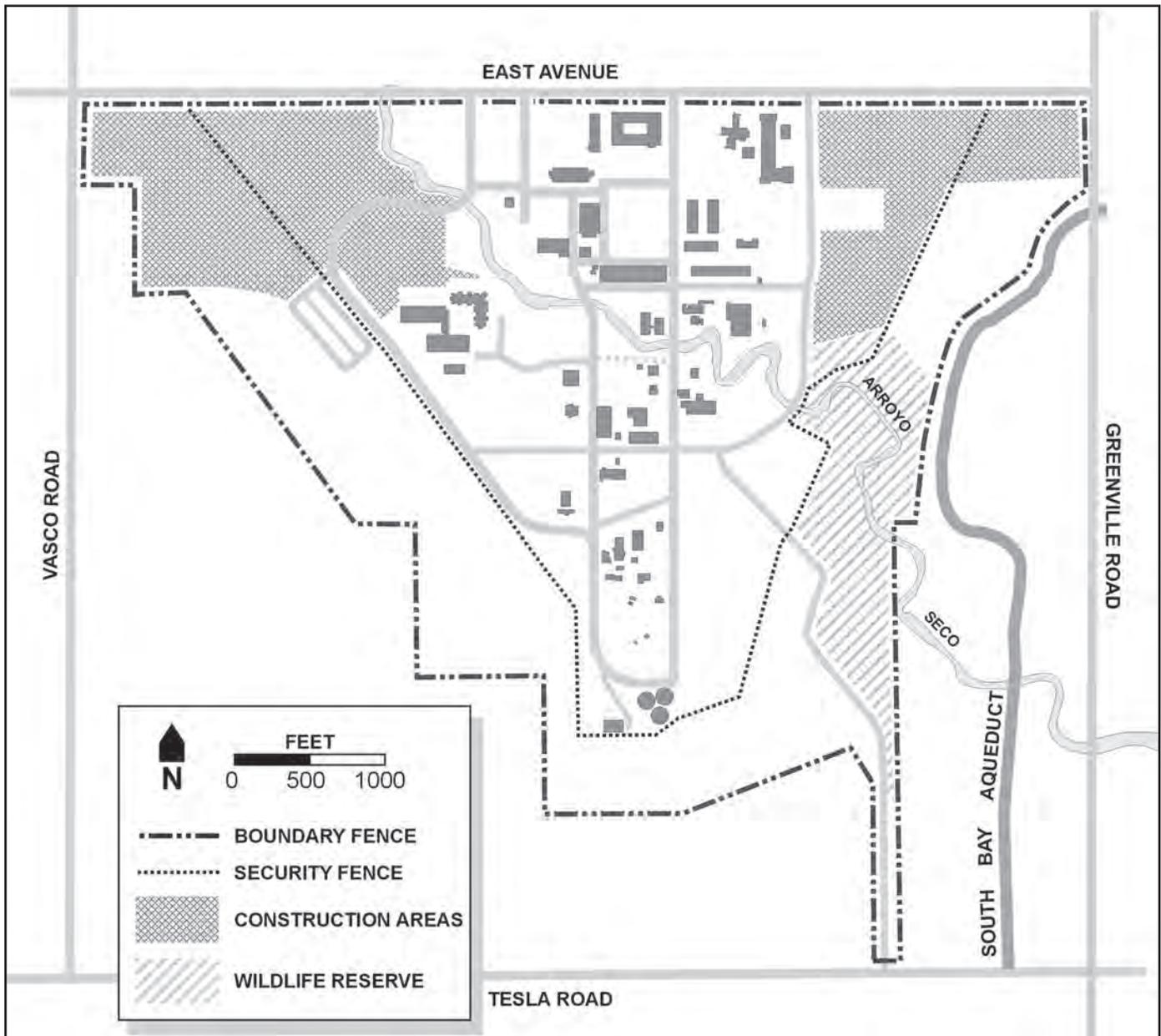
Resource or Topic Area	Summarized Effect	Effect on Resource or Topic Area (region of influence)	Proportional Effect on:	
			Low-Income	Minority Neighborhoods
Land Use and Visual Resources	No changes in land use; minor changes in developed areas of SNL/CA	Not adverse	Not adverse	Not adverse
Geology and Soils	SNL/CA activities are not anticipated to destabilize slopes. Minimal deposition of contaminants to soils and continued monitoring of existing contaminates.	Not adverse	Not adverse	Not adverse
Water Resources and Hydrology	No significant adverse impacts are projected.	Not adverse	Not adverse	Not adverse
Biological Resources	No significant adverse impacts are projected.	Not adverse	Not adverse	Not adverse
Cultural Resources	Lack of existing cultural resources.	Not adverse	Not adverse	Not adverse
Air Quality	Emissions would be below the most stringent standards, which define the pollutant concentrations below which there are no adverse impacts.	Not adverse	Not adverse	Not adverse
Infrastructure	All projected activities within capacities of existing road and utility systems.	Not adverse	Not adverse	Not adverse
Transportation	Material (Annual Shipments Radioactive, Chemical, and Explosives): 33 trips Waste (includes hazardous & radioactive): 76 shipments Sanitary Waste: 52 shipments Commuter vehicles: 700 to 1,000 vehicles SNL/CA Weekly Hazardous Materials Transports (excluding waste): 1 to 3 outbound shipments per week (Total of 33) Supplier Weekly Hazardous Material Transports: 1 to 3 inbound shipments per week Total of 100	Not adverse	Not adverse	Not adverse
Waste Generation	All waste projections within capacities of existing waste management operations.	Not adverse	Not adverse	Not adverse
Noise and Vibration	Background noise levels would continue at current levels from generators, air conditioners, and ventilation systems. Temporary increases during construction range from 50 to 70 dB)	Not adverse	Not adverse	Not adverse
Human Health and Worker Safety	Total recordable cases of accident or injury: 43 – 54 Lost Workday Cases: 10 – 13	Not adverse	Not adverse	Not adverse
Socioeconomics	SNL/CA workforce: 1,043 – 1,317 SNL/CA total economic activity: 180 M	Not adverse	Not adverse	Not adverse

Sources: Original

dB: decibel

M: million

SNL/CA: Sandia National Laboratories, California



Sources: Original

Figure 5-5. Construction and Wildlife Areas

Sandia National Laboratories, California plans to change land use of open spaces including setting aside 93 acres for future construction and 30 acres for wildlife

badge office on the western portion of SNL/CA would be consistent with established land use and utilization patterns, as explained under the No Action Alternative (Section 5.3.1). Modifications to Building 916 would have no impact on land use. With these changes, SNL/CA land use and operations would remain consistent with industrial park uses and would have no foreseeable effects on established land use patterns or requirements.

5.4.1.2 Visual Resources

The Planned Utilization and Operations Alternative would not adversely change the overall appearance of

the existing landscape, obscure views, or otherwise detract from the scenic views from SNL/CA or from areas adjacent to the site.

The 93 acres set aside for future construction and soil management would be located near areas with a high density of buildings and structures, thus any construction would blend with the existing built environment. All construction would be consistent with campus-style design and the guidelines presented in the *Master Plan* (Royston *et al.* 1993). Increasing the size of the main campus would have little effect on the scenic qualities of the SNL/CA site. Improvements to Arroyo Seco and

the designation of a wildlife reserve would improve the scenic qualities of these areas.

5.4.2 GEOLOGY AND SOILS

As with the No Action Alternative, no impacts to general geology and geologic resources are anticipated. Additionally, there would be no increase in the likelihood of impacts from seismic activity.

The Arroyo Seco Improvement Plan would remove 4,000 to 5,000 cubic yards (yd³) of soil (clean dirt/fill) per year to a 25-acre soil management area in the area designated for future construction. Assuming even distribution over 25 acres, this would represent less than a 1.5-inch elevation increase. The arroyo improvement activities would require 30,000 to 60,000 yd³ of new fill, rock, stone, and concrete (other materials would include mulch, hay, topsoil, seed, plants, etc.). However, these measures would improve the overall conditions of the streambank, improve slope stability, and reduce soil erosion.

Under the Planned Utilization and Operations Alternative, soil disturbed by construction would increase above the No Action Alternative. A new building totaling 5,000 sq ft would be constructed. New parking and other traffic controls (such as a bus turnaround) would require 8 acres. Upgrades to storm water runoff areas would be beneficial in controlling erosion.

Activities at SNL/CA would increase by 13 percent above the No Action Alternative, increasing the likelihood of a spill or release to the environment; however, controls are in place to minimize the potential for soil contamination from any SNL/CA operations.

5.4.3 WATER RESOURCES AND HYDROLOGY

5.4.3.1 Water Resources and Hydrology

Impacts to water resources of the Planned Utilization and Operations Alternative would not differ substantively from impacts described in Section 5.3.3 for the No Action Alternative. Impacts to groundwater quality and quantity and surface water quality and quantity are described in Sections 5.4.3.1, 5.4.3.2, 5.4.3.3, and 5.4.3.4 respectively.

5.4.3.2 Groundwater Quality

Section 5.3.3 identifies sources of groundwater contamination at SNL/CA. All groundwater quality impacts described in Section 5.3.3.1 are alternative-independent. The Planned Utilization and Operations Alternative would not change the nature or extent of groundwater contamination. No changes from current rate and scope of the Environmental Restoration (ER) Program remediation activities (long-term monitoring) are projected for the Planned Utilization and Operations Alternative.

5.4.3.3 Groundwater Quantity

Under the Planned Utilization and Operations Alternative, SNL/CA would not use groundwater for any portion of its supply. Therefore, no effects to groundwater quantity would be expected.

5.4.3.4 Surface Water Quality

SNL/CA impacts to surface water quality are discussed in Section 5.3.3.3. Under the Planned Utilization and Operations Alternative, an additional 27.7 acres of impervious surface (an additional 56 percent) would be created. This increase could add to the quantity of pollutant runoff. However, based on current monitoring data, pollutant concentrations in runoff have not been a concern. The projected increase in impervious surface is unlikely to increase pollutant concentrations to levels approaching water quality standard limits. No effects to storm water compliance would be anticipated.

5.4.3.5 Surface Water Quantity

Storm Water Runoff

SNL/CA impacts to surface water quality are discussed in Section 5.3.3.4. Under the Planned Utilization and Operations Alternative, an additional 27.7 acres of impervious surface (an additional 56 percent) would occur. This projected increase in impervious surface would increase the quantity of storm water runoff transported directly or indirectly into the Arroyo Seco. Upgrades to the storm water runoff areas are planned to correct existing erosion problems. The overall impact to surface water quantity would be minimal.

Discharge to Sanitary Sewer

The estimated annual volume of water discharged to the sanitary sewer under the Planned Utilization and Operations Alternative would be 13.6 to 21.5 M gal (based on a 13 percent increase in staff site-wide), an 8.8 percent increase from the No Action Alternative (also the baseline). The current system capacity is adequate to handle the increase (see Section 5.4.7). SNL/CA policy prohibits the discharge of regulated chemical wastes to the sanitary drain. The Wastewater Management Program participates in laboratory planning activities and staff training so that proper wastewater disposal practices are implemented as soon as the processes are online.

SNL/CA maintains a wastewater monitoring station in the northwestern portion of the site. The sewer discharges to the LLNL sewer system across East Avenue. Monitoring results are reported to the Livermore Wastewater Reclamation Plant (LWRP) monthly in monthly wastewater discharge reports. This anticipated increase in discharge would have no detrimental effects to receptors downstream of the site outfall.

5.4.4 BIOLOGICAL RESOURCES

Under this alternative, planned activities have the potential to affect plant and animal species within the boundaries of SNL/CA. Impacts would be minimal. Facility construction would result in the loss of some vegetation with a commensurate loss of wildlife habitat. Any direct or indirect losses of animals would be very small and some displaced animals may be able to occupy adjacent, unoccupied habitat. A newly created 30-acre wildlife reserve would include part of the Arroyo Seco improvements (Figure 5-5). This wildlife reserve would contribute to the preservation of plant and animal species at SNL/CA and provide a valuable refuge for both plant and animal species in the area.

Positive impacts to wetland areas and protected species may occur. These impacts are discussed for the Arroyo Seco Improvement Program, construction projects covered by the SWEA over the next 10 years, and installation maintenance operations.

5.4.4.1 Arroyo Seco Improvement Program

The Arroyo Seco is an ephemeral stream that runs through the developed portion of the SNL/CA site. Most of the channel is steep-sided, highly incised, with a trapezoidal to almost V-shaped cross section. Since establishment of SNL/CA in 1956, several bridges, security grates, and utility pipe crossings have been placed in and across Arroyo Seco. In the 1980s, additional arroyo modifications shortened and straightened the arroyo downstream of C Street, resulting in an increase in the channel slope and the amount of energy available for erosion of the streambed and banks. The *Arroyo Seco Management Plan* documented the resulting headcutting, or upstream migration of streambed instability, that has contributed to scouring in the bed and undercutting at structure crossings and where the channel is lined (GMA 2002a).

During the past five years, several informal consultations between DOE Sandia Site Office (SSO) and USFWS have discussed erosion control and streambed stability projects on Arroyo Seco. As a consequence of these consultations, SNL/CA and DOE have implemented an integrated approach to address erosion and other streambed instability issues for Arroyo Seco. The *Arroyo Seco Management Plan* identifies concepts for active channel improvements and stream zone management that would reduce current flood and erosion risk while providing additional and improved habitat and migration conditions for protected species that may use Arroyo Seco on SNL/CA property (GMA 2002a). The management plan proposes 18 improvement tasks that would provide riparian habitat enhancement.

Approximately 10 acres in and along the arroyo channel would be affected by the tasks proposed in the *Arroyo Seco*

Management Plan. About two acres identified for improvement are located within designated critical habitat for the California red-legged frog (GMA 2002a). Disturbances would be of a short-term nature associated with construction. Annual surveys for California red-legged frogs conducted on SNL/CA property since 1996 detected no individuals of this species. However, California red-legged frogs may use the Arroyo Seco as a travel corridor during or after rain events in the winter and spring (66 FR 14626). To avoid impacts to migrating California red-legged frogs, activities proposed in the *Arroyo Seco Management Plan* would be conducted during the dry season (that is, June 1 through September 30). Annual surveys for California red-legged frogs would continue at SNL/CA along the length of Arroyo Seco, specifically targeting those locations where work would be done during a particular year.

Erosion damage at 11 locations within the channel would be repaired. Repair activities along the Arroyo Seco would generally be beneficial to native vegetation, reducing soil disturbance that is conducive to invasion by weed species, and reducing episodic destruction of established vegetation during high flow events, thereby improving the site for native riparian species (SAIC 2001a). Approximately 1,800 linear ft of floodplains would be constructed to reduce flow velocities within the channel. Native riparian vegetation would be planted at four locations along the Arroyo Seco resulting in an additional 0.2 acres of riparian habitat (SNL/CA 2002c). Any improvements that would result in increased water depth and plant cover would increase the likelihood of California red-legged frogs using the drainage as summer habitat or as a travel corridor (SAIC 2001a). Five structures/ utility lines that are obstructions for species migration would be removed from the streambed. Debris that is an obstruction to species migration would also be removed from three locations in the arroyo. Activities that remove obstructions and debris from the arroyo drainage would increase its habitat value for California red-legged frog and other riparian-dependent species (SNL/CA 2002c).

In previous years, the California tiger salamander has been found at SNL/CA in upland areas, at the LLNL recharge basin located on the western side of the site, and in a farm pond east of the site. However, no individuals were found during a recent targeted survey (SAIC 2001a). In a study of terrestrial habitat use by the tiger salamander, individual tiger salamanders showed no indication of movement along creeks or riparian vegetation (Trenham 2001a). Additionally, this study showed that 95 percent of adult California tiger salamanders probably stay within 568 ft of their breeding ponds. The closest *Arroyo Seco Management Plan* activities would occur approximately 820 ft from the recharge basin and approximately 980 ft from the farm pond (both of which are outside the disturbance area of arroyo restoration activi-

ties). Therefore, there should be no effect on the California tiger salamander (SNL/CA 2002c).

5.4.4.2 Construction Projects

SNL/CA and DOE/SSO have identified approximately 93 acres of open grassland for future building construction, construction-related activities, and infrastructure improvements (Figure 5-6). Construction-related ground disturbance would occur in the area (SNL/CA 2002c).

Facility construction would result in the loss of some vegetation with a commensurate loss of wildlife habitat. Any direct or indirect losses of animals would be very small and some displaced animals may be able to occupy adjacent unoccupied habitat. Facility construction would avoid loggerhead shrike nests (a Federal species of concern and California species of special concern) whose locations have been monitored as shown in Figure 4-12. Further, the western burrowing owl (a Federal species of concern and California species of special concern) has not been sighted since 1997 in proposed construction or other areas of SNL/CA (SAIC 2001a).

At SNL/CA, 0.44 acres of the Arroyo Seco have been determined to be jurisdictional wetlands (SAIC 1998a). The use of standard soil erosion and sedimentation control measures during the land disturbance phase of new projects would ensure the protection of the wetland. Depending on the amount of soil disturbed at a particular time, the erosion control measures may require preparation of a storm water pollution prevention plan.

Of the 93 acres identified for construction and soil management, 35 acres on the east side of the SNL/CA site are located within designated critical habitat for the California red-legged frog. The critical habitat area is grassland with no surface water sources. The area does not provide any permanent habitat for red-legged frogs and is approximately 200 ft from the Arroyo Seco at its closest location. The grassland area would be used by the California red-legged frog as a dispersal habitat at night, during the wet season (that is, October 1 through May 31). Facilities in the area would be low-density development and low-use roadways that should not create a barrier to dispersal. Any new roads in the area would be used primarily during daylight hours, with intermittent use by SNL/CA security (less than 30 cars per hour) during the night. Low-density development and low-use roadways are not considered barriers to dispersal for the California red-legged frog (SNL/CA 2002c; 66 FR 14626).

Excess soil from construction and construction-related activities potentially would be stockpiled on the eastern side of the site, within designated critical habitat for the California red-legged frog. These clean soils would include native materials and may include some compacted fill and topsoil.

Construction activities would be conducted during the day, when California red-legged frogs are typically not dispersing. Although construction activities would be conducted within designated critical habitat for the California red-legged frog, construction should not form a barrier to dispersal and no permanent habitat sources are present in the area.

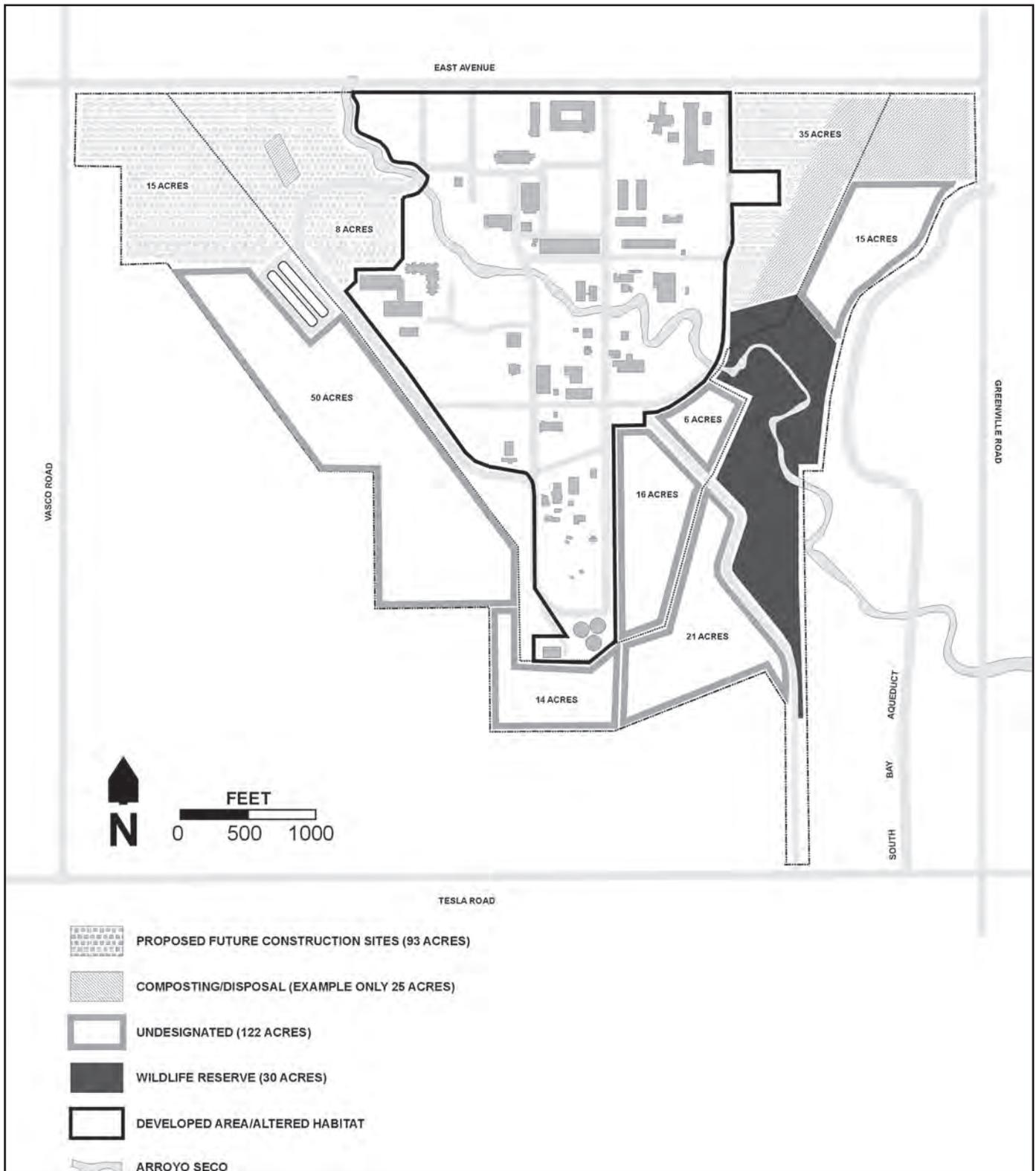
Areas proposed for construction on the west side of SNL/CA are outside designated critical habitat for the California red-legged frog. However, approximately 24 acres are within 568 ft of the LLNL recharge basin, where California tiger salamanders have been found in the past. The area also contains numerous ground squirrel burrows that may provide aestivation habitat for the tiger salamander. Before ground disturbance within the 568-ft zone noted above, each burrow would be surveyed for tiger salamanders using an infrared optical probe. A qualified field biologist would conduct the surveys and provide oversight during excavation activities. Any tiger salamanders found during the surveys would be relocated to the closest area outside of the construction zone. With implementation of this survey process, California tiger salamanders are not expected to be adversely affected.

A Biological Assessment has been prepared. The biological assessment was submitted to the USFWS on July 19, 2002, and is currently under review by this agency.

5.4.4.3 Maintenance Operations

Maintenance activities within the undeveloped areas of the site include mowing and herbicide use for fire management. Grasslands at SNL/CA, including areas within designated critical habitat for the California red-legged frog and potential habitat for the California tiger salamander, are mowed two or three times per year to reduce the fuel load. Mowing occurs in the spring and early summer and is done during daylight hours. For areas that are inaccessible to a mower (near fence lines and roadways), a water-soluble mixture of 2 percent Round-Up herbicide is used to control vegetation. Maintenance activities are conducted during daylight hours when California red-legged frogs and California tiger salamanders are typically not dispersing. Additionally, maintenance activities do not create barriers to dispersal within the critical habitat area (SNL/CA 2002c).

In the final rule listing the California red-legged frog as threatened, the USFWS identified activities that could potentially affect the species. Those activities include mowing of wetland or riparian vegetation and pesticide applications in violation of label restrictions (61 FR 25813). DOE has placed a moratorium on disking and rototilling for weed abatement in undeveloped areas and the buffer zone to minimize impact to protected and sensitive species (SNL/CA 2000a). Under current site maintenance operations, no wetland or riparian vegeta-



Source: SNL/CA 2002d

Figure 5-6. Future Construction and Maintenance Activities at Sandia National Laboratories, California

tion is mowed. Round-Up is used in accordance with the manufacturer's guidelines in a dilute mixture. Individual animals would not be sprayed, nor would areas within the arroyo channel. For these reasons, it is concluded that maintenance activities would not affect the California red-legged frog and the California tiger salamander.

5.4.5 CULTURAL RESOURCES

Planned Utilization and Operations Alternative would have no impacts to cultural resources due to the lack of prehistoric and Native American resources and historic archaeological sites, the nature of the buildings and structures present, and compliance with applicable regulations and established procedures for the protection and conservation of cultural resources located on lands administered by the DOE.

The likelihood of potential impacts to buried archaeological sites would be greater under this alternative than the No Action Alternative. This is due to increased ground-disturbing activities under this alternative. In addition to the LTF and DISL facilities identified in the No Action Alternative, the Planned Utilization and Operations Alternative would include one new facility (the new 5,000 sq ft badge office), the upgrade of storm water runoff areas, and road construction and paved service and parking areas. In addition, improvements to Arroyo Seco, the development of the 30-acre wildlife reserve, and associated infrastructure would occur under this alternative, although most of the ground-disturbing activities would occur in areas that have been previously disturbed. Maintenance activities that require ground disturbance could also result in the discovery of buried archaeological sites, but again, compliance with regulations and procedures would address any impacts. In all cases, compliance with regulations and procedures would ensure any impacts to cultural resources would be minimal by avoiding, reducing, or mitigating the potential impacts.

5.4.6 AIR QUALITY

The Planned Utilization and Operations Alternative would have at 30 to 32 nonexempt emission sources including:

- 12 boilers (includes boiler for the new badging facility)
- 1 degreasers
- 1 spray booth
- 9 backup generators (may include 1 additional backup generators for the new badging facility)
- 1 mixer
- 6 miscellaneous sources

Based on a projected site-wide staff increase of 13 percent, traffic emissions are estimated to increase 13 percent above the No Action Alternative. Table 5-16 presents the criteria pollutant emissions estimated for the Planned Utilization and Operations Alternative.

Table 5-17 estimates the Planned Utilization and Operations Alternative air toxics emissions, based upon the maximum emission rate during the period 1996 through 2001. Comparison of the Planned Utilization and Operations Alternative air toxic emissions with Bay Area air toxic emissions show that SNL/CA projects toxic emissions are less than one percent of those for the Bay Area.

Construction activities at SNL/CA 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. Under the Planned Utilization and Operation Alternative, construction activities would include projects under the

Table 5-16. Criteria Pollutant Emission Rates for the Planned Utilization and Operations Alternative (kilograms per year)

Pollutant	Planned Utilization and Operations Alternative ^a	Bay Area Emission Year 2000	Percent Contribution from SNL/CA
Particulates	NA	57,900,000	NA
Volatile Organic Compounds	1,871	179,000,000	< 1
Sulfur Dioxide	NA	29,100,000	NA
Nitrogen Dioxide	3,741	214,000,000	< 1
Carbon Monoxide	339 to 452	995,000,000	< 1

Source: SNL/CA 2002b

Notes: Based on a 13% increase in Sandia National Laboratories, California staff

All Bay Area wide emissions except particulates are based on an average summer day multiplied by 365 days. Bay Area particulate emissions are based on an average winter day multiplied by 365 days

^aBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June

<: less than

NA = not available/not applicable

SNL/CA: Sandia National Laboratories, California

Table 5-17. Air Toxic Emission Rates for the Planned Utilization and Operations Alternative (kilograms per year)

Pollutant	Planned Utilization and Operations Alternative ^a	Bay Area Emission Year 1999 ^b	Percent Contribution from SNL/CA
1,1,1-trichloroethane	235.1	58,968	< 1
1,4-dioxane	5.5	771	< 1
Ammonia	238.412	1,406,160	< 1
Benzene	0.32	28,577	< 1
Carbon tetrachloride	0.36	1,406	< 1
Formaldehyde	3.4	81,648	< 1
Methyl alcohol	681.77	276,696	< 1
Methylene chloride	75.55	49,896	< 1
Perchloroethylene	74.84	371,952	< 1
Toluene	43.04	335,664	< 1
Trichloroethylene	66.391	21,773	< 1
Xylene	14.77	276,696	< 1

Sources: TTNUS 2002a, SNL/CA 2002b

^aBased on maximum emission rate from 1996 through 2001

^bBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June

<: less than

NA: not available/not applicable

SNL/CA: Sandia National Laboratories, California

No Action Alternative plus one new project. The fugitive dust from construction could exceed PM₁₀ 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 PM₁₀ concentrations would be within all applicable standards.

Table 5-18 estimates construction-related CO emissions for one typical project. It is expected that construction-related CO emissions would be within all applicable standards. Table 5-19 estimates the Arroyo Seco Improvement CO emissions for a typical year of activities. This project is anticipated to last 10 years.

The estimated number of daily commuter vehicles to SNL/CA during FY 2001 was 700 to 1000. Under the Planned Utilization and Operations Alternative, a 13-percent increase in daily commuter traffic would occur, resulting in 791 to 1130 vehicles. Increases of carbon monoxide and nitrogen oxides, an ozone precursor, would occur with the increase in commuter traffic. However, the EPA model considers future vehicles will have lower emission rates and more stringent inspection and maintenance programs, actual emissions would be less than the baseline. In addition, the BAAQMD vehicle buy back program designed to remove older vehicles from the road will continue and contribute to the reduction in commuter vehicle emissions (SNL/CA 2002b, TtNUS 2002a, BAAQMD 2001).

Total carbon monoxide emissions are shown in Table 5-20. Total carbon monoxide emissions for the Planned Utilization and Operations Alternative would be slightly below the 2000 baseline, well below the 100 tons per year incremental increase above baseline that would require a conformity determination. In addition, the total carbon monoxide emissions for the Planned Utilization and Operations 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 Planned Utilization and Operations Alternative.

5.4.7 INFRASTRUCTURE

The Planned Utilization and Operations Alternative would increase demands on infrastructure over the next 10 years (Table 5-21). Annual consumption of water, electricity, and natural gas would be consistent with recent historic levels (DOE 1992a; TtNUS 2002a). Fluctuations in utility consumption rates would occur due to annual changes in weather. Under the Planned Utilization and Operations Alternative, the current infrastructure would be capable of accommodating SNL/CA facility requirements and no major additional infrastructure facilities would be required.

5.4.8 TRANSPORTATION

Based on the current transportation data, the Planned Utilization and Operations Alternative would increase the

Table 5-18. Estimated Carbon Monoxide Emissions Associated with Representative Construction Activities

1-Year Construction Activity (assumes 21-work day months or 252 days)	Total Annual Hours of Operation	Equipment Emission Factors ^a	Estimated Total Annual Carbon Monoxide Emissions (total pounds per year)	Estimated Total Annual Carbon Monoxide Emissions (total tons per year)
Assumptions for Diesel Vehicles Emissions				
7 Diesel Units (trucks for transportation of materials to site throughout life of construction phase)	3528 (or 2 hours per day each for 252 days)	0.11	388	0.194
8 Diesel Units (dozers, backhoes, graders, dump trucks to grade and lay foundation)	800 (or 5 hours per day each for 20 days)	0.11	88	0.044
6 Diesel Units (forklifts, crane, front end loader, other equipment for construction of buildings)	10,584 (or 7 hours per day each for 252 days)	0.11	1,164	0.582
Total Diesel units (21)	14,912	N/A	1,640	0.82
Assumptions for Gasoline Vehicles Emissions				
24 Light Gasoline units (worker personal vehicles, snack wagons, light commercial vans)	6,048 (or 1 hour per day each for 252 days)	0.48	2,903	1.451
2 Hand tampers	160 (or 4 hours per day each for 20 days)	0.48	77	0.38
Total Gas units	6,208	N/A	2,980	1.49
Total Estimated CO Emissions during Typical Construction Phase	4,620 pounds		2.31 tons	

Source: DOE 2001f

^aCarbon Monoxide (CO) emission factors are based on the Environmental Protection Agency (EPA) National Vehicle and Fuel Emission Laboratory (Ann Arbor, Michigan) average emission rates for idling vehicles. CO emissions for light-duty trucks are estimated at 219 grams per hour, for heavy-duty gas vehicles at 245 grams per hour, and for heavy-duty diesel vehicles at 50 grams per hour. Calculations are based on a conversion factor of 0.035 ounce per gram (grams x 0.035) divided by 16 (ounces per pounds) times hour's operation divided by 2,000 (pounds per ton) to obtain tons/yr.

Table 5-19. Estimated Carbon Monoxide Emissions Associated with Soil and Fill Material during Arroyo Seco Improvement^a

Typical Year (assumes 21-work day months or 252 days)	Total Annual Operation	Equipment Emission Factors ^b	Estimated Total Annual Carbon Monoxide Emissions (total pounds per year)	Estimated Total Annual Carbon Monoxide Emissions (total tons per year)
Assumptions for Diesel Vehicles Emissions				
200 Diesel Units trips (trucks for transportation of soil materials from Arroyo Seco and associated locations throughout SNL/CA to offsite location 20 miles from site over next 10 years)	400 hours per year (or 2 hours per trip 200 trips per year)	0.11	44	0.022
300 Diesel Units trips (trucks for transportation of incoming material including rock, concrete, and other fill soil materials for Arroyo Seco and associated locations throughout SNL/CA from offsite location 20 miles from site over next 10 years)	600 hours per year (or 2 hours per trip 300 trips per year)	0.11	66	0.033

Table 5-19. Estimated Carbon Monoxide Emissions Associated with Soil and Fill Material during Arroyo Seco Improvement^a

Typical Year (assumes 21-work day months or 252 days)	Total Annual Operation	Equipment Emission Factors ^b	Estimated Total Annual Carbon Monoxide Emissions (total pounds per year)	Estimated Total Annual Carbon Monoxide Emissions (total tons per year)
Assumptions for Diesel Vehicles Emissions				
8 Diesel Units (dozers, backhoes, graders, dump trucks to grade and lay foundation)	800 (or 5 hours per day each for 20 days)	0.11	88	0.044
6 Diesel Units (forklifts, crane, front end loader, other equipment for construction)	10,584 (or 7 hours per day each for 252 days)	0.11	1,164	0.582
Total Diesel units (21)	N/A	N/A	1,362	0.681
Assumptions for Gasoline Vehicles Emissions				
24 Light Gasoline units (worker personal vehicles, snack wagons, light commercial vans)	6,048 (or 1 hour per day each for 252 days)	0.48	2,903	1.451
2 Hand tampers	480 (or 4 hours per day each for 60 days)	0.48	230	0.12
Total Gas units	6,208	N/A	3,133	1.57
Total Estimated CO Emissions during Improvement Phase	4,495 pounds		2.25 tons	

Sources: SNL/CA 2001I, TiNUS 2002a

^aAssumed project would last for 10 years.^bCarbon Monoxide (CO) emission factors are based on the Environmental Protection Agency (EPA) National Vehicle and Fuel Emission Laboratory (Ann Arbor, Michigan) average emission rates for idling vehicles. CO emissions for light-duty trucks are estimated at 219 grams per hour, for heavy-duty gas vehicles at 245 grams per hour, and for heavy-duty diesel vehicles at 50 grams per hour. Calculations are based on a conversion factor of 0.035 ounce per gram (grams x 0.035) divided by 16 (ounces per pounds) times hours operation divided by 2,000 (pounds per ton) to obtain tons per year.^cTo bound the analysis, trucks transporting soil were assumed to ship to offsite locations. SNL/CA may manage some or all soil onsite.

SNL/CA: Sandia National Laboratories, California

Table 5-20. Carbon Monoxide Emissions from Sandia National Laboratories, California under the Planned Utilization and Operations Alternative (tons per Year) and Calendar Year 2000 (baseline)

Stationary Sources	Mobile Sources	Construction Activities	Total
Planned Utilization and Operations Alternative			
0.45	208	6.9 ^a	219.0
Baseline			
0.4	214	6.9 ^a	221.3

Source: EPA 1995

Notes: Mobile Source Emission Factors assumptions Baseline (2000) 24.77 grams per mile, the No Action Alternative (2005) 21.29 grams per mile, 1,000 to 1,130 vehicles, 30-mile trip, average speed 35 miles per hour.

^aAssumed two typical construction projects each year (2.31 tons per project) plus the Arroyo Seco project (2.25 tons per year).

amount of highway and pedestrian infrastructure within SNL/CA by approximately 56 percent (Table 5-22).

The number of truck shipments from SNL/CA would increase by 538 vehicles per year (11 per week) from the No Action Alternative. Of these 200 would be hauling soil. The number of commuter vehicles would increase by approximately 91 to 130. The increased number of ship-

ments and the increase in employee vehicles would not represent substantial increases in the number of vehicles on the road by virtue of the area's projected population growth and would have no significant impact on the region. Based on the relatively small number of additional vehicles, the potential for accidents should be no different from current conditions.

Table 5-21. Annual Sandia National Laboratories, California Utility Usage and Capacities under the Planned Utilization and Operations Alternative

Utility	Planned Utilization and Operations Alternative	System Capacity	Usage as Percent of Capacity
Water Use	56.5 to 67.8 M gal	922 M gal	6 to 7
Wastewater Discharge	13.6 to 21.5 M gal	81 M gal	17 to 27
Electrical Use	39,850 MWh	239,000 MWh	17
Natural Gas Use	94 M ft ³	430 M ft ³	22

Source: TtNUS 2002a, Royer 2002

ft³: cubic feet

M gal: millions of gallons

MWh: megawatt hour

Table 5-22. Transportation Activities under the Planned Utilization and Operations Alternative

Activity	No Action Alternative	Planned Utilization and Operations Alternative	Change from No Action Alternative
Paved and unpaved road	6.2 miles	9.7 miles	+3.5 miles
Pedestrian mall	4 acres	6.24 acres	+2.24 acres
Paved service areas	5.5 acres	8.6 acres	3.1 acres
Paved service parking	12.7 acres	19.8 acres	+7.1 acres
Material (Annual Shipments Radioactive, Chemical, and Explosives)	33 trips	37 trips	+4 trips
Waste (includes hazardous & radioactive)	76 shipments	86 shipments	+10 shipments
Sanitary Waste	52 shipments	59 shipments	+7 shipments
SNL/CA Weekly Hazardous Materials Transports (excluding waste)	1 to 3 outbound shipments per week (Total of 33)	1 to 3 shipments (Total of 37)	+4 shipments
Supplier Weekly Hazardous Material Transports	1 to 3 inbound shipments per week (Total of 100)	1 to 3 shipments (Total of 113)	+13 shipments
Soil Transports	NR	1,600 to 2,000 shipments over 10 Years	+200 shipments
Incoming Material (Rock, Soil, Concrete)	NR	1,500 to 3,000 shipments over 10 Years	+300 shipments
Site-Related Traffic - Total Daily traffic	700 to 1,000 vehicles	791 to 1,130 vehicles	+91 to 130 vehicles

Source: TtNUS 2002a

NR: not reported

5.4.9 WASTE GENERATION

The Planned Utilization and Operations Alternative would not cause any major changes in the types of waste streams generated onsite. Waste generation levels at SNL/CA would increase, consistent with 13 percent increases in laboratory operations. However, existing waste minimization and pollution prevention measures would control the extent of the waste generation increase. Under the Planned Utilization and Operations Alternative, waste projections used for analysis would not exceed existing waste management capacities.

Waste generation would be expected to increase by 13 percent above the 5-year average under the Planned Utilization and Operations Alternative. For specific facilities, the CY 2000 waste generation data were considered and increased or decreased based on the individual facility staffing projections. Existing operations wastes are considered to be derived from mission-related work. New operations are discussed separately in order to show the maximum likely existing operational increases. The projected totals would be below recent highs experienced within the last five years (see Tables 4-10 and 4-11).

5.4.9.1 Radioactive Wastes

Existing Operations

The Planned Utilization and Operations Alternative would generate LLW and LLMW but not TRU waste or high-level waste. Projections for radioactive waste generation for all operations are shown in Table 5-23. Projections for radioactive waste generation at specific facilities from new and existing operations are shown in Table 5-24.

SNL/CA anticipates a 13 percent increase in the generation of LLW from all operations over the next 10 years. LLMW generation would increase by 13 percent for all operations through 2012. There would be sufficient management capacity to accommodate anticipated radioactive wastes. LLW and LLMW are shipped offsite for final disposal.

New Operations

New Operations would not generate LLW and LLMW (Tables 5-23 and 5-24).

Balance of Operations (Maintenance and Decontamination and Decommissioning)

SNL/CA anticipates 5,998 kg per year of LLW and 510 kg per year of LLMW would be generated from balance of operations over the next 10 years (Table 5-23). There would be sufficient management capacity to accommodate projected radioactive wastes. Maintenance and D&D wastes are not expected to impact SNL/CA waste management operations.

Current Capacity

The total radioactive waste generated per year requiring offsite disposal at licensed/approved facilities would not exceed the existing storage and handling capacities at the Radioactive Waste Storage Facility. Projections indicate that radioactive waste throughput would increase by 13 percent. SNL/CA routinely ships radioactive waste to various offsite governmental and commercial treatment and disposal facilities. All waste is shipped to meet regulatory requirements. Based on these projections and contin-

Table 5-23. Average Annual Radioactive Waste Generation under the Planned Utilization and Operations Alternative (in kilograms)

All Waste	Unit	5-Year Average (1996 to 2000) ^a	Planned Utilization and Operations Alternative
LLW			
Existing Operations	kg	198	156
New Operations	kg	0	0
Balance of Operations	kg	5,110	5,842
SNL/CA Total LLW	kg	5,308	5,998
Percent Change		0%	+13.0%
LLMW			
Existing Operations	kg	0	0
New Operations	kg	0	0
Balance of Operations	kg	451	510
SNL/CA Total LLMW	kg	451	510
Percent Change		0%	+13.1%
Total All Radioactive Waste			
Existing Operations	kg	198	156
New Operations	kg	0	0
Balance of Operations	kg	5,561	6,352
SNL/CA Total All Radioactive Waste	kg	5,759	6,508
Percent Change		0%	+13.0%

Sources: SNL/CA 2002b; TtNUS 2002a

^a5-year average represents the No Action Alternative excluding new facilities

%; percent

LLW: low-level waste

LLMW: low-level mixed waste

SNL/CA: Sandia National Laboratories, California

Table 5-24. Average Annual Generation by Specific Sandia National Laboratories, California Facilities under the Planned Utilization and Operations Alternative (in kilograms)

Facility	Calendar Year 2000			Planned Utilization and Operations Alternative		
	LLW	LLMW	Hazardous ^a	LLW	LLMW	Hazardous ^a
Existing Facilities						
Combustion Research Facility (CRF)	0	0	2,444	0	0	2,933
Building 910	15	0	15,432	19	0	19,289
Building 914	0	0	1,741	0	0	1,741
Building 916	1.5	0	596	2.3	0	912
Building 927	0	0	4,182	0	0	6,273
Micro and Nano Technologies Laboratory (MANTL)	0	0	7,109	0	0	8,673
Chemical and Radioactive Detection Laboratory (CRDL)	13	0	1,169	68	0	6,135
Area 8 Facilities	168	0	814	67	0	326
Explosives Storage Area (ESA)	0	0	0	0	0	0
Hazardous and Radioactive Waste Storage Facilities	0	0	0	0	0	0
Subtotals Existing Facilities	198	0	33,487	156.3	0	46,282
New Facilities						
LIGA Technologies Facility (LTF)	0	0	0	0	0	2,964
Distributed Information Systems Laboratory (DISL)	0	0	0	0	0	0
Glass Furnace and Melting Laboratory (part of the CRF)	0	0	0	0	0	50
Subtotals New Facilities	0	0	0	0	0	3,014
Total All Facilities	198	0	33,487	156.3	0	49,296

Sources: SNL/CA 2002b; TtNUS 2002a

^aIncludes RCRA Hazardous, California Toxic, TSCA, and biohazardous (MWMA)

LLW: low-level waste

LLMW: low-level mixed waste

RCRA: Resource Conservation and Recovery Act

TSCA: Toxic Substances Control Act

MWMA: Medical Waste Management Control Act

ued operations at specific facilities under this alternative, the radioactive waste generation impacts would continue to be minimal.

5.4.9.2 Hazardous Waste

Existing Operations

The Planned Utilization and Operations Alternative total hazardous waste generation would increase for existing facilities. Under the Planned Utilization and Operations Alternative, SNL/CA anticipates 98,833 kg per year of hazardous waste through 2012. There would be sufficient

capacity to accommodate anticipated operations total hazardous wastes. Projections for specific facilities for existing operations are presented in Table 5-24.

New Operations

SNL/CA anticipates annual generation of 3,014 kg of hazardous waste by new operations over the next 10 years. The majority of the additional waste would be due to the full implementation of LIGA wafer production operations (Table 5-24, 2,964 kg/yr). New SNL/CA operations would account for three percent of the total hazardous waste at the site (Table 5-25).

Table 5-25. Average Annual Hazardous Waste Generation under the Planned Utilization and Operations Alternative (in kilograms)

All Waste	Unit	5-Year Average (1996 through 2000) ^a	Planned Utilization and Operations Alternative
RCRA Hazardous Waste			
Existing Operations	kg	8,659	11,967
New Operations	kg	0	779
Balance of Operations	kg	13,178	12,809
SNL/CA Total RCRA Hazardous	kg	22,616	25,556
Percent Change		0%	+13.0%
California Toxic Waste			
Existing Operations	kg	9,922	13,713
New Operations	kg	0	893
Balance of Operations	kg	15,099	14,677
SNL/CA Total California Toxic	kg	25,914	29,283
Percent Change		0%	+13.0%
TSCA			
Existing Operations	kg	14,695	20,310
New Operations	kg	0	1,323
Balance of Operations	kg	22,365	21,739
SNL/CA Total TSCA	kg	38,383	43,372
Percent Change		0%	+13.0%
Biohazardous (includes MWMA waste)			
Existing Operations	kg	211	292
New Operations	kg	0	19
Balance of Operations	kg	321	312
SNL/CA Total Biohazardous	kg	551	623
Percent Change		0%	+13.0%
Total All Hazardous Waste			
Existing Operations	kg	33,487	46,282
New Operations	kg	0	3,014
Balance of Operations	kg	50,963	49,538
SNL/CA Total All Hazardous waste	kg	87,464	98,834
Percent Change		0%	+13.0%

Sources: SNL/CA 2002b; TtNUS 2002a

^a5-year average represents the No Action Alternative excluding new facilities

kg: kilograms

MWMA: Medical Waste Management Control Act

RCRA: Resource Conservation and Recovery Act

SNL/CA: Sandia National Laboratories, California

TSCA: Toxic Substances Control Act

Balance of Operations (Maintenance and Decontamination and Decommissioning)

During maintenance and D&D, SNL/CA would produce hazardous waste (includes construction debris) each year.

Projected hazardous waste quantities for these activities are included in Table 5-25 as balance of operations. This work would directly impact the quantity of TSCA waste requiring disposal. SNL/CA would generate TSCA waste,

primarily PCBs and asbestos that are removed from transformers and buildings. Assuming that up to 20,000 gsf would be removed, D&D activities would generate 133 tons of debris.

Current Capacity

The total hazardous waste generated per year requiring offsite disposal at licensed/approved facilities would not exceed the existing storage and handling capacities at the Hazardous Waste Storage Facility. Projections indicate that an increase of 13 percent of total hazardous waste generation would occur. SNL/CA routinely ships hazardous waste to various offsite commercial disposal facilities. All waste is shipped in less than one year to meet regulatory requirements. Based on these projections and continued operations at specific facilities under the Planned Utilization and Operations Alternative, the hazardous waste generation impacts would be minimal.

5.4.9.3 All Other Wastes

SNL/CA operations also involve four additional waste management activities discussed below.

Biohazardous (Medical Waste Management Act) Waste

Under the Planned Utilization and Operations Alternative, biohazardous waste generation would increase from 551 kg/yr to 623 kg/yr (see Table 5-25). The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would be sufficient.

Construction Waste

Under the Planned Utilization and Operations Alternative, construction debris would include the construction of facilities identified in the No Action Alternative (LTF, 60 tons; DISL, 140 tons; and Glass Furnace and Melting Lab, 8 tons) plus the new badge office (10 tons). Since a typical roll off container handles 20 tons of debris, the expected construction waste would be minimal. No additional offsite impacts would occur, because offsite disposal capacity would be sufficient.

Municipal Solid Waste

Under the Planned Utilization and Operations Alternative, an estimated 279.7 metric tons would be generated annually. No appreciable impacts to disposal facilities would occur because existing waste handling capabilities are already in place.

Wastewater

SNL/CA would generate approximately 13.6 to 21.5 M gal of wastewater annually compared to 15 million gallons in CY2000. Sufficient disposal capacity would be available (see Table 5-21).

5.4.10 NOISE

Under the Planned Utilization and Operations Alternative, activities at SNL/CA would increase beyond current land uses and planned facility operations for all facilities in support of SNL/CA's assigned missions. The increase would include ongoing and planned Arroyo Seco improvements, land use changes, and new facility construction and upgrades, where detailed design and associated NEPA documentation are not expected to be complete before the Final SWEA is approved.

Noise levels under the Planned Utilization and Operations Alternative are similar to those described under the No Action Alternative. During the site preparation phase of construction of new facilities, relatively high and continuous levels of noise in the range 93 to 108 dBA would be produced by heavy equipment operations. Upon completion of construction activities, noise levels would return to preconstruction levels (55 to 65 dBA).

5.4.11 HUMAN HEALTH AND WORKER SAFETY

The Planned Utilization and Operations Alternative would result in the human health and worker safety impacts described in the following sections for radiological health and occupational health and safety.

5.4.11.1 Radiological Health Effects

Under the Planned Utilization and Operations Alternative, NNSA expects minimal worker radiological health impacts from the SNL/CA activities. The values for this alternative were calculated assuming the number of radiation workers and their average annual radiation dose would be the same as for the past 3 years. In addition, NNSA assumed that the ratio of radiation workers to total employees and the average radiation dose to these workers would remain constant. Table 5-26 presents estimated radiation doses for the collective population of workers who would be directly involved in implementing the alternative as well as LCFs likely attributable to these doses.

The estimated number of LCFs listed in Table 5-26 for the Planned Utilization and Operations 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 (CDC 1998). 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 1,222 workers, 284 persons would be likely to contract fatal cancers from all causes. In all cases, the incremental impacts from SNL/CA operations would be small.

Table 5-26. Estimated Radiological Dose and Health Impacts to Sandia National Laboratories, California Workers by Alternative

Health Impact	No Action Alternative	Planned Utilization and Operations Alternative
Collective involved worker dose (person-rem)	0.85 ^a	1.0
Estimated increase in number of latent cancer fatalities	3.4×10^{-4}	4.0×10^{-4}

Sources: DOE 1999d, 2000d, 2001g, TtNUS 2002a

^aSNL/CA involved worker dose estimated at 11 percent of SNL lab-wide totals in Table 4-15. Any increase in estimated radiation doses would be a result of the increase in radiation workers and not the result of different exposure mechanisms or levels.

rem: Roentgen equivalent, man

5.4.11.2 Occupational Health and Safety

Table 5-27 estimates the number of TRCs and LWCs that could occur under the Planned Utilization and Operations Alternative. The projected injury rates are based on an average historic SNL/CA injury rates over a 3-year period from 1999 through 2001 (DOE 2002b). These rates were then multiplied by the anticipated workforce levels for this alternative to calculate the number of TRCs and LWCs.

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.

5.4.12 SOCIOECONOMICS

The Planned Utilization and Operations Alternative would result in no appreciable impacts to demographic characteristics, economy, and community services in the ROI, as discussed below.

5.4.12.1 Demographic Characteristics

The Planned Utilization and Operations Alternative would not be likely to have any noticeable change in existing demographic characteristics within the ROI (Section 4.14.3). Under this Alternative, employment is expected to increase by 179 workers. Assuming, for a conservative analysis, that all employees would migrate

in from areas outside of the ROI, the population increase not realized by the ROI would represent an extremely small percentage (far less than one percent) of the 2000 ROI population as a whole.

5.4.12.2 Economic Base

The Planned Utilization and Operations Alternative would not be likely to have a noticeable change in the existing economic base in the ROI (Section 4.14.3). Table 5-28 presents the direct and indirect impacts SNL/CA operations currently (FY 2000) have on the economy of the ROI. Table 5-29 presents the direct and indirect impacts SNL/CA's Planned Utilization and Operations Alternative operations would have on the 2000 economy. (In order to provide a more conservative estimate of the impact of this alternative, a comparison is being made between Planned Utilization and Operations Alternative expenditures and FY 2000 economic indicators.) As the data indicate, SNL/CA's 2000 payroll expenditures represent only 0.1 percent of the total personal income for the ROI. Additionally, SNL/CA's 2000 employment represents only 0.2 percent of the 1,455,700 individuals currently employed in the ROI.

SNL/CA estimates that the Planned Utilization and Operations Alternative will require 1,497 (including contract employees) employees and \$170.3 million in total operating expenditures. From 1998-2000, SNL/CA payroll expenditures represented an average of 51 percent of the total operating budgets. Therefore, SNL/CA estimates payroll expenditures under the Planned Utilization and Operations Alternative at \$86.9 million. This represents a \$13 million increase in payroll expenditures (over

Table 5-27. Estimated Occupational Safety Impacts to Sandia National Laboratories, California Workers

Worker Safety Parameters	No Action Alternative	Planned Utilization and Operations Alternative
Workforce	1,043 – 1,317	1,222 – 1496
Total recordable cases of accident or injury	43 – 54	50 – 61
Lost workday cases	10 – 13	12 – 15

Sources: SNL 2001i, 2002a

Table 5-28. Sandia National Laboratories, California's Current Impact on the Regional Economy

Economic Measure	FY 2000		
	SNL/CA	Total ROI	Percent of ROI
Earnings (Income) (\$Millions)			
Wages and Salaries	74.3		
Indirect and Induced	47.6		
TOTAL EARNINGS	121.9	\$108,376.8	0.1
Earnings Multiplier: 1.64 (2002)			
Employment (Number of Workers)			
SNL/CA Workforce	1,317		
Indirect and Induced	1,264		
TOTAL EMPLOYMENT	2,581	1,455,700	0.2
Employment Multiplier: 1.96 (2002)			

Sources: BEA 2000b, BEA 2002a

FY: fiscal year

ROI: region of influence

SNL/CA: Sandia National Laboratories, California

Table 5-29. Sandia National Laboratories, California's Estimate of Planned Utilization and Operations Alternative Impacts on the Regional Economy

Economic Measure	Planned Utilization and Operations Alternative		
	SNL/CA	Total ROI	Percent of ROI
Estimated Earnings (Income) (\$Millions)			
Wages and Salaries	86.9		
Indirect and Induced	55.6		
TOTAL EARNINGS	142.5	\$108,376.8	0.1
Earnings Multiplier: 1.64 (2002)			
Employment (Number of Workers)			
SNL/CA Workforce ^a	1,496		
Indirect and Induced	1,436		
TOTAL WORKFORCE	2,932	1,455,700	0.2
Employment Multiplier: 1.96 (2002)			

Source: BEA 2000b, BEA 2002a

^aEmployment would range from 1,222 to 1,496 workers.

ROI: region of influence

SNL/CA: Sandia National Laboratories, California

the No Action Alternative). The Planned Utilization and Operations Alternative expenditures combined with indirect and induced expenditures would total \$142.5 million and would continue to represent 0.1 percent of the personal income in the ROI for the year 2000. Additionally, a total workforce of 2,932 persons (direct, indirect, and induced) would represent 0.2 percent of the 2000 employment level in the ROI.

5.4.12.3 Housing and Community Services

The Planned Utilization and Operations Alternative would not create a noticeable change in existing housing

and community services within the ROI (Section 4.14.3). Assuming one housing unit per additional employee, 179 housing units would be required. This number represents 0.5 percent of the housing stock available in the ROI. Therefore, ROI capacity would far exceed demand. Additionally, contributory effects from other industrial and economic sectors within the ROI would greatly reduce or mask the SNL/CA proportional impact.

5.4.13 ENVIRONMENTAL JUSTICE

The impacts of this alternative on environmental justice resources would be substantially the same as those associ-

ated with the No Action Alternative. For a summary of potential environmental justice impacts under the No Action Alternative, see Table 5-15.

5.5 MAXIMUM OPERATIONS ALTERNATIVE

5.5.1 LAND USE AND VISUAL RESOURCES

Implementing the Maximum Operations Alternative would not affect existing land use patterns or visual resources at SNL/CA. Sections 5.5.1.1 and 5.5.1.2 discuss these resource areas in relation to the Maximum Operations Alternative.

5.5.1.1 Land Use

No changes would occur to land use patterns at SNL/CA under this alternative. The extent of DOE land available for use by SNL/CA, 410 acres, would remain the same. SNL/CA operations would remain consistent with industrial research park uses and would not change established land use patterns or requirements.

Under this alternative, Building 916 would be replaced with a new building twice as big, and a new R&D building would be constructed. Both would be constructed within the 93 acres designated for new construction, thus there would be no impact to overall site land use, as explained in Section 5.4.1. Completion of these facilities would be consistent with the existing environment. In addition, the functions of these buildings would be consistent with those surrounding them. Structures no longer determined to be economically useful potentially would be vacated and removed (up to 100,000 sq ft). These existing structures are located throughout the SNL/CA and their removal would not impact land use.

5.5.1.2 Visual Resources

The Maximum Operations Alternative would not adversely change the overall appearance of the existing landscape, obscure views, or otherwise detract from the scenic views of SNL/CA or from areas adjacent to the site. A new Building 916 and a new R&D building would be constructed within the 93-acre construction area, and would be expected to have no impacts to visual resources. All construction would be consistent with campus-style design and the guidelines presented in the *Master Plan* (Royston *et al.* 1993). Although construction in this area increases the size of the main campus, it would have little or no effect on the scenic qualities of the SNL/CA site. Removal of facilities and structures would tend to improve the visual characteristics of the site.

5.5.2 GEOLOGY AND SOILS

As with the No Action Alternative, no impacts to general geology and geologic resources are anticipated. Additionally,

there would be no increase in the likelihood of impacts from seismic activity.

For a discussion regarding the Arroyo Seco Improvement Plan and the placement of the soil on a 25-acre part of the 93-acre future construction areas, see Section 5.4.2.

Construction activities would result in the construction of two new buildings totaling 100,000 sq ft. D&D activities would potentially remove 100,000 sq ft of facilities determined to be no longer economically useful. While these activities would disturb soil, these areas are part of the existing industrial park and the land would be used again for future construction; no impacts would be expected. Additionally, upgrades to storm water runoff areas would be beneficial.

In general, activities at SNL/CA would increase by 53 percent (derived from the increase in workforce) above the No Action Alternative. There would be a proportional increase in the likelihood of a spill or release to the environment; however, industry accepted controls are in place to minimize the potential for soil contamination from any SNL/CA operations.

5.5.3 WATER RESOURCES AND HYDROLOGY

The impacts of this alternative on water resources and hydrology would be essentially the same as those associated with the Planned Utilization and Operations Alternative. Due to the increased staffing levels (53 percent increase in staff site-wide) under this alternative, increases in discharge to the sanitary sewer system would occur. The capacity of the current system is adequate to handle this increase (see Section 5.5.7).

5.5.4 BIOLOGICAL RESOURCES

Under the Maximum Operations Alternative, impacts to biological resources would be substantially the same as those associated with the Planned Utilization and Operations Alternative. The main difference between the alternatives would be the use of two work shifts to increase R&D (versus the one work shift used in the No Action and Planned Utilization and Operations Alternatives). Due to the proposed disturbance of critical habitat for the California red-legged frog on the east side of SNL/CA, DOE would coordinate with the USFWS under the provisions of Section 7 of the *Endangered Species Act*.

Under this alternative, two new structures are proposed, including a new building similar to the CRDL and a replacement for Building 916. These proposed structures would have a negligible effect on biological and ecological resources. They would be constructed on previously disturbed land in either the existing footprint or within 93 acres designated for future development (see Section 5.4.4.2).

5.5.5 CULTURAL RESOURCES

Implementation of the Maximum Operations Alternative would likely have no impacts on cultural resources due to the apparent lack of prehistoric and Native American resources and historic archaeological sites, the nature of the buildings and structures present, and compliance with applicable regulations and established procedures for the protection and conservation of cultural resources located on lands administered by the DOE.

The potential to impact buried archaeological sites would be the same under this alternative as under the Planned Utilization and Operations Alternative. Additional construction projects that would occur under this alternative would take place within the 93-acres set aside for construction projects. Again, some maintenance activities that require ground disturbance could result in the discovery of buried archaeological sites, but compliance with regulations and procedures would ensure that any impacts would be minimal. Approximately 100,000 sq ft of buildings potentially would be removed from the site under this alternative. These existing buildings are recent in origin and not historically significant, thus removing them would not adversely affect cultural resources.

5.5.6 AIR QUALITY

Under the Maximum Operations Alternative, DOE and interagency programs and activities at SNL/CA would increase. The Maximum Operations Alternative would increase the number of nonexempt emission sources to 57, including:

- 12 boilers
- 14 degreasers and solvent use
- 10 backup generators
- 2 spray booths
- 1 service station

- 1 mixer
- 1 electroplating operation
- 16 miscellaneous sources

Criteria pollutant emissions are estimated to increase 53 percent based on projections of site-wide staff increases of 53 percent (see Section 5.2.6). Table 5-30 presents the criteria pollutant emissions under the Maximum Operations Alternative, reflecting the increase in emissions above the No Action and Planned Utilization and Operations Alternatives. Criteria pollutant emissions from SNL/CA under the Maximum Operations Alternative remain below one percent of the respective pollutant emissions from the Bay Area.

Table 5-31 presents the Maximum Operations Alternative air toxics emissions from SNL/CA, which are estimated to be twice the air toxic emission rates for the Planned Utilization and Operations Alternative, based on the addition of a second shift to the operations at SNL/CA. The Maximum Operations Alternative air toxic emissions are less than one and one-half percent of those for the Bay Area.

Construction activities at SNL/CA could have short-term adverse impacts due to emissions of criteria air pollutants from construction equipment, traffic from construction worker vehicles, and fugitive dust from earth-moving activities. Under the Maximum Operations Alternative, construction activities would include projects under the Planned Utilization and Operations Alternative plus two new projects. The fugitive dust could exceed PM₁₀ 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 be implemented to minimize fugitive dust. It is expected that PM₁₀ concentrations would be within all applicable standards.

Table 5-32 estimates construction-related emissions CO emissions for one typical project. Construction of a

Table 5-30. Criteria Pollutant Emission Rates for the Maximum Operations Alternative (kilograms per year)

Pollutant	Maximum Operations Alternative ^a	Bay Area Emission Year 2000 ^{b,c}	Percent Contribution from SNL/CA
Particulates	NA	57,900,000	NA
Volatile Organic Compounds	2,534	179,000,000	< 1
Sulfur Dioxide	NA	29,100,000	NA
Nitrogen Dioxide	5,066	214,000,000	< 1
Carbon Monoxide	459 to 612	995,000,000	< 1

Sources: SNL/CA 2002b

^aBased on a 53 percent increase in Sandia National Laboratories, California (SNL/CA) staff

^bBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June

^cAll Bay Area-wide emissions except particulates are based on an average summer day multiplied by 365 days. Bay Area particulate emissions are based on an average winter day multiplied by 365 days

<: less than

NA: not available/not applicable

SNL/CA: Sandia National Laboratories, California

Table 5-31. Air Toxic Emission Rates for the Maximum Operations Alternative (kilograms per year)

Pollutant	Maximum Operations Alternative ^a	Bay Area Emission Year 1999 ^b	Percent Contribution from SNL/CA
1,1,1-trichloroethane	470	58,968	< 1
1,4-dioxane	11	771	< 1.5
Ammonia	477	1,406,160	< 1
Benzene	0.64	28,577	< 1
Carbon tetrachloride	0.72	1,406	<1
Formaldehyde	6.8	81,648	< 1
Methyl alcohol	1,364	276,696	< 1
Methylene chloride	151	49,896	< 1
Perchloroethylene	150	371,952	< 1
Toluene	86	335,664	< 1
Trichloroethylene	133	21,773	< 1
Xylene	30	276,696	< 1

Sources: TTNUS, 2002a; SNL/CA 2002b

^aBased on twice the maximum emission rate from the Planned Utilization and Operations Alternative^bBay Area Air Quality Management District (BAAQMD) inventory is reported annually for period July to June

<: less than

NA: not available/not applicable

SNL/CA: Sandia National Laboratories, California

Table 5-32. Estimated Carbon Monoxide Emissions Associated with Representative Project Construction Activities

1-Year Construction Activity (assumes 21-work day months or 252 days)	Total Annual Hours of Operation	Equipment Emission Factors ^a	Estimated Total Annual Carbon Monoxide Emissions (total pounds per year)	Estimated Total Annual Carbon Monoxide Emissions (total tons per year)
Assumptions for Diesel Vehicles Emissions				
7 Diesel Units (trucks for transportation of materials to site throughout life of construction phase)	3,528 (or 2 hours per day each for 252 days)	0.11	388	0.194
8 Diesel Units (dozers, backhoes, graders, dump trucks to grade and lay foundation)	800 (or 5 hours per day each for 20 days)	0.11	88	0.044
6 Diesel Units (forklifts, crane, front end loader, other equipment for construction of buildings)	10,584 (or 7 hours per day each for 252 days)	0.11	1,164	0.582
Total Diesel units (21)	14,912	N/A	1,640	0.82

Table 5-32. Estimated Carbon Monoxide Emissions Associated with Representative Project Construction Activities

1-Year Construction Activity (assumes 21-work day months or 252 days)	Total Annual Hours of Operation	Equipment Emission Factors ^a	Estimated Total Annual Carbon Monoxide Emissions (total pounds per year)	Estimated Total Annual Carbon Monoxide Emissions (total tons per year)
Assumptions for Gasoline Vehicles Emissions				
24 Light Gasoline units (worker personal vehicles, snack wagons, light commercial vans)	6,048 (or 1 hour per day each for 252 days)	0.48	2,903	1.451
2 Hand tampers	160 (or 4 hours per day each for 20 days)	0.48	77	0.38
Total Gas units	6,208	N/A	2,980	1.49
Total Estimated Carbon Monoxide Emissions during Typical Construction Phase			4,620 pounds	2.31 tons

Source: SNL/CA 2001i

^aCarbon Monoxide (CO) emission factors are based on the Environmental Protection Agency (EPA) National Vehicle and Fuel Emission Laboratory (Ann Arbor, Michigan) average emission rates for idling vehicles. CO emissions for light-duty trucks are estimated at 219 grams per hour, for heavy-duty gas vehicles at 245 grams per hour, and for heavy-duty diesel vehicles at 50 grams per hour. Calculations are based on a conversion factor of 0.035 ounce per gram (grams x 0.035) divided by 16 (ounces per pounds) times hour's operation divided by 2,000 (pounds per ton) to obtain tons per yr.

replacement building for Building 916 and a new building similar to the CRDL would produce similar levels of CO emissions shown in Table 5-32. It is expected that CO emissions will be within all applicable standards. The Arroyo Seco improvement activities are covered in Table 5-19.

The estimated number of daily commuters to SNL/CA during FY 2001 is 700 to 1,000 vehicles. Under the Maximum Operations Alternative, it is estimated that a 53 percent increase in daily commuter traffic will occur resulting in 1,071 to 1,530 vehicles. Increases of carbon monoxide and nitrogen oxides, an ozone precursor, will occur with the increase in commuter traffic. Actual future emissions are not expected to be equivalent to the increase in commuter vehicles because future vehicles will have lower emission rates and more stringent inspection

and maintenance programs. In addition, the BAAQMD vehicle buy back program designed to remove 1981 and earlier model vehicles from the road will contribute to the reduction in commuter vehicle emissions.

Total carbon monoxide emissions estimates are shown in Table 5-33. Total carbon monoxide emissions for the Maximum Operations Alternative are 70 tons per year above the 2000 baseline and below the 100 tons per year incremental increase above baseline that would require a conformity determination. In addition, the total carbon monoxide emissions for the Maximum Operations 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 Maximum Operations Alternative.

Table 5-33. Carbon Monoxide Emissions from Sandia National Laboratories, California under the Maximum Operations Alternative (tons per year) and Calendar Year 2000 (baseline)

Stationary Sources	Mobile Sources	Construction Activities	Total
Maximum Operations Alternative			
0.61	282	9.2	291.8
Baseline			
0.4	214	6.9	221.3

Source: EPA 1995

Notes: Mobile Source Emission Factors assumptions Baseline (2000) 24.77 grams per mile, the No Action Alternative (2005) 21.29 grams per mile, 1,000 to 1,530 vehicles, 30-mile trip, average speed 35 miles per hour. Assumed three typical construction projects each year (2.31 tons per project) plus the Arroyo Seco project (2.25 tons per year).

5.5.7 INFRASTRUCTURE

As discussed in Section 5.3.7, the infrastructure analysis evaluated potential incremental changes to SNL/CA services, utilities, and facilities by alternative.

The Maximum Operations Alternative would increase demands on infrastructure over the next 10 years (Table 5-34). Annual consumption of water, electricity, and natural gas would exceed recent historic levels (DOE 1992a; TtNUS 2002a). Under the Maximum Operations Alternative, the current infrastructure would be capable of accommodating SNL/CA facility requirements and no major additional infrastructure facilities are proposed.

5.5.8 TRANSPORTATION

Based on current transportation operation data, the Maximum Operations Alternative would increase the amount of highway and pedestrian infrastructure within SNL/CA by approximately 53 percent (Table 5-35). The number of truck shipments from SNL/CA would increase by approximately 600 vehicles per year from the current/No Action numbers. Of these, 57 would be hazardous shipments. The number of commuter vehicles would increase by approximately 371 to 530. The increased number of shipments and the increase in employee vehicles would not represent substantial increase in the number of vehicles on the road by virtue of the area's

**Table 5-34. Annual Sandia National Laboratories, California
Utility Usage and Capacities under the Maximum Operations Alternative**

Utility	Maximum Operations Alternative	System Capacity	Usage as Percent of Capacity
Water Use	76.5 to 91.8 M gal	922 M gal	8 to 10
Wastewater Discharge	18.4 to 29.1 M gal	81 M gal	23 to 36
Electrical Use	48,800 MWh	239,000 MWh	20
Natural Gas Use	94 M ft ³	430 M ft ³	22

Source: TtNUS 2002a; Royer 2002a

ft³: cubic feet

M gal: millions of gallons

MWh: megawatt hours

Table 5-35. Transportation Activities under the Maximum Operations Alternative

Activity	No Action Alternative	Maximum Operations Alternative	Change from No Action
Paved and unpaved road	6.2 miles	9.7 miles	+3.5 miles
Pedestrian mall	4 acres	6.24 acres	+2.24 acres
Paved service areas	5.5 acres	8.6 acres	+3.1 acres
Paved service parking	12.7 acres	19.8 acres	+7.1 acres
Waste (includes hazardous & radioactive)	76 shipments	116 shipments	+40 shipments
Sanitary Waste	52 shipments	80 shipments	+28 shipments
SNL/CA Weekly Hazardous Materials Transports (excluding waste)	1 to 3 outbound shipments per week (Total of 33)	1 to 3 shipments (Total of 50)	+17 shipments
Supplier Weekly Hazardous Material Transports	1 to 3 inbound shipments per week (Total of 100)	1 to 3 shipments (Total of 150)	+50 shipments
Soil Transports	NR	1,600 to 2,000 shipments over 10 Years	+200 shipments
Incoming Material (Rock, Soil, Concrete)	NR	1,500 to 3,000 shipments over 10 Years	+300 shipments
Commuter traffic	700 to 1,000 vehicles	1,071 to 1,530 vehicles	+371 to 530 vehicles

Source: TtNUS 2002a

NR: not reported

SNL/CA: Sandia National Laboratories, California

projected population growth and would have no significant impact on the region. Based on the number of additional vehicles, impacts from accidents should be the same as under current conditions.

5.5.9 WASTE GENERATION

The Maximum Operations Alternative would not cause any major changes in the types of waste streams generated onsite. Waste generation at SNL/CA would increase, consistent with a 53 percent increase in laboratory operations. However, existing waste minimization and pollution prevention programs would control the extent of the waste generation increase. Under the Maximum Operations Alternative, waste projections used for analysis would not exceed existing waste management capacities.

Site-wide waste generation would increase by 53 percent above the 5-year average under the Maximum Operations Alternative. For specific facilities, the CY 2000 waste generation data were doubled to correspond with two shifts. Existing operations wastes are considered to be derived from mission-related work. New operations are

discussed separately in order to show the maximum likely operational increases. The projected totals would be below recent highs experienced within the last five years (See Tables 4-10 and 4-11).

5.5.9.1 Radioactive Wastes

Existing Operations

Under the Maximum Operations Alternative, SNL/CA would generate LLW and LLMW (Table 5-36). However, SNL/CA would not generate any TRU waste or high-level waste. Projections for radioactive waste generation at specific facilities from new and existing operations are shown in Table 5-37.

Under the Maximum Operations Alternative, SNL/CA anticipates a 53 percent increase in the generation of LLW and LLMW from all operations over the next 10 years. There would be sufficient management capacity to accommodate anticipated radioactive wastes. LLW and LLMW are shipped offsite for final disposal.

Table 5-36. Average Annual Radioactive Waste Generation under the Maximum Operations Alternative (in kilograms)

All Waste	Unit	5-Year Average (1996 through 2000) ^a	Maximum Operations Alternative
LLW			
Existing Operations	Kg	198	444
New Operations	Kg	0	0
Balance of Operations	Kg	5,110	7,677
SNL/CA Total LLW	Kg	5,308	8,121
Percent Change		0%	+53%
LLMW			
Existing Operations	Kg	0	0
New Operations	Kg	0	0
Balance of Operations	Kg	451	690
SNL/CA Total LLMW	Kg	451	690
Percent Change		0%	+53%
Total Radioactive Waste			
Existing Operations	Kg	198	444
New Operations	Kg	0	0
Balance of Operations	Kg	5,561	8,367
SNL/CA Total Radioactive Waste	Kg	5,759	8,811
Percent Change		0%	+53%

Sources: SNL/CA 2002b; TtNUS 2002a

^a5-year average represents the No Action Alternative excluding new facilities

%; percent

LLW: low-level waste

LLMW: low-level mixed waste

SNL/CA: Sandia National Laboratories, California

Table 5-37. Average Annual Waste Generation by Specific Sandia National Laboratories, California Facilities under the Maximum Operations Alternative (in kilograms)

Facility	Calendar Year 2000			Maximum Operations Alternative		
	LLW	LLMW	Hazardous ^a	LLW	LLMW	Hazardous ^a
Existing Facilities						
Combustion Research Facility (CRF)	0	0	2,444	0	0	4,888
Building 910	15	0	15,432	30	0	30,864
Building 914	0	0	1,741	0	0	3,482
Building 916	1.5	0	596	3	0	1,192
Building 927	0	0	4,182	0	0	8,364
Micro and Nano Technologies Laboratory (MANTL)	0	0	7,109	0	0	14,218
Chemical and Radioactive Detection Laboratory (CRDL)	13	0	1,169	75	0	6,719
Area 8 Facilities	168	0	814	336	0	1,628
Explosives Storage Area (ESA)	0	0	0	0	0	0
Hazardous and Radioactive Waste Storage Facilities	0	0	0	0	0	0
Subtotals Existing Facilities	198	0	33,487	444	0	71,355
New Facilities						
LIGA Technologies Facility (LTF)	0	0	0	0	0	5,928
Distributed Information Systems Laboratory (DISL)	0	0	0	0	0	0
Glass Furnace and Melting Laboratory (part of the CRF)	0	0	0	0	0	50
Subtotals New Facilities	0	0	0	0	0	5,978
Totals All Facilities	198	0	33,487	444	0	77,333

Sources: SNL/CA 2002b; TtNUS 2002a

^aIncludes RCRA Hazardous, California Toxic, TSCA, and biohazardous (MWMA)

LLW: low-level waste

LLMW: low-level mixed waste

RCRA: *Resource Conservation and Recovery Act*TSCA: *Toxic Substances Control Act*MWMA: *Medical Waste Management Control Act***New Operations**

SNL/CA anticipates 444 kg per year of LLW would be generated from new operations annually over the next 10 years. There would be sufficient capacity to accommodate anticipated new operations radioactive wastes.

Balance of Operations (Includes Maintenance and Decontamination and Decommissioning)

SNL/CA anticipates 7,677 kg per year of LLW and 690 kg per year of LLMW would be generated from balance of operations over the next 10 years. There would be sufficient capacity to accommodate projected radioactive

wastes. Maintenance and D&D wastes are not expected to impact overall SNL/CA waste management operations.

Current Capacity

The total radioactive waste generated per year requiring offsite disposal at licensed/approved facilities would not exceed the existing storage and handling capacities at the Radioactive Waste Storage Facility. Projections indicate that radioactive waste throughput would increase by 53 percent. SNL/CA routinely ships radioactive waste to various offsite governmental and commercial treatment and disposal facilities. All waste is shipped to meet regulatory requirements. Based on these projections and continued operations at specific facilities under this alternative, the radioactive waste generation impacts would continue to be minimal.

5.5.9.2 Hazardous Waste

Existing Operations

The Maximum Operations Alternative total hazardous waste generation would increase for existing facilities. Under the Maximum Operations Alternative, SNL/CA anticipates 133,820 kg per year of hazardous waste through 2012 (Table 5-38). There would be sufficient capacity to accommodate anticipated operations total hazardous wastes. Projections for specific facilities for existing and new operations are presented in Table 5-37.

New Operations

SNL/CA anticipates generation of 5,978 kg per year of hazardous waste by new operations over the next 10 years. The majority of the increase would primarily be due to the full implementation of LIGA wafer production operations (Table 5-37, 5,928 kg/yr). New SNL/CA operations would account for less than five percent of the total hazardous waste at the site (Table 5-38).

Balance of Operations (Includes Maintenance and Decontamination and Decommissioning)

Maintenance and D&D, SNL/CA would produce hazardous waste (includes construction debris) each year. Projected hazardous waste quantities for these activities are included in Table 5-38 as balance of operations. This work would directly impact the quantity of TSCA hazardous waste requiring disposal. SNL/CA would continue to generate TSCA hazardous waste, primarily PCBs and asbestos that are removed from transformers and buildings. Under the Maximum Operations Alternative, 100,000 gsf (an estimated 600 tons or 600,000 kg of construction debris) would be removed.

Current Capacity

The total hazardous waste generated per year requiring offsite disposal at licensed/approved facilities would not exceed the existing storage and handling capacities at the Hazardous Waste Storage Facility. Projections indicate that an increase of 53 percent of hazardous waste generation would occur. SNL/CA routinely ships hazardous waste to various offsite commercial disposal facilities. All waste is shipped in less than one year to meet regulatory requirements. Based on these projections and continued operations at specific facilities under the Maximum Operations Alternative, the hazardous waste generation impacts would be minimal.

5.5.9.3 All Other Wastes

SNL/CA operations also involve the four additional waste management activities discussed below.

Biohazardous (includes Medical Waste Management Act) Waste

Under the Maximum Operations Alternative, biohazardous waste generation would increase from 551 kg/yr to 843 kg/yr (see Table 5-37). 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 Waste

Under the Maximum and Operations Alternative, construction debris would include the construction of facilities identified in the No Action Alternative (a total of 208 tons), Planned Utilization Operations Alternative (an additional 10 tons), plus construction of a new 84,000 sq ft building and a new 16,000 sq ft building would generate 168 tons and 32 tons of construction debris, respectively. Since a typical roll off container handles 20 tons of debris, the expected construction waste would be minimal. No additional offsite impacts would occur, because offsite disposal capacity would be sufficient.

Municipal Solid Waste

Under the Maximum Operations Alternative, an estimated 378.7 metric tons per year would be generated annually. No appreciable impacts to disposal facilities would occur because existing waste handling capabilities are already in place.

Wastewater

SNL/CA would generate approximately 18.4-29.1 M gallons annually compared to 15 million gallons in CY 2000. Sufficient disposal capacity would be available (see Table 5-34).

Table 5-38. Average Annual Hazardous Waste Generation under the Maximum Operations Alternative (in kilograms)

All Waste	Unit	5-Year Average (1996 through 2000) ^a	Maximum Operations Alternative
RCRA Hazardous Waste			
Existing Operations	kg	8,659	18,451
New Operations	kg	779	1,546
Balance of Operations	kg	13,178	14,606
SNL/CA Total RCRA Hazardous	kg	22,616	34,603
Percent Change		0%	53.0%
California Toxic Waste			
Existing Operations	kg	9,922	21,141
New Operations	kg	893	1,771
Balance of Operations	kg	15,099	16,736
SNL/CA Total California Toxic	kg	25,914	39,648
Percent Change		0%	53.0%
TSCA			
Existing Operations	kg	14,695	31,313
New Operations	kg	1,323	2,633
Balance of Operations	kg	22,365	24,789
SNL/CA Total TSCA	kg	38,383	58,725
Percent Change		0%	+53.0%
Biohazardous (includes MWMA waste)			
Existing Operations	kg	211	450
New Operations	kg	19	38
Balance of Operations	kg	321	356
SNL/CA Total Biohazardous waste	kg	551	843
Percent Change		0%	+53.0%
Total Hazardous Waste			
Existing Operations	kg	33,487	71,355
New Operations	kg	3,014	5,978
Balance of Operations	kg	50,963	56,487
SNL/CA Total Hazardous waste	kg	87,464	133,820
Percent Change		0%	+53.0%

Sources: SNL/CA 2002b; TtNUS 2002a

^a5-year average represents the No Action Alternative excluding new facilities

%: percent

RCRA: *Resource Conservation and Recovery Act*

SNL/CA: Sandia National Laboratories, California

TSCA: *Toxic Substances Control Act*MWMA: *Medical Waste Management Control Act*

5.5.10 NOISE

Under the Maximum Operations Alternative, activities at SNL/CA would increase to two-shifts.

The Maximum Operations Alternative consists of the background noise levels presented for the affected environment in Section 4.12, Table 4-14, with the following changes:

- Community Noise Equivalent Level (day) (CNEL L_d) changes from 7 am-7 pm to 7 am-10 pm
- L_{dn} (day/night) is deleted
- L_n (night) remains the same

A two-shift operation at SNL/CA would increase onsite noise levels during the evening hours. Little or no increase in ambient background noise levels is expected in the adjacent community.

5.5.11 HUMAN HEALTH AND WORKER SAFETY

Implementation of the Maximum Operations Alternative would result in the human health and worker safety impacts described in the following sections for radiological health and occupational health and safety.

5.5.11.1 Radiological Health Effects

Under the Maximum Operations Alternative, NNSA expects minimal worker radiological health impacts from the SNL/CA activities. The values for the 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. In addition, NNSA assumed that the ratio of radiation work-

ers to total employees would remain constant and that the average radiation dose to these workers would be the same as under the No Action Alternative (also the baseline). Table 5-39 presents estimated radiation doses for the collective population of workers who would be directly involved in implementing the alternatives as well as LCFs likely attributable to these doses.

The estimated number of LCFs listed in Table 5-39 for the Maximum Operations 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 (CDC 1998). 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 1,657 – 1,931 workers, 381 – 444 persons would be likely to contract fatal cancers from all causes. Under this alternative, the incremental impacts from SNL/CA operations would be small.

5.5.11.2 Occupational Health and Safety

Table 5-40 provides estimates of the number of TRCs and LWCs that could occur under this alternative. The projected injury rates are based on an average historic SNL/CA injury rates over a 3-year period from 1999 through 2001 (SNL 2001i, 2002a). These rates were then multiplied by the employment levels for this alternative to calculate the number of TRCs and LWCs.

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

Table 5-39. Estimated Radiological Dose and Health Impacts to Sandia National Laboratories, California Workers by Alternative

Health Impact	No Action Alternative (baseline)	Maximum Operations Alternative
Collective involved worker dose (person-rem)	0.85 ^a	1.35
Estimated increase in number of latent cancer fatalities	3.4×10^{-4}	5.4×10^{-4}

Sources: DOE 1999d, 2000d, 2001g

^aSNL/CA involved worker dose estimated at 11 percent SNL lab-wide totals in Table 4-15. Any increase in estimated radiation doses would be a result of the increase in the number of radiation workers and not the result of different exposure mechanisms or levels.
rem: Roentgen equivalent, man

Table 5-40. Estimated Occupational Safety Impacts to Sandia National Laboratories, California Workers by Alternative

Worker Safety Parameters	No Action Alternative	Maximum Operations Alternative
Workforce	1,043 – 1,317	1,657 – 1,931
Total recordable cases of accident or injury	43 – 54	68 – 79
Lost workday cases	10 – 13	17 – 19

Source: SNL 2001i, 2002a

from work or limited to restricted work activity because of an occupational injury or illness.

5.5.12 SOCIOECONOMICS

Implementation of the Maximum Operations Alternative would result in no appreciable impacts to demographic characteristics, economy, or community services in the ROI, as discussed below.

5.5.12.1 Demographic Characteristics

The Maximum Operations Alternative would not exert any noticeable change in existing demographic characteristics within the socioeconomic ROI (Section 4.14.3). Under this Alternative, employment is expected to increase by 614 employees to 1,931 workers. Assuming, for a conservative analysis, that all employees would migrate in from areas outside of the ROI, the population increase would represent an extremely small percentage (far less than one percent) of the 2000 ROI population, as a whole.

5.5.12.2 Economic Base

The Maximum Operations Alternative would not have a noticeable change in the existing economic base in the ROI (Section 4.14.3). Table 5-41 presents the direct and indirect impacts SNL/CA operations currently (2000) have on the economy of the ROI. Table 5-42 presents the direct and indirect impacts SNL/CA's Maximum Operations Alternative operations would have on the 2000 economy. (In order to provide a more conservative estimate of the impact of this alternative, a comparison is being made between Maximum Operations Alternative expenditures and year 2000 economic indicators.) As the data indicate, SNL/CA's 2000 payroll expenditures

represent only 0.1 percent of total personal income for the ROI. Additionally, SNL/CA's 2000 employment represents only 0.2 percent of the 1,455,700 individuals currently employed in the ROI.

SNL/CA estimates that the Maximum Operations Alternative will require 1,931 personnel and \$262 million in total operating expenditures. From 1998-2000, SNL/CA payroll expenditures have represented an average of 51 percent of the total operating budgets. Therefore, SNL/CA estimates that payroll expenditures under the Maximum Operations Alternative would be approximately \$133.6 million. This represents a \$59.3 million increase in payroll expenditures (over the No Action alternative). The Maximum Operations Alternative payroll expenditures combined with indirect and induced expenditures would total \$219.1 million and would represent 0.2 percent of the personal income levels found in the ROI for the year 2000. Additionally, a total of 3,784 workers (direct, indirect, and induced) would represent only 0.3 percent of the 2000 employment level in the ROI.

5.5.12.3 Housing and Community Services

The Maximum Operations Alternative would not create a noticeable change in existing housing and community services within the ROI (Section 4.14.3). Assuming one housing unit per additional worker, 614 housing units would be required. This number represents 1.8 percent of the housing stock available in the ROI. Therefore, ROI capacity would far exceed demand. Additionally, contributory effects from other industrial and economic sectors within the ROI would greatly reduce or mask the SNL/CA proportional impact.

Table 5-41. Sandia National Laboratories, California's Current Impact on the Regional Economy

Economic Measure	FY 2000		
	SNL/CA	Total ROI	Percent of ROI
Earnings (Income) (\$Millions)			
Wages and Salaries	74.3		
Indirect and Induced	47.6		
TOTAL EARNINGS	121.9	\$108,376.8	0.1
Earnings Multiplier: 1.64 (2002)			
Employment (Number of Workers)			
SNL/CA Workforce	1,317		
Indirect and Induced	1,264		
TOTAL EMPLOYMENT	2,581	1,455,700	0.2
Employment Multiplier: 1.96 (2002)			

Sources: BEA 2000b, BEA 2002a

FY: fiscal year

ROI: region of influence

SNL/CA: Sandia National Laboratories, California

Table 5-42. Sandia National Laboratories, California's Estimate of Maximum Operations Alternative Impacts on the Regional Economy

Economic Measure	Maximum Operations Alternative		
	SNL/CA	Total ROI	Percent of ROI
Estimated Earnings (Income) (\$Millions)			
Wages and Salaries	133.6		
Indirect and Induced	85.5		
TOTAL EARNINGS	219.1	\$108,376.8	0.2
Earnings Multiplier: 1.64 (2002)			
Employment (Number of Workers)			
SNL/CA Workforce ^a	1,931		
Indirect and Induced	1,853		
TOTAL WORKFORCE	3,784	1,455,700	0.3
Employment Multiplier: 1.96 (2002)			

Sources: BEA 2000b, BEA 2002a

^aEmployment would range from 1,657 to 1,931 workers

ROI: region of influence

SNL/CA: Sandia National Laboratories, California

5.5.13 ENVIRONMENTAL JUSTICE

The impacts of this alternative on environmental justice resources would be the same as those associated with the No Action Alternative. No disproportionately high and adverse impacts to minority or low-income communities are anticipated for these resource areas. For summary of potential environmental justice impacts under the No Action Alternative see Table 5-15.

5.6 ACCIDENTS

This section describes the potential impacts to workers and the public of potential accidents involving SNL/CA facilities and the release of radioactive and/or chemical materials, explosions, and other hazards for all alternatives. As discussed in Section 5.2.12, two accident scenarios were considered for additional analysis: a postulated event initiated by natural phenomena and a postulated material event initiated by unspecified accident.

5.6.1 POSTULATED EVENT INITIATED BY NATURAL PHENOMENA

An earthquake is the most likely natural phenomena to initiate an emergency situation onsite. Two possible faults could affect SNL/CA: Greenville and Las Positas. The Tesla and Greenville faults trend northwest-southeast and are the most strongly documented faults near SNL/CA. The location of a possible earthquake on the Greenville fault is based primarily on geologic evidence.

The Greenville fault is the largest fault with the nearest location to SNL/CA, and evidence of its recent activity is more conclusive than in the case of the other faults. The Las Positas fault branches (see Figure 4-4) through the SNL/CA site and pass very close to SNL/CA facilities, and has a total length of about 10 mi. If the Las Positas fault were to be substantiated by future studies as a structure capable of generating moderate earthquakes, the maximum credible earthquake based on this length and the resulting ground motion at the site would be less than is estimated for the Greenville fault. Section 4.4.3.1 provides further details on the seismic characteristics of the area around SNL/CA. Section 5.3.2 discusses impacts associated with geology and soils.

In January 1980, the Livermore Valley experienced two moderate sized earthquakes estimated to be 5.8 and 5.6 on the Richter scale. Over 100 aftershocks followed, with magnitudes up to 4.6. The epicenters were located on the Greenville fault within 11.2 mi of the SNL/CA site.

Substantial earthquake-resistant structural modifications have been made to onsite facilities where hazardous materials are handled and future construction will meet future standards. Therefore, the more likely result of an earthquake would be damage to unsecured equipment that might impact hazardous chemical containers or a fire resulting from damage to electrical equipment or the rupture of onsite gas lines.

Following a major earthquake, typical emergency response actions would be taken, including inspection and damage assessment of facilities, gas lines, water lines, fire alarms, and building areas. Impacts would be the same for all three alternatives.

5.6.2 POSTULATED MATERIAL EVENT INITIATED BY UNSPECIFIED ACCIDENT

As a result of review of available documentation, the accident assessment team considered a case of a hydrogen tanker explosion. The potential effects of hydrogen explosions are estimated using trinitrotoluene (TNT) equivalence model. The case examined is an explosion of a refueling tanker truck carrying 40,000 cubic feet (ft³). These impacts would be limited to the immediate vicinity of the explosive device and would not impact the offsite public. The potential effects are estimated in Table 5-43. Impacts would be the same for all three alternatives.

5.7 COMPARISON OF DATA ANALYZED AND ENVIRONMENTAL CONSEQUENCES AMONG ALTERNATIVES

The SWEA combines the results of several studies to address consequences to the environment and risks associated with the NNSA's operations at SNL/CA. The environmental consequences presented in the SWEA includes the following 13 resource areas (excludes accidents): land use and visual resources, geology and soils, water resources and hydrology, biological and ecological resources, cultural resources, air quality, infrastructure, human health and worker safety, transportation, waste generation, noise, socioeconomics, and environmental justice.

The following section presents the comparison of the consequences by resource area under each alternative in tabular form (Table 5-44).

Table 5-43. Physical Effects as a Function of Distance for the Postulated Flammable Gas Explosions

Physical Effects	Distance in Feet	
	40,000 cubic feet (209-pound) TNT	10,000 cubic feet (52-pound) TNT
Peak Pressure	19	12
50 percent survival rate for pressures in excess of 50 psi	46	29
50 percent rate of eardrum rupture and total destruction of buildings for pressures in excess of 10 psi	96	60
Pressures in excess of 2 to 3 psi will cause concrete or cinder blocks to shatter.	282	177
Pressures in excess of 1 psi will cause a house to be demolished.	501	315

Source: Original
psi: pounds per square inch
TNT: trinitrotoluene

Table 5-44. Comparison of Potential Consequences of Continued Operations at Sandia National Laboratories, California

Resource Area	No Action Alternative	Planned Utilization and Operations Alternative	Maximum Operations Alternative
Land Use	Includes current land use plus LTF (2-acre construction site), DISL (4-acre construction site (estimate)), and Hazardous Waste Storage Facility modifications.	New facilities are the same as the No Action Alternative plus one new facility. Other activities would include upgrades to Arroyo Seco (as described in the Arroyo Management Plan and the Biological Assessment), setting aside 30 acres for a wildlife reserve, upgrading storm water runoff areas, designating 93 acres as future construction sites, leaving 122 acres as undesignated, and establishing a 2.5-acre soil management area. An easement would be established with landowners along western boundary.	Same as Planned Utilization and Operations Alternative. Other activities would include replacement of Building 916 (42,000 sq ft) with a building twice the size (84,000 sq ft) and the addition of a new 16,000-sq ft facility similar to the existing CRDL for research and development. Removal of no longer economically useful structures (100,000 sq ft).
Geology and Soils	Overall	SNL/CA activities are not anticipated to impact geology and soils.	Same as No Action Alternative
	Solid Waste Management Units	23 (20 No Further Action) 3 to Long Term Monitoring	Same as No Action Alternative
	Soil Removed from Arroyo Seco	Not Part of This Alternative	Same as Planned
	New Material, Backfill, Stone, etc.	Not Part of This Alternative	Same as Planned
	Onsite Soil Management Area (2.5 acre site)	Not Part of This Alternative	Same as Planned
Water Resources	Impervious Surface	49.2 acres	Same as Planned Utilization and Operations Alternative
	Water Use	50 to 60 MGY	76.5 to 91.8 MGY
	Wastewater Discharge	12 to 19 MGY	18.4 to 29.1 MGY
	Irrigation	16 to 17 MGY	Same as No Action Alternative

Table 5-44. Comparison of Potential Consequences of Continued Operations at Sandia National Laboratories, California

Resource Area	No Action Alternative	Planned Utilization and Operations Alternative	Maximum Operations Alternative
Biological Resources	Impacts projected for biological resources are minimal.	Same as the No Action Alternative plus several additional actions. Other activities would include upgrades to Arroyo Seco (20 improvement projects), setting aside 30 acres for a wildlife reserve, upgrading storm water runoff areas, designating 93 acres as future construction sites, and leaving 122 acres as undesignated.	Same as Planned Utilization and Operations Alternative.
Cultural Resources	No impacts.	Same as No Action Alternative	Same as No Action Alternative
Air Quality	Concentrations would be below the most stringent standards, which define the pollutant concentrations below which there are no adverse impacts to human health and the environment.	Same as No Action Alternative	Same as No Action Alternative
	Concentrations are below regulatory standards and human health guidelines.	Same as No Action Alternative	Same as No Action Alternative
Infrastructure	All projected activities are within capacities of existing road, waste management, and utility systems. The Glass Furnace and Melting Laboratory requires a new natural gas line.	Same as No Action Alternative	Same as No Action Alternative
Human Health and Worker Safety	Estimated increase in number of latent cancer fatalities	4.0 x 10 ⁻⁴	5.4 x 10 ⁻⁴
	Total recordable cases of accident or injury	43 – 54	50 – 61
	Lost work-day cases	10 – 13	12 – 15

Table 5-44. Comparison of Potential Consequences of Continued Operations at Sandia National Laboratories, California

Resource Area	No Action Alternative	Planned Utilization and Operations Alternative	Maximum Operations Alternative	
Transportation	Paved and unpaved road	9.7 miles	9.7 miles	
	Pedestrian mall	6.24 acres	6.24 acres	
	Paved service areas	8.6 acres	8.6 acres	
	Paved service parking	19.8 acres	19.8 acres	
	Material (Annual Shipments Radioactive, Chemical, and Explosives)	37 trips per year	50 trips per year	
	Waste (includes hazardous and radioactive)	86 shipments per year	116 shipments per year	
	Sanitary Waste	59 shipments per year	80 shipments per year	
	SNL/CA Weekly Hazardous Materials Transports (excluding waste)	1 to 3 outbound shipments per week (Total of 33)	1 to 3 shipments (Total of 37)	1 to 3 shipments (Total of 50)
	Supplier Weekly Hazardous Material Transports	1 to 3 inbound shipments per week (Total of 100)	1 to 3 shipments (Total of 113)	1 to 3 shipments (Total of 150)
	Soil Transports	Not Part of This Alternative	1,600 to 2,000 shipments over 10 years	1,600 to 2,000 shipments over 10 years

Table 5-44. Comparison of Potential Consequences of Continued Operations at Sandia National Laboratories, California

Resource Area	No Action Alternative	Planned Utilization and Operations Alternative	Maximum Operations Alternative
Transportation	Incoming Material (Rock, Soil, Concrete)	1,500 to 3,000 shipments over 10 years	1,500 to 3,000 shipments over 10 years
	Site-Related Traffic, Total Daily Traffic	700 to 1,000 vehicles	791 to 1,130 vehicles
Waste Generation	Management Capability	All projected activities are within capacities of existing facilities and systems	Same as No Action Alternative
	LLW	5,308 kg/yr	8,121 kg/yr
	LLMW	451 kg/yr	690 kg/yr
	Total Hazardous	90,488 kg/yr	118,465 kg/yr
Noise	No impacts	Same as No Action Alternative	Same as No Action Alternative
Socioeconomics	\$131 M	\$170 M	\$262 M
Environmental Justice	No disproportionately high and adverse impacts to minority or low-income communities are anticipated	Same as No Action Alternative	Same as No Action Alternative

Source: Original

^aTo bound the analysis, soil transports were assumed to be delivered to an offsite location. SNL/CA plans include managing soil onsite.

^bTotal hazardous including RCRA, California Toxic, TSCA, and biohazardous

CRDL: Chemical and Radiation Detection Laboratory

DISL: Distributed Information Systems Laboratory

kg: kilograms per year

LLW: low-level waste

LLMW: low-level mixed waste

LTF: LIGA Technologies Facility

M gal: millions of gallons

MGY: million gallons per year

SNL/CA: Sandia National Laboratories, California

sq ft: square foot/feet

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CHAPTER 6

Cumulative Effects Analysis

The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) define cumulative effects as “the impact on the environment which results from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7). The regulations further explain “cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.” The cumulative effect analysis presented in this Site-Wide Environmental Assessment (SWEA) is based on the incremental actions at Sandia National Laboratories, California (SNL/CA) and in the region.

Based upon examination of the potential environmental effects of direct and indirect actions, coupled with other agencies and the United States (U.S.) Department of Energy (DOE) and the National Nuclear Security Administration (NNSA) actions in the region and private actions, NNSA has determined the following resource areas would be likely to experience cumulative effects and needed to be analyzed in detail: biological and ecological resources, air quality, and transportation. This chapter provides a description of the impacts of SNL/CA as they relate to impacts from other activities in the region of influence (ROI) including Lawrence Livermore National Laboratory (LLNL). The methods of analysis are identified in Section 6.1. Section 6.2 summarizes the impacts associated with potentially affected resources. Section 6.3 discusses resource areas with potential cumulative impacts.

6.1 METHODS OF ANALYSIS

Methodology for the analysis of cumulative effects for this SWEA was developed from the guidelines and methodology in the CEQ’s *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997b). The major components of the CEQ methodology include:

- Scoping, including identifying the significant potential cumulative effects issues associated with the proposed action, identifying the ROI and time frame for the analysis, and identifying other actions affecting the resources,
- Describing the affected environment (see Chapter 4), and
- Determining the environmental consequences, including the impacts from the proposed action and other activities in the ROI, and the magnitude and significance of the cumulative effects.

NNSA assessed the cumulative effects by combining the potential effects of the Maximum Operations Alternative with the effects of other past, present and reasonably foreseeable activities in the ROI. The ROIs vary by resource area, and are generally the same as those presented in Chapter 4. The Maximum Operations Alternative was selected to assess a bounding scenario of potential cumulative effects. This approach results in a conservative analysis of the maximum cumulative effects.

An internet search, literature review of environmental documents for the ROI, and personal contacts with local government planning departments were undertaken to obtain information on the potential cumulative effects for each resource area analyzed in Chapter 5. In most

resource areas, the analysis in Chapter 5 includes the cumulative regional impacts. For example, for air resources impacts, the analysis accounts for projected impacts to the region regulated by the Bay Area Air Quality Management District (BAAQMD).

6.2 POTENTIALLY AFFECTED RESOURCES

The well-defined ROIs presented in Chapter 4 associated with the continued operation of SNL/CA results in a baseline for assessing cumulative impacts. In some cases the ROI for cumulative impacts may be larger than that presented in Chapter 4. For example, although potential impacts from a proposed action may impact only local biological resources, if loss of habitat is a problem throughout the region, then the ROI for cumulative effects may extend to a larger area.

Potential impacts to land use and visual resources, geology and soils, water resources, cultural resources, infrastructure, human health, waste generation, noise, socioeconomics, and environmental justice pose no incremental or relatively minor roles in this assessment. As such, these areas are not discussed in the same level of detail as the other subject areas addressed in this Site-Wide Environmental Assessment (SWEA). This helps focus the assessment on factors most relevant to the nature of the proposed actions and avoids duplication of analyses. The following discussion summarizes the baseline condition (Maximum Operations Alternative) of each of the areas not discussed in detail. Potential accidents at SNL/CA are not cumulative with other impacts in the ROI, so they are not discussed here, but are included in Chapter 5. Cumulative impacts are summarized in Table 6-1.

Table 6-1. Comparison of Potential Cumulative Impact Data by Resource Area

Discipline Area	Summary of Cumulative Impacts
Land Use and Visual Resources	<p>ROI—Encroaching development and loss of agricultural land and open spaces is a major concern and cumulative impact from all activities in Alameda County. Agricultural land uses and undeveloped land are increasingly being converted into residential, commercial, and light industrial land uses. Growth of the surrounding community is placing suburban and industrial development closer to site boundaries.</p> <p>SNL/CA—Use of SNL/CA as a federal research and development facility is consistent with existing land use plans. No new land use impacts are expected.</p>
Geology and Soils	<p>ROI—At LLNL, existing soil contamination is being cleaned up under the remediation program, and routine analyses of surface soil, sediment, and vadose zone soil samples in 2000 indicate that the impact of LLNL has not changed from previous years and remains insignificant.</p> <p>SNL/CA—Soil contamination at SNL/CA occurred as the result of past operations. Analyses indicate no significant risk to the general public. No other geological or soil impacts were found to have a cumulative effect.</p>
Water Resources and Hydrology	<p>ROI—Flooding from Arroyo Seco has occurred downstream from SNL/CA. LLNL drains to Arroyo Las Positas, which is also subject to flooding. Radioactivities detected in storm water samples at LLNL were small percentages of the MCL for drinking water. Nitrates and chromium have been detected above their MCLs in wells on LLNL. LLNL is working to contain and cleanup groundwater contamination. In the Livermore Valley, no monitored radioactive or inorganic nonradioactive constituent was found to exceed primary drinking water MCLs in any well off LLNL.</p> <p>SNL/CA—The <i>Arroyo Seco Management Plan</i> would reduce current flood and erosion potential offsetting the 27 percent increase in impervious areas for the Maximum Operations Alternative. Groundwater monitoring would be part of a long-term monitoring program. No groundwater use is expected.</p>
Biological Resources	<p>ROI—Throughout the area, vegetation in developed areas has been altered by human activity. The wildlife present are species that have adapted to human presence. In 2000, Federally threatened California red-legged frogs were found in the area including LLNL.</p> <p>SNL/CA—The <i>Arroyo Seco Management Plan</i> identifies concepts for providing additional and improved habitat and migration conditions for protected species that may use Arroyo Seco on SNL/CA property. The initial impacts may disrupt critical habitats and sensitive species, however, the long-term impact of improved habitat would be beneficial both on a local and regional basis.</p>
Cultural Resources	<p>ROI—For cultural resources, the ROI is SNL/CA.</p> <p>SNL/CA—Neither the SNL/CA site nor the adjoining properties contain any known archeological, historical, or cultural features, therefore no cumulative impacts to cultural resources are anticipated.</p>
Air Quality	<p>ROI—Total emission of criteria pollutants from the Bay Area was approximately 1.5 million tons in 2000. Total emission of criteria pollutants from LLNL was approximately 34 tons in 2000.</p> <p>SNL/CA—For criteria (8 tons/yr) and toxic air (3 tons/yr) pollutants (with the exception of 1,4-dioxane), emissions are well below 1 percent of Bay Area emissions for the same pollutants. SNL/CA 1,4-dioxane emissions are less than 1.5 percent of Bay Area 1,4-dioxane emissions. The air pollutant contribution from a maximum of 1,530 vehicles at SNL/CA would be small.</p>
Infrastructure	<p>ROI—The city of Livermore handles 1.8 billion gallons of wastewater per year. For a city the size of Livermore, 8 billion gallons of water would be used per year. LLNL water use expected in 2002 has been estimated at 261 MGY. Total power consumption for 2002 at LLNL has been estimated at 474 million kWh.</p> <p>SNL/CA—Maximum SNL/CA utility projections are water use of 91.8 M gal, wastewater discharges of 29.1 M gal, electrical use 48,800 MWh, and natural gas use of 94 M ft³.</p>
Transportation	<p>ROI—Average Annual Daily Traffic, Greenville Road—117,000 Average Annual Daily Traffic, Vasco Road—145,000 Estimated LLNL commuters—8,000 (16,000 trips/day)</p> <p>SNL/CA—Estimated SNL/CA commuters—1,500 (3,000 trips/day)</p>
Waste Generation	<p>ROI—Radioactive waste total, DOE Annual—40,000 m³ Radioactive waste total, LLNL Annual—70 m³ Hazardous waste total, State of California Annual—427,302 tons Hazardous waste total, LLNL Annual—200 tons.</p> <p>SNL/CA—Radioactive waste total, Annual—10 m³ Hazardous waste total, Annual—118 tons.</p>

Table 6-1. Comparison of Potential Cumulative Impact Data by Resource Area

Discipline Area	Summary of Cumulative Impacts
Noise	<p>ROI—Traffic is the primary source of noise within the ROI. At LLNL, no noise standards are being exceeded.</p> <p>SNL/CA—Cumulative effects of noise from SNL/CA operations occur during new facility construction would be expected to increase background noise levels.</p>
Human Health and Worker Safety	<p>ROI—The calculated total potential dose to the maximally exposed individual from all LLNL operations was 0.038 mrem in 2000.</p> <p>SNL/CA—There are no SNL/CA sources of radioactive air emissions.</p>
Socioeconomics	<p>ROI—The population density in the three-county ROI was 2,956,155 people in 2000. Employment at LLNL decreased from a peak of about 11,200 workers in 1989 to approximately 8,000 in 2001.</p> <p>SNL/CA—Under the Maximum Operations Alternative, 1,530 workers would be employed.</p>
Environmental Justice	<p>ROI—Minority and low-income populations are found in the local area; however, no impacts to these populations were noted in the available documentation.</p> <p>SNL/CA—No incremental impacts would be expected.</p>

Sources: DOE 1992a, 1999a, 2001a, GMA 2002a, LLNL 2001a

EIS: Environmental Impact Study

EPA: The U.S. Environmental Protection Agency

ft³: cubic feet

kg/yr: kilograms per year

kWh: kilowatt hour

LLNL: Lawrence Livermore National Laboratory

MCL: maximum contaminant level

M gal: millions of gallons

MGY: million gallons per year

mrem: millirem

MWh: megawatt hour

rem: Roentgen equivalent, man

ROI: region of influence

SNL/CA: Sandia National Laboratories, California

6.2.1 LAND USE AND VISUAL RESOURCES

SNL/CA land use and visual resources are those which are associated with an industrial park. In general, land use and visual resources would remain the same. No incremental cumulative impact would be expected. NNSA recognizes that adjacent public land use (encroachment of single-family homes) would continue, and those agricultural and undeveloped lands in the ROI (Livermore and Alameda County) are increasingly being converted into residential, commercial and light industrial land uses.

6.2.2 GEOLOGY AND SOILS

Within the ROI (LLNL and SNL/CA) existing soil contamination has occurred from operations. However, present and planned activities are designed to minimize contamination at both LLNL and SNL/CA. The cleanup of these soils is performed to a level that meets State of California approved health risk-based standards (which vary depending on the chemicals of concern) corresponding to the intended future uses of the site. Analyses indicate no significant risk to the general public (see Section 5.3.2.3). Existing contamination at LLNL is being cleaned up under the remediation program (LLNL 2001). Sampling and analysis of the vadose zone showed no evidence of contamination that would significantly affect ground-

water (DOE 2001a). As a result, the cumulative effect of soil contamination is not considered appreciable. No other geological or soil impacts were found to have an incremental cumulative effect.

6.2.3 WATER RESOURCES

For water resources, the ROI includes the Spring and Mocho I subbasins of the Livermore Valley for groundwater, and Arroyo Seco for surface water. Impacts analyzed include groundwater and surface water (including storm water) quality and quantity.

Because groundwater would not be used, the cumulative impact of the Maximum Operations Alternative on groundwater quantities would not be expected to result in discernible cumulative impacts. Groundwater contamination has occurred from DOE-related operations at LLNL and cleanup measures are underway. Any cleanup measures undertaken as a result of groundwater cleanup at either LLNL or SNL/CA would result in an improvement in groundwater quality. No substantial long-term cumulative impacts would be expected.

For surface water, an increase of 27.7 acres of impervious area, representing an increase of 56 percent, is projected for the Maximum Operations and Planned Utilization

and Operations Alternatives. This would add to the quantity of storm water runoff being transported directly or indirectly into the Arroyo Seco. Floodplain maps indicate that along most of the channel on SNL/CA property, the entire 100-year discharge is contained within the existing channel. However, the area between A Street and Thunderbird Lane is subject to flooding (GMA 2001b). The *Arroyo Seco Management Plan* (GMA 2002a) includes active channel improvements and stream zone management activities that would reduce current flood and erosion risk. Because the increase in impervious area at SNL/CA would be offset by floodplain and channel improvements, the effects of the Maximum Operations or Planned Utilization and Operations Alternative would not result in significant cumulative impacts.

Impacts to water quality from storm water runoff would be minimal. Cleanup actions planned, underway, or completed at the Environmental Restoration (ER) sites at SNL/CA and within the ROI are intended to remove any potential source of surface water contamination, and the cleanup activities themselves are not expected to negatively affect surface water quality.

6.2.4 CULTURAL RESOURCES

Neither the SNL/CA site nor the adjoining properties contain any known archeological, historical, or cultural features; therefore, no cumulative impacts to cultural resources would be anticipated.

6.2.5 INFRASTRUCTURE

The SWEA found the infrastructure system, including utilities, at SNL/CA has more than adequate capacity. Any increases within the ROI, including the city of Livermore and LLNL, would be relatively minor (see Table 6-1).

6.2.6 HUMAN HEALTH AND WORKER SAFETY

For radiological doses within the ROI, including the city of Livermore and Alameda County, only one facility (LLNL) has potential for radiological air emissions with associated impacts of a public dose. The calculated total potential dose to the maximally exposed individual from all LLNL operations using tritium was 0.038 millirem (mrem) in 2000, or about 0.4 percent of the U.S. Environmental Protection Agency (EPA) regulatory standards, and about 1/8000 of the dose received by individuals from natural background radiation (LLNL 2001). There are no SNL/CA sources of radioactive air emissions and

thus no radiation exposure or cumulative impacts to the offsite population from SNL/CA operations. Collective doses to involved workers and worker injuries are not cumulative because they impact only individuals.

6.2.7 WASTE GENERATION

The SWEA found the waste generation impact of the Maximum Operations Alternative would be less than impacts of fiscal year (FY) 2000 operations, generally small, and masked by ROI waste generation. For radioactive waste, SNL/CA would generate only 14 percent of DOE operations locally and 0.025 percent of DOE operations nationally. For hazardous waste, SNL/CA would generate only 0.028 percent within California. For municipal solid waste, the EPA determined that California has over 10 years of remaining landfill capacity. NNSA recognizes landfill space can have a cumulative impact, however, land disposal is not expected to result in critical shortages.

6.2.8 NOISE

Activities under the Maximum Operations Alternative would result in incremental levels of noise due to increased vehicle traffic, normal SNL/CA operations (including the firing range), and construction. Vehicle traffic and normal operations would likely result in a greater frequency of noise at current levels of intensity, similar to those presently experienced, whereas construction would be expected to increase peak noise levels.

Nearby housing construction, East Avenue construction, and LLNL operations would also contribute to ambient background noise levels.

Noise would remain within current decibel ranges, but increase in duration or frequency. The small incremental effect resulting from SNL/CA activities would not contribute appreciable cumulative impacts.

6.2.9 SOCIOECONOMICS

The population density of the area within the ROI is high. The SWEA found the socioeconomic impact is beneficial, and small (0.2 percent) (see Table 6-1).

6.2.10 ENVIRONMENTAL JUSTICE

Based on the SWEA analyses of all the resource areas and topic areas, impacts that would result during the course of normal operations would not pose disproportionately high and adverse health or environmental

Maximally Exposed Individual

A hypothetical person at a location where he or she could potentially receive the maximum dose of radiation.

impacts on minority and low-income populations within the ROI (15-mile radius from SNL/CA). No incremental impacts would be expected.

6.3 RESOURCES WITH POTENTIAL CUMULATIVE IMPACTS

Potential impacts to biological resources, air quality, and transportation pose incremental changes in this assessment. The following discussion summarizes the baseline condition (Maximum Operations Alternative) of each of the areas discussed in detail.

6.3.1 BIOLOGICAL RESOURCES

SNL/CA serves as a refuge for wildlife in the general area, providing open space, habitat, and protection. Implementation of the three major features of the Maximum Operations Alternative that could affect biological resources, the Arroyo Seco Improvement Program, construction in undeveloped areas, and fire management in grasslands areas, would likely serve to improve wildlife habitat to a small extent. While there would be some small loss of terrestrial habitat due to construction, implementation of the Arroyo Seco Improvement Program would enhance the diversity and utilization of this corridor and the biological value of the site as a whole. Continued operation under the Maximum Operations Alternative would perpetuate the provision of habitat and its protection. When taken in context with the continuing area-wide conversion of wildlife habitat for agricultural, residential, and commercial and industrial use, the incremental effect of the proposed action would likely be very positive, particularly in the long term.

6.3.2 AIR QUALITY

Data reported in 1999 indicated that the City of Livermore has the worst air quality in the San Francisco Bay Area in terms of ozone and particulate matter (Livermore

2001). Current growth rates in the ROI (Livermore Valley Basin) would negatively impact air quality. Much of the air quality problem is from traffic emissions. The estimated number of daily commuters to SNL/CA during FY2001 is 700 to 1,000 vehicles. Under the Maximum Operations Alternative, it is estimated that a 53 percent increase in daily commuter traffic would occur, resulting in 1,071 to 1,530 vehicles. SNL/CA traffic-related emissions would represent less than 2 percent of emissions from DOE-related traffic. Correspondingly, the SNL/CA incremental contribution to the ROI would be less than one percent.

In general criteria and toxic air pollutants emissions are well below 1 percent of Bay Area emissions (see Section 5.5.6). SNL/CA would account for approximately 7 to 20 percent of DOE-related criteria pollutant emissions in the Livermore area. For toxic air pollutants, because of the difference in operations between LLNL and SNL/CA the emissions are not directly comparable. Cumulative impacts to air quality are minimal with respect to criteria and toxic air pollutants from SNL/CA operations.

6.3.3 TRANSPORTATION

Data reported in 2001 indicated that Vasco Road and Greenville Road Average Annual Daily Traffic was 145,000 and 117,000 vehicles, respectively (see Table 6-1). SNL/CA commuters would represent less than 1.1 percent under the Maximum Operations Alternative. Current growth rates for the ROI are much higher than the resulting increase in SNL/CA commuter traffic.

6.4 CONCLUSION

The effects of the Maximum Operations Alternative, when combined with those effects of other actions defined in the scope of this chapter, do not result in cumulatively significant impacts.

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CHAPTER 7

Applicable Laws, Regulations, and Other Requirements

Environmental compliance requirements, including statutes, regulations, and orders, which are applicable to the alternatives, will be presented in this chapter.

7.1 INTRODUCTION

As part of the *National Environmental Policy Act* (NEPA) process, the Sandia National Laboratories/California (SNL/CA) Site-Wide Environmental Assessment (SWEA) should consider, in determining the impacts, if actions described under the SWEA alternatives threaten to violate any Federal, state, or local law or requirement and must list all required Federal permits, licenses, or other entitlements (40 *Code of Federal Regulations* [CFR] §1508.27(b)(10) and §1502.25, respectively). This chapter summarizes assessment of the major existing environmental requirements, agreements, and permits that relate to continuing operations at SNL/CA.

In addition to this introduction, Chapter 7 is divided into two sections. Section 7.2 describes general environmental laws, regulations, and other requirements under which the United States (U.S.) Department of Energy (DOE) must proceed in preparing the SWEA. Section 7.3 describes specific environmental requirements for each resource area.

7.2 GENERAL ENVIRONMENT, HEALTH, SAFETY LAWS, REGULATIONS, AND OTHER REQUIREMENTS

7.2.1 ATOMIC ENERGY ACT OF 1954 (42 U.S.C. §2011)

The *Atomic Energy Act* (AEA) of 1954 makes the Federal government responsible for regulatory control of the production, possession, and use of three types of radioactive material: source, special nuclear, and by-product. Regulations promulgated by the U.S. Nuclear Regulatory Commission (NRC) under the AEA establish standards for the management of these radioactive materials, licensing of nuclear facilities, and protection of the public and property against radiation. The AEA authorizes the DOE to set radiation protection standards for itself and its contractors for DOE nuclear facilities and provides exclusions from NRC licensing for defense production facilities. The NRC regulates private and commercial nuclear activities, but currently has no regulating authority at most DOE facilities. In December 1996, the DOE announced that it would begin a process of transferring oversight of nuclear safety to the NRC for all DOE nuclear facilities. The transfer, which requires legislative action, is to be phased-in over a 10-year period.

The AEA authorizes the DOE to establish standards that protect health and minimize danger to life or property from activities under the DOE's jurisdiction. The mechanisms through which DOE manages its facilities are the promulgation of regulations and the issuance of DOE orders and associated standards and guidance. Requirements for the protection of environment, safety, and health are implemented at DOE sites primarily through contractual mechanisms, which establish the applicable DOE requirements for management and operating contractors.

7.2.2 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969, AS AMENDED (42 U.S.C. §4321)

NEPA requires Federal agencies to evaluate the environmental impacts of proposed actions on the quality of the human environment and to document this evaluation with a succinct statement. The Act also created the Council on Environmental Quality (CEQ), which oversees the NEPA process. NEPA requires an agency to consider the environmental impacts of an action, prior to taking action that would preclude any reasonable alternative actions. It also provides for public input into the decision-making process.

7.2.3 REGULATIONS FOR IMPLEMENTING THE PROCEDURAL PROVISIONS OF THE NATIONAL ENVIRONMENTAL POLICY ACT (40 CFR PARTS 1500-1508)

The implementing regulations for NEPA were developed by the CEQ. These regulations seek to integrate the NEPA process into the early planning phase of a project to insure appropriate consideration of NEPA policies and to eliminate delay; emphasize cooperative consultation among agencies before the environmental document is prepared; identify at an early stage the significant environmental issues deserving of study and de-emphasize insignificant issues, thus, narrowing the scope of the environmental document; provide a mechanism for putting appropriate time limits on the environmental documentation process; and provide for public participation in the NEPA process.

7.2.4 NATIONAL ENVIRONMENTAL POLICY ACT IMPLEMENTING PROCEDURES (10 CFR PART 1021)

The DOE established its NEPA implementing procedures to meet the requirements of Section 102(2) of NEPA,

CEQ implementing regulations, and Executive Order (EO) 11514, *Protection and Enhancement of Environmental Quality* (35 Federal Register [FR] 4247). The procedures formalize DOE's policy to follow the letter and spirit of NEPA, comply fully with the CEQ regulations, and apply the NEPA review process early in the planning stages for DOE proposals. The Site-Wide Environmental Assessment is being prepared under 10 CFR §1021.330, programmatic (including site-wide) NEPA documents, requiring preparation of site-wide environmental documentation for certain of its large, multiple-facility sites.

7.2.5 PROTECTION AND ENHANCEMENT OF ENVIRONMENTAL QUALITY (EO 11514)

Under EO 11514, Federal agencies are required to monitor and control their activities continually to protect and enhance the quality of the environment (35 FR 4247). It directs agencies to develop programs and measures to protect and enhance environmental quality and further directs heads of agencies to consult with appropriate Federal, state, and local agencies in carrying out their activities as they affect the quality of the environment. EO 11514 contains requirements to ensure that Federal agencies include the public in the decision-making process. This order was in part responsible for the development of the DOE implementing procedures for NEPA and DOE Order 451.1A, *National Environmental Policy Act Compliance Program*.

7.2.6 FEDERAL COMPLIANCE WITH POLLUTION CONTROL STANDARDS (EO 12088)

Under EO 12088, the head of each executive agency is responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to Federal facilities and activities under their control (43 FR 47707). Specifically, they must ensure compliance with applicable pollution control standards, including those established by, but not limited to, the *Clean Air Act* (CAA), *Noise Control Act* (NCA), *Clean Water Act* (CWA), *Safe Drinking Water Act* (SDWA), TSCA, and RCRA.

7.2.7 DOE O 451.1A, NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE PROGRAM

This order establishes DOE internal program requirements and responsibilities for implementing NEPA, CEQ implementing regulations, and DOE NEPA implementing procedures.

7.2.8 DOE O 5400.1, GENERAL ENVIRONMENTAL PROTECTION PROGRAM

This order establishes the environmental protection program requirements, authorities, and responsibilities for DOE operations for ensuring compliance with applicable

Federal, state, and local environmental protection laws and regulations, EOs, and internal DOE policies. This order also provides for environmental protection standards, notification, and reporting requirements for discharges and unplanned releases, environmental protection and program plans, and environmental monitoring and surveillance requirements. It establishes formal recognition that DOE's environmental management activities are extensively, but not entirely, regulated by the U.S. Environmental Protection Agency (EPA), state, and local environmental agencies, and it provides requirements for satisfying these externally imposed regulations. In addition, it establishes requirements for those environmental protection programs that are not externally regulated.

7.3 ENVIRONMENT, HEALTH, AND SAFETY LAWS, REGULATIONS, AND OTHER REQUIREMENTS FOR EACH RESOURCE AREA

Because SNL/CA was constructed and began operations in the 1950s, before the advent of current environmental requirements, operational nuclear safety and national security were the dominant factors in the early design and operation of facilities. With the enactment of environmental laws and regulations from the 1960s to the present, resources and philosophies have changed to place greater emphasis on achieving compliance with all applicable environmental requirements. Due to its long history, SNL/CA has had difficulty in achieving compliance with some regulatory requirements and has a legacy from past management practices of environmental cleanup requirements for waste, spills, and releases. All environmental protection, legacy environmental cleanup, and operational compliance activities at SNL/CA are covered by laws, regulations, permits, and DOE orders. Several agreements are also in effect with regulatory agencies to bring SNL/CA into full compliance with some regulatory requirements. In general, the DOE and SNL/CA must now comply with applicable Federal and state requirements to the same extent as any other entity. Noncompliance with these requirements can lead to enforcement actions.

Applicable environmental laws, regulations, and other requirements have been identified for each of the resources evaluated in this SWEA. These are discussed below by resource.

7.3.1 LAND USE AND VISUAL RESOURCES

7.3.1.1 DOE P 430.1, DOE Land Use and Facility Policy

This policy governs DOE's management of its land and facilities as valuable national resources, based on the principles of ecosystem management and sustainable development.

7.3.2 INFRASTRUCTURE

7.3.2.1 Hazardous Materials (29 CFR Part 1910, Subpart H)

This regulation provides the health and safety requirements for work with and around hazardous materials. Subpart H covers work involving compressed gas cylinders, hazardous compounds and elements (such as acetylene, explosive agents, and hydrogen), and mechanical processes involving dip tanks and spray finish units. It includes Subpart 1910.120, *Hazardous Waste Operations*, which is the main health and safety regulation for work in hazardous waste operations.

7.3.2.2 Hazardous Waste Operations and Emergency Response (29 CFR §1910.120)

This regulation specifies requirements for conducting waste operations and response activities. These requirements include both activity and training requirements for personnel.

7.3.2.3 Materials Handling and Storage (29 CFR Part 1910, Subpart N)

This regulation specifies requirements for material handling equipment such as cranes, derricks, helicopters, slings, and powered industrial trucks. This subpart covers the minimum distance a worker must be from a single rim and multi-piece rim wheel while servicing the tire and the maintenance and use of forklifts, cranes, and derricks.

7.3.2.4 Toxic and Hazardous Substances (29 CFR Part 1910, Subpart Z)

This regulation provides requirements for performing air monitoring and medical monitoring for a variety of hazardous chemicals and materials such as asbestos, methyl chloromethyl ether, vinyl chloride, benzene, blood borne pathogens, and cotton dust. It also establishes acceptable levels for toxic and hazardous substances in the blood of workers, as well as proper collection and measuring techniques.

7.3.2.5 California Electric Utility Industry Restructuring Act (Assembly Bill 1890)

The *California Electric Utility Industry Restructuring Act* provides requirements for establishing the restructure of the electric utility industry, including customer choice in the supply of electricity, and establishment of the Independent System Operator to control electric transmission.

7.3.2.6 DOE O 251.4, Environmental, Safety, and Health Program for Department of Energy Operations

This order applies to ES&H programs at all government-owned, contractor-operated facilities including the occu-

pational safety and health programs for DOE contractor employees at facilities where the contracts include the occupational safety and health contract clause specified in 48 CFR, *Federal Acquisition Regulations*. This order also applies to environmental protection programs and programs for protection against accidental loss or damage to property as provided by law or contract and as implemented by the appropriate contracting officer.

7.3.2.7 DOE 5480.4, Environmental Protection, Safety and Health Protection Standards

This order specifies the requirements for the application of mandatory ES&H standards applicable to all DOE and DOE contractor operations, provides a listing of reference ES&H standards, identifies the sources of the mandatory and reference ES&H standards, and specifies several mandatory and reference standards applicable to nuclear criticality protection for all DOE nuclear facilities. It also mandates that hazardous waste regulations set forth in 40 CFR Parts 260-265 be followed as a matter of policy.

7.3.3 GEOLOGY AND SOILS

Regulatory environmental protection statutes governing geology and soils are addressed under other resource areas in this chapter. They include the RCRA (42 U.S.C. §6901), the *Comprehensive Environmental Response Compensation and Liability Act* (CERCLA) (42 U.S.C. §6902), and the 1986 amendment to the CERCLA, the *Superfund Amendments and Reauthorization Act* (SARA) (42 U.S.C. §6902, as amended).

7.3.4 WATER RESOURCES AND HYDROLOGY

7.3.4.1 Clean Water Act of 1948, as Amended (33 U.S.C. §1251)

The goals of the CWA are to restore and maintain waters of the U.S. in order to protect human health and safety and to provide for the protection and propagation of fish, shellfish, and wildlife. The Act authorizes regulations that establish limitations and permitting requirements for hazardous substances being discharged from point sources, dredge or fill operations at wetlands and other waters of the U.S., storm water discharges from industrial runoff, and oil discharges. Key elements of the Act include nationally applicable, technology-based effluent limitations set by the EPA for specific industry categories, and water quality standards set by states.

The U.S. Army Corps of Engineers administers the dredge or fill material permit program (Section 404) of the Act.

The CWA contains provisions for the National Pollutant Discharge Elimination System (NPDES), a permitting program for the discharge of pollutants from any point source into waters of the U.S. Individual NPDES permits

set parameters and maximum contaminant levels for specified pollutants at specific outfall sites.

To comply with the CWA, the City of Livermore issues wastewater permits under the *City of Livermore Sewer Use and Wastewater Control Ordinance*. Under this ordinance, SNL/CA is subject to limitations on volumes and constituent concentrations for wastewater discharged to the sanitary sewer.

7.3.4.2 Safe Drinking Water Act of 1944, as Amended (42 U.S.C. §300f)

The SDWA sets national standards for contaminant levels in public drinking water systems, regulates the use of underground injection wells, and prescribes standards for groundwater aquifers that are a sole source of drinking water. Primary enforcement responsibility for the Act is by the states. The Act authorizes regulations that establish national drinking water standards for contaminants in public drinking water systems. The EPA maintains oversight responsibilities over the states, sets new contaminant standards as appropriate, and maintains separate enforcement responsibility for the Underground Injection Control Program.

The SDWA applies to Federal facilities that own or operate a public water system. A public water system is defined as a system for the provision of piped water for human consumption that has at least 15 service connections or regularly serves at least 25 individuals. Lawrence Livermore National Laboratory (LLNL) provides drinking water to SNL/CA. LLNL is required to monitor drinking water quality for organic and inorganic compounds, radionuclides, metals, turbidity, and total coliforms.

7.3.4.3 National Drinking Water Regulations (40 CFR Parts 141-143)

These regulations establish primary (40 CFR Part 141) and secondary (40 CFR Part 143) drinking water standards; 40 CFR Part 141 also establishes regulations applicable to public water systems. Although the primary standards are Federally enforceable (40 CFR Part 142), the secondary standards are intended as guidelines for the states. The primary and secondary standards have been adopted by California. Along with inorganic and organic constituents, the primary standards also establish limits for radioactivity and some radioactive constituents in drinking water. The annual dose to the general public from beta and photon emitters is limited to 4 millirem (1/1000 of a rem) and there are maximum contaminant levels for alpha, radium, and uranium. The DOE also establishes this same level in DOE 5400.5, *Radiation Protection of the Public and the Environment*. The secondary standards relate to contaminants in drinking water that primarily affect aesthetic qualities related to public acceptance of drinking water.

7.3.4.4 Spill Control and Countermeasures Plan (40 CFR Part 112)

SNL/CA has a spill control and countermeasures plan, as required by 40 CFR Part 112. The 1990 *Oil Pollution Act* rewrote sections of the CWA. This plan requires that secondary containment be provided for all aboveground storage tanks. The plan also provides for spill control at oil storage sites at SNL/CA. This plan meets requirements of both EPA and California for control of spills to surface areas and below the ground surface.

7.3.4.5 DOE 5400.1, General Environmental Protection Program (modified by DOE O 231.1)

This order requires SNL/CA to prepare a groundwater protection management program plan (GWPMPP) and to implement the program outlined by that plan. GWPMPP also fulfills the requirements of Chapter IV, Section 9, of the order, which requires development of a groundwater-monitoring plan. The groundwater-monitoring plan identifies all DOE requirements and regulations applicable to groundwater protection and includes strategies for sampling, analysis, and data management.

Chapter IV, Section 9c, of DOE 5400.1 requires that groundwater monitoring be determined by site-specific characteristics and, where appropriate, that groundwater monitoring programs be designed and implemented in accordance with RCRA regulations 40 CFR Part 264, Subpart F, or 40 CFR Part 265, Subpart F. These regulations also require that monitoring for radionuclides be in accordance with DOE 5400.5, *Radiation Protection of the Public and the Environment*.

7.3.4.6 Porter-Cologne Water Quality Control Act (California Water Code §13000, et seq.)

In the state of California, both surface water and groundwater resources are protected under the *Porter-Cologne Water Quality Control Act*, which created the State Water Resources Control Board and nine Regional Water Quality Control Boards (RWQCBs). Each RWQCB is responsible for preparing and updating a water quality control plan (basin plan) every three years; the basin plan for a specific region identifies water quality protection policies and procedures for that region.

7.3.4.7 Section 1601/1603 of the Fish and Game Code

The California Department of Fish and Game (CDFG) typically specifies water quality protection measures when they issue streambed alteration agreements pursuant to Section 1601/1603 of the Fish and Game Code. However, as an agency of the Federal government, DOE is exempt from these requirements.

7.3.5 BIOLOGICAL RESOURCES

7.3.5.1 *Endangered Species Act of 1973, as Amended (16 U.S.C. §1531)*

The *Endangered Species Act* requires that a Federal agency ensure that any actions authorized, funded, or carried out by the agency are not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat. The Act is jointly administered by the U.S. Department of Commerce, National Marine Fisheries Service (NMFS), the U.S. Department of the Interior (DOI), and the U.S. Fish and Wildlife Service (USFWS). Under the Act, agencies undergo a process of informal and formal consultation, which may include preparation of a biological assessment, to determine if a threatened or endangered species would be affected by planned agency activities.

The DOE has consulted with the USFWS and the CDFG regarding concerns each agency may have about the impact of SNL/CA activities on protected animal and plant species.

7.3.5.2 *Migratory Bird Treaty Act of 1918, as Amended (16 U.S.C. §703)*

This Act protects migratory birds by making it unlawful to pursue, take, attempt to take, capture, possess, or kill any migratory bird, or any part, nest, or egg of any such bird, unless and except as permitted by regulation. The Act is intended to protect birds that have common migratory patterns within the U.S., Canada, Mexico, Japan, and Russia.

7.3.5.3 *Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. §668)*

This Act makes it unlawful to capture, kill, destroy, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the U.S. A permit must be obtained from the DOI to relocate a nest that interferes with resource development or recovery operations.

7.3.5.4 *Fish and Wildlife Coordination Act of 1934 (16 U.S.C. §661, et seq.)*

This Act requires Federal agencies involved in actions that result in structural modification or control of any natural stream or body of water for any purpose to take action to protect the fish and wildlife resources that may be affected by the action.

7.3.5.5 *Section 404 of the Clean Water Act of 1948 (33 U.S.C. §1344)*

Section 404 of the CWA requires permits to authorize the discharge of dredged or fill material into navigable waters

or wetlands and to authorize certain structures or work in or affecting navigable waters. Authority to issue permits resides with the USACE.

Individual permits issued by the USACE under Section 404 are reviewed at the Federal level by EPA.

7.3.5.6 *Protection of Wetlands (EO 11990) and Floodplain Management (EO 11988)*

EO 11990 requires government agencies to avoid short- and long-term adverse impacts to wetlands whenever a practicable alternative exists (42 FR 26961). EO 11988 directs Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken (42 FR 26951). Impacts to floodplains are to be avoided to the extent practicable. The DOE issued regulations (10 CFR Part 1022) that establish procedures for compliance with these EOs.

7.3.5.7 *California Endangered Species Act (Fish & Game Code §§2050, et seq.)*

The *California Endangered Species Act* (CESA) generally parallels the main provisions of the Federal *Endangered Species Act* and is administered by the CDFG. Under CESA, the term “endangered species” is defined as a species of plant, fish, or wildlife that is “in serious danger of becoming extinct throughout all, or a significant portion of its range” and is limited to species or subspecies native to California. CESA establishes a petitioning process for the listing of threatened or endangered species. The California Fish and Game Commission is required to adopt regulations for this process and establish criteria for determining whether a species is endangered or threatened. The California Code of Regulations, Title 14, §670.1(a), sets forth the required contents for such a petition. CESA prohibits the “taking” of listed species except as otherwise provided in state law. Unlike its Federal counterpart, CESA applies the take prohibitions to species petitioned for listing (state candidates).

7.3.5.8 *California Wildlife Conservation Law of 1947 (Fish & Game Code §§ 1300, et seq.)*

This law establishes requirements for protecting wildlife, primarily related to taking for sport purposes, and permits for collecting and use. The law also protects endangered and threatened animals listed by the state of California.

7.3.5.9 *Natural Community Conservation Planning Act (Fish & Game Code §§2800, et seq.)*

The Natural Community Conservation Planning (NCCP) program of the Department of Fish and Game is an effort by the State of California, and numerous private and

public partners that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. The goal of a NCCP programs identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity.

The NCCP program is a cooperative effort to protect habitats and species. The program, which began in 1991 under the State's *Natural Community Conservation Planning Act*, is broader in its orientation and objectives than the California and Federal *Endangered Species Acts*. The primary objective of the NCCP program is to conserve natural communities at the ecosystem scale while accommodating compatible land use. The program seeks to anticipate and prevent the controversies and gridlock caused by species' listings by focusing on the long-term stability of wildlife and plant communities and including key interests in the process.

The NCCP program applies statewide, although there is currently no NCCP region near SNL/CA.

7.3.6 CULTURAL RESOURCES

7.3.6.1 National Historic Preservation Act of 1966, as Amended (16 U.S.C. §470)

This Act directs that sites with significant historic value be placed on the National Register of Historic Places (NRHP). Government agencies must locate and inventory historic properties and cultural resources under their jurisdiction before taking an action that might harm them, with the intent of minimizing such harm through appropriate mitigation actions. As required by Section 106 of the Act, proposed SNL/CA activities are evaluated in consultation with the State Historic Preservation Officer (SHPO) for possible effects on historic properties.

7.3.6.2 The American Indian Religious Freedom Act of 1978 (42 U.S.C. §1996)

This Act establishes that it is the policy of the United States to protect and preserve for Native Americans their inherent right of freedom to believe, express, and exercise their traditional religions. This includes access to sites, use and possession of sacred objects, and the freedom to worship through ceremonies and traditional rites.

7.3.6.3 Archeological Resources Protection Act of 1979, as amended (16 U.S.C. §470aa)

This Act requires the preservation and management of archaeological resources greater than 100 years old on lands administered by Federal agencies.

7.3.6.4 The Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. §3001)

This Act states that tribal descendants shall own Native American human remains and cultural items discovered on Federal lands after November 16, 1990. When items are discovered during an activity on Federal lands, the activity is to cease and the appropriate tribal government is to be notified. Work on the activity can resume 30 days after the receipt of certification that notice has been received by the tribal government. A consultation process is used to determine which tribe(s) is affiliated with the remains or items, and disposition and treatment is accomplished in accordance with the wishes of the affiliated tribe.

7.3.6.5 Protection of Historic and Cultural Properties (36 CFR Part 800)

This regulation defines the process used by Federal agencies to meet their responsibilities under Section 106 of the *National Historic Preservation Act*. Section 106 of the Act requires Federal agencies to take into account the effects of the agency's activities on properties included in or eligible for the NRHP and, prior to approval of an undertaking, to afford the State Historic Preservation Officer and the Advisory Council on Historic Preservation a reasonable opportunity to comment on the activity. The overall goal is to accommodate historic preservation concerns during Federal undertakings.

7.3.6.6 National Historic Preservation (EO 11593)

This EO requires Federal agencies, including the DOE, to locate, inventory, and nominate properties under their jurisdiction or control to the NRHP if those properties qualify (36 FR 8921). The DOE is required to provide the Advisory Council on Historic Preservation the opportunity to comment on possible impacts of a proposed activity on any potentially eligible or listed resources.

7.3.6.7 Indian Sacred Sites (EO 13007)

This EO requires that each executive branch agency with statutory or administrative responsibility for the management of Federal lands shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of sacred sites by Native American religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites (61 FR 26771).

7.3.6.8 Consultation and Coordination with Indian Tribal Governments (EO 13175)

This EO establishes regular and meaningful consultation and collaboration with tribal officials in developing Federal policies. It also requires each Federal agency to have an answerable process to ensure meaningful and timely input by tribal officials in developing Federal policies and other activities that have tribal implications (65 FR 67249).

7.3.6.9 American Indian Tribal Government Policy (DOE Order 1230.2)

This order provides guidance for consulting and coordinating with Indian tribal governments in compliance with Federal statutes and regulations. The policy directs all DOE officials, staff, and contractors regarding fulfilling trust obligations and responsibilities arising from Departmental actions that may potentially affect American Indians' and Alaska Natives' traditional, cultural, and religious values and practices; natural resources; and treaties and other Federally recognized and reserved rights.

7.3.6.10 Department of Energy Management of Cultural Resources (DOE Policy 141.1)

This policy ensures that DOE and NNSA programs integrate cultural resource management into their missions and activities, and raises the awareness of the importance of the Department's cultural resource-related legal and trust responsibilities. The policy directs that all DOE programs and missions will be implemented in a manner consistent with Federal statutes, regulations, orders, DOE Orders, and implementation guidance protecting cultural resources.

7.3.7 AIR QUALITY

7.3.7.1 *Clean Air Act of 1955, as Amended* (42 U.S.C. §7401)

The CAA establishes air quality standards to protect public health and the environment from the harmful effects of air pollution. The Act requires establishment of national standards of performance for new stationary sources of atmospheric pollutants, emissions limitations for any new or modified structure that emits or may emit an air pollutant, and standards for emission of hazardous air pollutants. In addition, the CAA requires that specific emission increases be evaluated to prevent a significant deterioration in air quality.

The *Clean Air Act Amendments of 1990*, signed into law on November 15, 1990, enhanced and expanded existing authorities and created new programs in the areas of permitting, enforcement, and operations in nonattainment areas (areas not meeting air quality standards),

control of acid rain, regulation of air toxins, mobile sources, and protection of the ozone layer. Section 118 of the Act and EO 12088, *Federal Compliance With Pollution Control Standards* (43 FR 47707), require that each Federal agency, such as the DOE, with jurisdiction over any property or facility that might result in the discharge of air pollutants, comply with "all Federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution to the same extent as any nongovernmental entity.

The EPA is the regulating authority for the CAA. However, the EPA has granted authority to the state of California for regulating air quality under an approved state implementation plan (SIP). The EPA has delegated to the state the authority for implementing the regulations promulgated for stratospheric ozone protection and the accidental release provisions of the Act.

The EPA continues to regulate the radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAP) and radon emissions.

7.3.7.2 Protection of Environment: National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61)

This regulation limits the radiation dose to the public from airborne radionuclide emissions from DOE facilities to 10 mrem per year effective dose equivalent (EDE) (40 CFR §61.92). The standards also prescribe emission monitoring and test procedures for determining compliance with the 10 mrem per year standard and reporting and permit provisions.

7.3.7.3 Accidental Release Prevention Requirements: Risk Management Programs (40 CFR Part 68)

The intent of this regulation is to prevent accidental releases to the air and mitigate the consequences of such releases by focusing prevention measures on chemicals that pose the greatest risk to the public and the environment. This regulation requires the preparation of risk management plans for listed regulated chemicals and within 3 years after listing any new regulated chemical.

7.3.7.4 Protection of Stratospheric Ozone (40 CFR Part 82)

The primary purposes of this regulation are to eliminate the production of certain ozone-depleting substances and require users of the substances to reduce emissions to the atmosphere through recycling and mandatory use of certified maintenance technicians. These requirements are applicable to SNL/CA and are implemented accordingly.

7.3.7.5 **California Clean Air Act and Amendments (California Health and Safety Code, §§40910 et seq.)**

Nonradioactive air emissions from SNL/CA facilities are subject to the regulatory requirements established under this Act. The California Air Resources Board (CARB), as provided by the Act, regulates air quality through a series of air quality control regulations. These regulations include ambient air quality standards (AAQS) and emission standards for emission sources and processes such as backup generators, boilers, and asphalt plants. At SNL/CA, these regulations are administered by the Bay Area Air Quality Management District (BAAQMD).

7.3.7.6 **Bay Area Air Quality Management District, Regulation 2, Permitting**

On July 21, 1992, the EPA promulgated 40 CFR Part 70, *Operating Permit Program*, which implements Title V of the CAA. The purposes of this program are to identify all the air quality regulations and emission limitations applicable to an air pollution source and establish monitoring, record-keeping, and reporting requirements necessary to demonstrate continued compliance with these requirements. This regulation required each state to develop an operating permit program meeting the minimum requirements set forth in 40 CFR Part 70.

Local authority rests with the BAAQMD. SNL/CA has several operating permits. A list of BAAQMD regulations is available in the *SNL/CA Environmental Information Document*.

7.3.7.7 **California Construction Permits**

Provisions of this regulation require construction permits for any new or modified source of any regulated air contaminant if the source is expected to exceed threshold emission rates. More than 500 toxic air pollutants are regulated, and each chemical's threshold hourly rate is based on its toxicity. Each new or modified air emission source is reviewed and conservative estimates are made of maximum hourly chemical use and emissions.

7.3.7.8 **Conformity of General Federal Actions to the State Implementation Plan**

The purpose of this regulation is to implement Section 176(c) of the CAA and regulations under 40 CFR Part 51, Subpart W, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, with respect to the conformity of general Federal actions to the SIP. Under those authorities, no department, agency, or instrumentality of the Federal government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity that does not conform to a SIP. This regulation sets forth policy,

criteria, and procedures for demonstrating and assuring conformity of such actions to the SIP.

7.3.8 **HUMAN HEALTH AND WORKER SAFETY (INCLUDING ACCIDENTS)**

7.3.8.1 **Occupational Radiation Protection (10 CFR Part 835)**

This regulation derives regulatory requirements from the AEA and not from the *Occupational Safety and Health Act* of 1970 (OSHA). 10 CFR Part 835 establishes worker radiation protection standards limiting exposures from ionizing radiation. For the occupational worker, the standard is 5 Roentgen equivalent, man (rem) (5,000 mrem) in any one year; and for members of the public entering a controlled area, the standard is 100 mrem per year. The standards for both internal and external exposure are described in Subpart C. The as low as reasonably achievable (ALARA) goal is set forth as the approach to be implemented by the DOE for radiation protection of workers and the general public. The management and control of radiation exposure will involve ALARA when considering individual and collective exposures.

7.3.8.2 **Occupational Safety and Health Act of 1970 (29 U.S.C. §651)**

OSHA, administered and enforced by the U.S. Department of Labor (DOL), establishes a national policy to provide safe and healthful working conditions. States are encouraged to assume responsibility for administration of their own safety and health standards. Only public employers, (that is, Federal, state, and municipal governments) and mining employers are excluded. Mining employers are covered by other safety and health acts. Federal agencies such as the DOE must have in place equivalent safety standards, as a minimum.

OSHA standards are designed to reduce on-the-job injuries and to develop health standards to limit workers risk of developing occupational disease. OSHA standards are universal and cover hazards that exist in a wide variety of industries. These are compiled as general industry standards. 29 CFR Part 1910 covers general industry standards, including walking and working surfaces, platforms and their use, health and environmental controls, hazardous materials, personal protective equipment, medical and first aid, fire protection, compressed gas and air equipment, materials handling and storage, machinery and machine guarding, hand and portable tools, welding, cutting and brazing, electrical, commercial diving, and toxic and hazardous substances. OSHA has promulgated industry-specific standards for construction, agriculture, and maritime sectors.

The provisions of Section 19 of the OSHA; EO 12196 (45 FR 12769); and Part 1925 (*Safety and Health Stan-*

dards for Federal Service Contracts) and Part 1960 (*Basic Program Elements for Federal Employees OSHA*) of Title 29 identify OSHA's applicability to DOE operations. These provisions are summarized as follow:

- Furnish employees with places and conditions of employment that are free from recognized hazards that are causing or are likely to cause death or serious physical harm.
- Set up procedures for responding to employee reports of unsafe and unhealthful working conditions.
- Acquire, maintain, and require the use of approved personal protective equipment and safety equipment.
- Inspect all workplaces at least annually with participation by representatives of employees.
- Establish procedures to ensure that no employee is subject to restraint, interference, coercion, discrimination or reprisal for exercising his/her right under the agency's safety and health program.
- Post notices of unsafe or unhealthful working conditions found during inspections.
- Ensure prompt abatement of hazardous conditions. Employees exposed to the conditions must be so informed and Imminent-danger corrections must be made immediately.
- Set up management information systems to keep records of occupational accidents, injuries, illnesses, and their causes, and post annual summaries of injuries and illnesses for a minimum of 30 days at each establishment.
- Conduct occupational safety and health training programs for top management, supervisors, safety and health personnel, employees, and employee representatives.

7.3.8.3 Occupational Safety and Health Standards (29 CFR Part 1910)

29 CFR Part 1910 provides standards for safe operations of facilities. Part 1910 includes 19 subparts, all of which are applied to SNL/CA operations. These subparts cover items such as toxic and hazardous substances, personal protective equipment, material handling and storage, permissible exposure limits, general environmental controls, and reporting of occupational accidents, injuries, and illnesses.

7.3.8.4 Federal Employee Occupational Safety and Health Programs and Related Matters (29 CFR Part 1960)

29 CFR Part 1960 provides regulations and guidelines for implementation of EO 12196, *Occupational Safety and Health Programs for Federal Employees*, which establishes

requirements and procedures for Federal agencies to provide occupational safety and health programs for their employees (45 FR 12769). Federal agencies such as the DOE must have in place equivalent safety standards, as a minimum.

The head of each Federal agency is charged with the responsibility to "establish and maintain an effective and comprehensive occupational safety and health program which is consistent with the standards" set by OSHA for private sector employees. That broad mandate is further defined by EO 12196, which identifies the responsibilities of the agencies and the role of the Secretary of Labor in developing, implementing, and evaluating such programs. DOE safety standards are specified in DOE Orders.

Although OSHA does not directly apply to DOE employees, SNL/CA's prime contract with the DOE requires adherence to DOE O 440.1, which states that contractors and contractor employees shall adhere to DOE-prescribed OSHA standards and requirements (29 CFR) for worker safety. Sandia Corporation, as a private company, is required to abide by OSHA regulations as well as any DOE contractual obligations or requirements in its operation of SNL/CA. These two sets of agency requirements (DOE and OSHA) may overlap in numerous health and safety areas.

7.3.8.5 Recording and Reporting Occupational Injuries and Illnesses (29 CFR Part 1904)

29 CFR Part 1904 specifies *The Record-Keeping Guidelines For Occupational Injuries and Illnesses, 1986*, which contains the description of the system requirements that businesses must follow in keeping records of work-related occupational deaths, injuries, or illnesses. It includes requirements for recording and reporting to the U.S. Bureau of Labor Statistics, all occupational injuries and illnesses requiring more than a first-aid response and reporting all occupational fatalities. These occupational injury and illness records have multiple purposes. Mainly, they are to provide information for employers and employees, raising their awareness of the frequency and kinds of injuries and illnesses occurring in the workplace and their related hazards. They also serve as a "management tool" for the administration of company safety and health programs. The information is also used by OSHA compliance staff to focus their inspections on the safety and health hazards revealed by the injury and illness records. Lastly, the records may be used to produce statistical data on the incidence of workplace injuries and illnesses, thereby measuring the magnitude of the injury and illness problem across the country.

7.3.8.6 DOE O 232.1A Occurrence Reporting and Processing of Operations Information

DOE O 232.1 establishes a system for occurrence reporting and defines a number of situations that must be formally reported, all of which are important to the overall safety, health, and security of workers in the workplace. These requirements include the categorization of occurrences that have potential safety, environmental, health, or operational significance; DOE notification of these occurrences; and the development and submission of documented follow-up reports. Occurrence reports must be done in a timely manner and contain sufficient information describing the occurrence, significance, causal factors, and corrective actions. Occurrence reporting increases sensitivity to potentially unsafe conditions, requires analysis to determine causes of events, is a vehicle for formal corrective actions, and fosters lessons-learned programs. The documentation and distribution requirements for the occurrence reports are satisfied with a centralized, unclassified operational database called the Occurrence Reporting and Processing System (ORPS).

7.3.8.7 DOE O 231.1, Environment, Safety, and Health Reporting

The objective of this order is to ensure the collection and reporting of information on ES&H that is required by law or regulation or that is essential for evaluation of DOE operations and for identifying opportunities for improvement needed for planning purposes within the DOE. Elements contained in this order link to requirements specified in parts of cancelled DOE 5483.1A, *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities*, and parts of cancelled DOE 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*. Requirements for an annual site environmental report, containing summary environmental data, are set forth in DOE O 231.1. It also specifies the need for the annual reporting of occupational safety and health information to the Secretary of Energy in order to allow the Secretary to comply with 29 CFR Part 1960.

7.3.8.8 DOE 5400.5, Radiation Protection of the Public and Environment

This order establishes standards and requirements for operations of the DOE and its contractors with respect to protection of members of the public and the environment against undue risk from radiation. This order provides for general standards; requirements for radiation protection of the public and the environment; derived concentration guides for air and water; and guidelines, limits, and controls for residual radioactive materials. The order also establishes the DOE's objective to operate its facilities and conduct its activities so that radiation exposures to

members of the public are maintained within the limits established by this order, and to control radioactive contamination through the management of the DOE's real and personal property. This order limits the annual effective dose equivalent (EDE) to any member of the public from all sources to 100 mrem per year. The requirements of this order are being incorporated into a nuclear safety regulation.

7.3.8.9 DOE O 440.1A, Worker Protection Management for Department of Energy Federal and Contractor Employees

The purpose of DOE O 440.1A is to establish the framework for an effective worker protection program that will reduce or prevent injuries, illnesses, and accidental losses by providing Federal and contractor employees with a safe work environment. This order replaces elements contained in cancelled DOE 5480.4. It contains requirements for mandatory environmental, safety, and health standards for areas such as fire protection, threshold limit value (TLVs) for chemical substances and physical agents in the workplace and other industrial hygiene requirements; construction safety, general safety, explosives safety, firearms safety, and motor vehicle safety. It also establishes radiological protection program requirements that, combined with 10 CFR Part 835 and associated implementation guidance, form the basis of a comprehensive radiological protection program.

7.3.8.10 DOE 5480.1B, Environment, Safety, and Health Program for Department of Energy Operations

The purpose of DOE 5480.1B is to establish the environment, safety, and health program for the DOE. It establishes standards and requirements for the DOE and DOE contractor operations regarding protection of the public and the environment from undue radiological risk. It contains the DOE's policy of adopting and implementing radiation protection standards consistent with those of the U.S. Nuclear Regulatory Commission (NRC). These standards are applied to DOE facilities and activities not subject to NRC licensing.

7.3.8.11 DOE O 225.1A, Accident Investigations

The objective of this DOE Order is to prescribe requirements for conducting investigations of certain accidents occurring at DOE sites. The prevention of reoccurrence of such accidents is also prescribed. The order aims to contribute to the improved environmental protection and safety of DOE employees, contractors, and the public. Requirements set forth in this order include the categorization of accidents, the notification of other agencies, the conduct of investigations of the accidents, and the close-out of the investigations.

7.3.8.12 Accidents

Risk Management Program Rule (40 CFR Part 68, Subpart G) This rule establishes the contents of Risk Management Plans (RMP) that the owner or operator of a facility handling regulated substances must submit to the EPA. An RMP includes information on the accidental release prevention and emergency response policies in effect, regulated substances handled, worst-case release scenario(s), the general accidental release prevention program and chemical-specific prevention steps, a 5-year accident history, the emergency response program, and planned changes to improve safety. In addition, the owner or operator must complete a single registration form that covers all regulated substances handled.

7.3.8.13 *California Safe Drinking Water and Toxic Enforcement Act of 1986, known as Proposition 65 (California Code of Regulations, Title 22, §12000, et seq.)*

Proposition 65 requires the Governor to publish a list of chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm. This list must be updated at least once a year. Over 550 chemicals have been listed as of May 31, 2002. Proposition 65 imposes certain controls that apply to chemicals that appear on this list. These controls are designed to protect California's drinking water sources from contamination by these chemicals, to allow California consumers to make informed choices about the products they purchase, and to enable residents or workers to take whatever action they deem appropriate to protect themselves from exposures to these harmful chemicals.

7.3.9 TRANSPORTATION

7.3.9.1 *Hazardous Materials Transportation Act of 1994 (49 U.S.C. §5101, et seq.)*

Under this Act, the Secretary of Transportation may establish regulations for the safe transport of hazardous materials. Such regulations may be applicable to manufacturers as well as transporters. Covered activities include packing, handling, labeling, marking, and routing of hazardous materials, as well as manufacturing, marking, maintaining, repairing, and testing of packages or containers used in the transportation of such materials.

7.3.9.2 *DOE O 460.2, Departmental Materials Transportation and Traffic Management*

This order establishes DOE policies and procedures for the management of materials transportation activities, including traffic management, for other than intrabuilding and intrasite transfers. The provisions of this order apply to all elements of the DOE involved in transportation activities and responsible for the payment or reim-

bursement of charges for transportation services. It is DOE policy to ensure that traffic and transportation management shall be accomplished in a manner commensurate with operational requirements for transportation services, established practices and procedures for transportation safety, economy, efficiency, and cargo security, national transportation policy as established in 49 U.S.C. §1801 *et seq.*, *Transportation*, and implemented by the Federal agencies, and applicable Federal, state, local, and international transportation regulations.

7.3.9.3 *International Atomic Energy Agency, Regulations for the Safe Transport of Radioactive Materials (1996 Edition)*

The International Atomic Energy Agency, a specialized agency of the United Nations, is the primary international organization that enforces a system of safeguards to ensure that nonnuclear weapons states do not divert shipments of sensitive nuclear-related equipment from peaceful applications to the production of nuclear weapons. The agency's regulations for transporting radioactive materials have gained worldwide adoption, helping to control the radiation hazards associated with all modes of transport. They cover general provisions, activity limits and material restrictions, requirements and controls for transport, test procedures, and administrative requirements. Schedules are also included detailing transport requirements for specific radioactive material consignments.

7.3.9.4 *California Code of Regulations, Title 22*

Under these regulations, the State of California established requirements for the safe transport of hazardous wastes. Covered activities include packing, handling, labeling, marking, and transporting hazardous waste.

7.3.10 WASTE GENERATION

7.3.10.1 *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 AEA.

7.3.10.2 *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 New Mexico Environment Department (NMED), requiring the DOE, SNL/NM, and SNL/CA to comply with FFCA. Compliance with the order is achieved through site treatment plans prepared by DOE.

Original jurisdiction for implementing RCRA was with EPA; however, RCRA authorizes EPA to turn this responsibility over to individual states as they develop satisfactory implementation programs. EPA granted base RCRA authorization to California, transferring regulatory control of hazardous wastes under RCRA to California EPA.

Both EPA and the State of California established regulations for the safe management of hazardous waste from the point of generation to disposal. Covered requirements include seismic considerations under 40 CFR 264 Part 18, Location Standards.

7.3.10.3 Underground Storage Tanks (42 U.S.C. §6901, Subtitle I)

Underground storage tanks (UST) 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 SNL/CA.

7.3.10.4 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 on October 4, 1995, to address storage and treatment of mixed waste.

7.3.10.5 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. SNL/CA 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.

7.3.10.6 Emergency Planning and Community Right-to-Know Act of 1986 (42 U.S.C. §11001)

EPCRA is also known as SARA Title III. Section 313 of the Act requires facilities meeting certain standard industrial classification code criteria to submit an annual toxic chemical release inventory report (*Toxic Chemical Release Reporting: Community-Right-to-Know* [40 CFR Part 372]). For covered facilities, a report describing the use of, and emissions from, Section 313 chemicals stored or used onsite and meeting threshold-planning quantities, must be submitted to the EPA and California every July for the preceding calendar year (CY). Other provisions of the Act require planning notifications (Sections 302 and 303), extremely hazardous substance release notifications (Section 304), and annual chemical inventory/material safety data sheet reporting (Sections 311 and 312). EPCRA required all Federal facilities, regardless of standard industrial classification code, to meet the requirements of the Act.

SNL/CA does not meet standard industrial classification code criteria for Section 313 reporting, but has voluntarily submitted annual toxic chemical release inventory reports since 1987. All research operations are exempt under provisions of the regulation, and only pilot plants, production, or manufacturing operations at SNL/CA are reported.

7.3.10.7 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.

7.3.10.8 Toxic Substances Control Act of 1977 (15 U.S.C. §2601)

The TSCA, 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 polychlorinated biphenyls (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 SNL/CA's research and development activities are not related to the manufacture of new chemicals, PCBs are SNL/CA's main concern under the Act. Activities at SNL/CA 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.

The TSCA regulates PCB items and materials having concentrations exceeding 50 parts per million (ppm). Implementing regulations (40 CFR 761) contain an antidilution clause that requires waste to be managed based on the PCB concentration of the source (transformer, capacitor, PCB equipment, etc.), regardless of the actual concentration in the waste. If the concentration at the source is unknown, the waste must be managed as though it were a spill of mineral oil with an assumed PCB concentration of 50 to 500 ppm. At SNL/CA, PCB-contaminated wastes are transported offsite for treatment and disposal unless

they also have a radioactive component. Solid 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).

SNL/CA currently has no treatment or disposal facilities for liquid wastes that contain PCBs. Such wastes have been collected from site generators, stored at the Hazardous Waste Storage Facility for offsite shipment.

The asbestos abatement implementing regulations of the Act (40 CFR Part 763) relate primarily to the identification and abatement of asbestos-containing materials in schools. SNL/CA conducts asbestos abatement projects in accordance with OSHA requirements (29 CFR Part 1926), applicable requirements of the CAA and the *California Solid Waste Management Regulations*.

7.3.10.9 Radioactive Waste Management Regulations

Low-level radioactive waste is a waste that contains radioactivity and is not classified as high-level radioactive waste, transuranic (TRU) waste, or spent nuclear fuel. Solid low-level radioactive waste usually consists of clothing, tools, and glassware. Low-level radioactive liquid waste consists primarily of experiment debris. Radioactive waste management at SNL/CA is regulated under the AEA, through applicable DOE orders (primarily DOE Order 5820.2A, *Radioactive Waste Management*, and DOE 435.1, *Radiation Protection of the Public and the Environment*).

7.3.10.10 Right-to-Know Laws and Pollution Prevention Requirements (EO 12856)

This EO directs all Federal agencies to reduce and report toxic chemicals entering any waste stream; improve emergency planning, response, and accident notification; and encourage clean technologies and testing of innovative prevention technologies (58 FR 41981). The DOE and SNL/CA meet applicable reporting requirements under the provisions of EPCRA and California EPCRA, in accordance with the EO.

7.3.10.11 DOE O 435.1, Radioactive Waste Management

This order 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 environ-

ment. 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.

7.3.11 NOISE

7.3.11.1 *Noise Control Act of 1972* (42 U.S.C. §4901)

By this Act, Congress directed all Federal agencies to carry out the programs under their control to promote an environment free from noise that jeopardizes public health or welfare. Furthermore, it requires any Federal agency engaged in any activity resulting, or which may result, in the emission of noise, to comply with Federal, state, interstate, and local requirements regarding control and abatement of environmental noise to the same extent that any person is subject to such requirements. Beyond the general obligation in the Act and implementing regulations, there are no specific Federal or state requirements regulating environmental noise.

7.3.11.2 *Occupational Noise Exposure* (29 CFR §1910.95)

This regulation provides protection to workers from excessive levels of noise. It establishes sound levels that

are not to be exceeded for specific periods of time without protective measures being taken. When employees are subjected to sound exceeding the specified levels, feasible administrative or engineering controls are to be instituted. If such controls fail to reduce sound levels to the prescribed levels, personal protective equipment must be provided and used to reduce sound levels.

7.3.11.3 *Environmental Justice—Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898)*

This EO directs each Federal agency to identify and address disproportionately high adverse human health or environmental impacts on minority and low-income populations resulting from an agency's programs, policies, or activities (59 FR 7629). The order further directs each Federal agency to collect, maintain, analyze, and make information publicly available on the race, national origin, and income level of populations in areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on these populations. This requirement applies when such facilities or sites become the subject of a substantial Federal environmental administrative or judicial action. Environmental justice impacts are being identified and addressed through the SWEA, and the policies and data analysis requirements of this EO remain applicable to future actions at SNL/CA.

CHAPTER 8

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- 10 CFR Part 1021 “*National Environmental Policy Act (NEPA): Implementing Procedures*”; Title 10, Energy; Chapter X, Department of Energy (General Provisions); *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; January 1, 1998.
- 10 CFR Part 1021.330 .. “*National Environmental Policy Act: Implementing Procedures*”; Title 10, Part 1021.330, Energy; Programmatic NEPA Documents; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.
- 14 CFR 150 Department of Transportation, “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, D.C.; Revised January 1, 1999.
- 29 CFR Part 1910 “Occupational Safety and Health Standards”; Title 29, Labor; Chapter XVII, Occupational Safety and Health Administration, Department of Labor; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.
- 29 CFR Part 1910.95 “Occupational Noise Exposure”; Title 29, Occupational Safety and Health Administration, Department of Labor, *Code of Federal Regulations*, National Archives and Records Administration, Washington, D.C., Washington, D.C.; Revised as of July 1, 2001.
- 36 CFR 60 “National Register of Historic Places”; Title 36, Parks, Forests, and Public Property; Chapter I, National Park Service, Department of the Interior; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.
- 40 CFR Part 6 “Procedures for Implementing the Requirements of the Council on Environmental Quality on the *National Environmental Policy Act*,” Title 40, Protection of the Environment; Chapter I, Environmental Protection Agency; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.
- 40 CFR Part 50 “National Ambient Air Quality Standards, National Primary and Secondary Ambient Air Quality Standards;” Title 40, Protection of Environment; Chapter I, Environmental Protection Agency; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.
- 40 CFR Part 51 “Requirements for Preparation, Adoption, and Submittal of Implementation Plans,” Title 40, Protection of Environment; Chapter I, Environmental Protection Agency; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.
- 40 CFR Part 61 “National Emission Standards for Hazardous Air Pollutants;” Title 40, Protection of Environment; Chapter I, Environmental Protection Agency; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.
- 40 CFR 93 “Determining Conformity of Federal Actions to State or Federal Implementation Plans;” Title 40, Protection of Environment; Chapter I, Environmental Protection Agency; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.

- 40 CFR Part 761 “Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions”; Title 40, Protection of Environment; Chapter I, Environmental Protection Agency; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; July 1, 1998.
- 40 CFR Parts 1500-1508 . “NEPA Implementing Regulations”; Council on Environmental Quality, U.S. Department of Energy; Title 40, *Code of Federal Regulations*; Washington, D.C.; October 2002.
- 40 CFR Part 1501.7 “NEPA and Agency Planning”; Title 40, Protection of Environment; Chapter V, Title 40, *Code of Federal Regulations*; Washington, D.C.; October 2002.
- 49 CFR Part 172.101 “Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements”; Title 49, Transportation; Vol. 2; Chapter I, Research and Special Programs Administration, Department of Transportation; *Code of Federal Regulations*; National Archives and Records Administration, Washington, D.C.; October 1, 1997.

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- 42 FR 26951 Executive Order 11988, “Floodplain Management”; *Federal Register*, Vol. 42, pp. 26951; Washington, D.C.; May 25, 1977.
- 42 FR 26961 Executive Order 11990, “Protection of Wetlands”; *Federal Register*, Vol. 42, pp. 26961;
- 59 FR 7629 Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”; *Federal Register*, Vol. 59, pp. 7629; Washington, D.C.; February 11, 1994.
- 61 FR 25813 *Federal Register*, Vol. 61, No. 101, Endangered and Threatened Wildlife and Plants, Final Determination of Threatened Status for the California Red-legged Frog, pp. 25813-25833, May 23, 1996.
- 62 FR 38855 EPA, National Ambient Air Quality Standards for Ozone; Final Rule, *Federal Register*, Vol. 62, Pg 38855, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, D.C.; July 18, 1997.
- 65 FR 24595 Executive Order 13148, “Greening the Government Through Leadership in Environmental Management;” *Federal Register*, Vol. 65, pp. 24595; Washington, D.C.; April 21, 2000.
- 66 FR 14626 FR, Vol. 65, No. 49, Endangered and Threatened Wildlife and Plants, Final Determination of Critical Habitat for California Red-Legged Frog, Final Rule, *Federal Register* pp. 14626-14661.
- 66 FR 51812 Executive Order 13228, 2001, Establishing the Office of Homeland Security and the Homeland Security Council *Federal Register*, Vol. 66, pp. 51812; Washington, D.C.; October 10, 2001. Available Online: <http://www.nara.gov/fedreg/eo2001b.html>
- 67 FR 5089 “National Nuclear Security Administration Notice of Intent To Prepare A Site-Wide Environmental Assessment, Sandia National Laboratories/California, Notice of Intent;” *Federal Register*, Vol. 67, Issue 23, pp. 5089-5091; National Nuclear Security Administration, Albuquerque New Mexico; February 4, 2002.

8.4 PUBLIC LAW

- PL 107-107 “*National Defense Authorization Act for Fiscal Year 2002*”; Vol. 107; Part 2, pp. 1547-1966; *United States Statues at Large*; United States Government Printing Office, Washington, D.C.; 1994.

8.5 UNITED STATES CODE

- 15 U.S.C. §2601 *Toxic Substances Control Act*; “Findings, policy, and intent”; Title 15, Commerce and Trade; Chapter 53, Toxic Substances Control; Subchapter I, Control of Toxic Substances; *United States Code*; Washington, D.C.; January 1, 1977.

- 16 U.S.C. § 470 *National Historic Preservation Act*; “Short title; Congressional finding and declaration of policy;” Title 16, Conservation; Chapter 1A, Historic Sites, Buildings, Objects, and Antiquities; Subchapter II, National Historic Preservation; *United States Code*, Washington, D.C.; October 15, 1966, as amended.
- 16 U.S.C. §668 “Bald and Golden Eagles;” Title 16, Conservation; Chapter 5A, Protection and Conservation of Wildlife; Subchapter II, Protection of Bald and Golden Eagles; *United States Code*, Washington, D.C.; June 8, 1940, as amended.
- 16 U.S.C. §703 “Taking, killing, or possessing migratory birds unlawful;” Title 16, Conservation; Chapter 7, Protection of Migratory Game and Insectivorous Birds; Subchapter II, Migratory Bird Treaty; *United States Code*, Washington, D.C.; July 3, 1918, as amended.
- 16 U.S.C. §§1531-1544 Chapter 35, “*Endangered Species Act*;” Title 16 Conservation; *United States Code*, Washington, D.C.; December 28, 1973, as amended.
- 42 U.S.C. §2011 “*Atomic Energy Act*; Congressional declaration of policy;” Title 42, Public Health and Welfare; Chapter 23, Development and Control of Atomic Energy; Division A, Atomic Energy; Subchapter I, General Provisions; *United States Code*, Washington, D.C.; August 1, 1946, as amended.
- 42 U.S.C. §4321 *et seq.* ... “Congressional declaration of purpose;” Title 42, Public Health and Welfare; Chapter 55, *National Environmental Policy Act (NEPA)*; *United States Code*, Washington, D.C.; January 1, 1970, as amended.
- 42 U.S.C. §4901 “Congressional findings and statement of policy;” Title 42, Public Health and Welfare; Chapter 65, *Noise Control Act*; *United States Code*, Washington, D.C.; October 27, 1972, as amended.
- 42 U.S.C. §6901 “Resource Conservation and Recovery Act; Congressional findings;” Title 42, Public Health and Welfare; Chapter 82, Solid Waste Disposal; Subchapter I, General Provisions; *United States Code*, Washington, D.C.; November 8, 1978, as amended.
- 42 U.S.C. §6961 “Application of Federal, state, and local law to Federal facilities;” Title 42, Public Health and Welfare; Chapter 82, Solid Waste Disposal; Subchapter IV, Federal Responsibilities; *United States Code*, Washington, D.C.; October 21, 1976, as amended.
- 42 U.S.C. §7401 “*Clean Air Act*; Congressional findings and declaration of purpose;” Title 42, Public Health and Welfare; Chapter 85, Air Pollution Prevention and Control; Subchapter I, Programs and Activities; Part A, Air Quality and Emission Limitations; *United States Code*, Washington, D.C.; July 14, 1955, as amended.
- 42 U.S.C. §9601 “Definitions;” Title 42, The Public Health and Welfare; Chapter 103, Comprehensive Environmental Response, Compensation, and Liability; Subchapter I, Hazardous Substances Releases Liability, Compensation; *United States Code*, Washington, D.C.; December 22, 1980, as amended.
- 42 U.S.C. §11001 “Establishment of State commissions, planning districts, and local committees;” Title 42, Public Health and Welfare; Chapter 116, Emergency Planning and Community Right-To-Know; Subchapter I, Emergency Planning and Notification; *United States Code*, Washington, D.C.; October 17, 1986.

8.6 U.S. DEPARTMENT OF ENERGY

- DOE 440.1A “Worker Protection Management for DOE Federal and Contractor Employees,” U.S. Department of Energy, Washington, D.C.; December 21, 1994.
- DOE 5400.1 “General Environmental Protection Program,” U.S. Department of Energy, Washington, D.C.; November 9, 1988.
- DOE P 430.1 “Land and Facility Use Policy,” U.S. Department of Energy, Washington, D.C.; March 27, 1998.

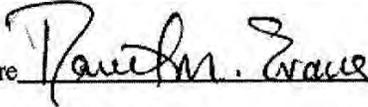
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Sandia National Laboratories/CA Site-Wide EA
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Conflict of Interest Statement

Tetra Tech NUS, Inc.
For the
U.S. Department of Energy
Under Contract No. DE-AM04-97AL77613
Task Order No. DE-AT04-02AL67938

OCI Representation Statement

As a representative of my organization, I hereby certify that, to the best of my knowledge and belief, no facts exist relevant to any past, present, or currently planned interest or activity (financial, contractual, personal, organizational, or otherwise) which relate to the proposed work and bear on whether I have (or the organization has) a possible conflict of interest with respect to (1) being able to render impartial, technically sound, and objective assistance or advice, or (2) being given an unfair competitive advantage.

Signature  Date 02/25/02
Name Daniel M. Evans
Title General Manager
Organization: Tetra Tech NUS, Inc.

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CHAPTER 10

List of Preparers

- **Annett, John**
Tetra Tech NUS
Air Quality and Noise
B.A., Mathematics
30 years experience
- **Bartosch, James**
Tetra Tech NUS
Project Manager, Waste Generation,
Infrastructure, Lead Author
B.S., Chemical Engineering
15 years experience
- **Connor, Steven J.**
Tetra Tech NUS
Transportation
M.S. Physics
29 years experience
- **Dimmick, Ross A.**
Tetra Tech NUS
Geology, Water Resources
M.S., Geological Sciences
B.S., Geological Sciences
15 years experience
- **Enyeart, Sasndra**
Tetra Tech NUS
Cumulative Impacts
BCE Civil Engineering (Environmental)
25 years experience
- **Gaylor, Robert**
Tetra Tech NUS
Geology, Floodplains and Wetlands
M.S., Geology
A.B., Geology
15 years experience
- **Gould, John**
DOE/OKSO
Environmental Restoration/Waste Management
B.S. Geology
A.A.S. Environmental Science
25 years experience
- **Gunter, Gary**
Tetra Tech NUS
Transportation
B.S., Geology
14 years experience
- **Hill, Nicole**
Tetra Tech NUS
Regional Socioeconomist, MBA
B.A., Social Science/Psychology
4 years experience
- **Irwin, Jeffrey P.E.**
DOE/NNSA/OKSO
SNL/CA Site Operations Manager
B.S., Electrical Engineering
WSO, Certified Government Safety Officer
27 years experience
- **Lacy, Susan**
DOE/NNSA/OKSO
Document Manager
NEPA Compliance Officer
B.S., Chemical Engineering
15 years experience
- **Moford, Lane**
Tetra Tech NUS
Document Production, Graphics
B.A. Philosophy
8 years experience
- **Moore, Tami**
DOE/NNSA/OKSO
Public Affairs Specialist
M.A., Communications
B.A., Journalism
11 years experience
- **Oliver, James**
Tetra Tech NUS
Deputy Project Manager, Technical Reviewer
B.S. Biology (Fisheries)
30 years experience
- **Patterson, Karen**
Tetra Tech NUS
Editor, MLIS Information Science
M.A. Biology
B.A. Biology
25 year experience
- **Pratt, George**
Tetra Tech EMI
Biological Resources
Ph.D., Entomology
M.S., Entomology
B.S., Biology
28 years experience

- **Reed, Karol-Lynn**
Tetra Tech NUS
Document Production Lead, Editor, Graphics
B.A. candidate, Business/Computer
18 years experience
- **Robbins, Jeff**
U.S. Department of Energy
NEPA Compliance Officer
Albuquerque Office Liaison
B.S., Biology
28 years experience
- **Roxlau, Katherine**
Tetra Tech NUS
Cultural Resources, Land Use, Reviewer
M.A., Anthropology
B.A., Anthropology
14 years experience
- **Sifuentes, Mark**
DOE/NNSA/OKSO
Biological Resources
M.S., Microbiology, B.S., Biology
31 years experience
- **Taber, William**
Tetra Tech NUS
LLNL Liaison, Reviewer
B.A., Biology
25 years experience
- **Philip Young, CHP**
Tetra Tech NUS
Human Health and Safety
M.S., Health Physics
B.S., Radiation Health (Health Physics)
14 years experience

CHAPTER 11

List of Agencies, Organizations, and Individuals to Whom Copies of this Site-Wide Environmental Assessment were Sent

Name	Affiliation	City	State
Federal Agencies			
<i>Buford, Dan</i>	U.S. Fish and Wildlife Service	Sacramento	CA
<i>Dermer, M.</i>	U.S. Environmental Protection Agency	San Francisco	CA
<i>Gutierrez, Robert</i>	Office of Congressman Richard Pombo	Stockton	CA
<i>Hoffman, Julie</i>	For Congresswoman Ellen Tauscher	Walnut Creek	CA
<i>Kevin, Dan</i>	Lawrence Berkeley National Laboratory	Berkeley	CA
<i>Tauscher, Ellen, Congresswoman</i>	House Office Building	Washington	DC
<i>Tauscher, Ellen, Congresswoman</i>	U.S. District 10	Walnut Creek	CA
<i>Zahn, Ken</i>	Lawrence Livermore National Laboratory	Livermore	CA
State Agencies			
	California Environmental Protection Agency	Sacramento	CA
<i>Bailey, E.</i>	California Department of Health Services	Sacramento	CA
<i>Ciriello, Sal</i>	California Environmental Protection Agency	Berkeley	CA
<i>Gan, Janice</i>	California Department of Fish and Game	Yountville	CA
<i>Klobas, Ryan</i>	Office of Assembly Woman Lynne Leach	Walnut Creek	CA
<i>Leach, Lynne, Assemblywoman</i>	State District 15	Livermore	CA
<i>Meillier, Laurent</i>	California Regional Water Quality Control Board	Oakland	CA
<i>Mellon, Dr. Knox</i>	California Office of Historic Preservation	Sacramento	CA
<i>Meyers, Larry</i>	California Native American Heritage Commission	Sacramento	CA
<i>Murphey, Daniel</i>	Department of Toxic Substances Control	Berkeley	CA
<i>Omania, Gloria</i>	Office of State Senator Tom Torlakson	Concord	CA
<i>Wong, J.</i>	California Department of Health Services	Berkeley	CA
County/Regional Agencies			
	Alameda County Health Department, Hazardous Materials Division	Oakland	CA
	Alameda County Waste Management Authority	San Leandro	CA
	Alameda County, Planning Department	Hayward	CA
	Association of Bay Area Governments	Oakland	CA
<i>Guthrie, James</i>	Bay Area Air Quality Management District, Enforcement Services	San Francisco	CA
<i>Haggerty, Scott</i>	Alameda County Board of Supervisors, District One	Oakland	CA

Name	Affiliation	City	State
Weston, Robert	Alameda County Health Care Services Agency, Department of Environmental Health Services	Alameda	CA
City			
	City of Livermore, Planning Division	Livermore	CA
Barton, Linda, City Manager	City of Livermore	Livermore	CA
Bilbrey, Dan, Mayor	City of Tracy	Tracy	CA
Garcy, Lorraine, Superintendent	Livermore Valley Unified School District	Livermore	CA
Gary, Stewart, Fire Chief	Livermore-Pleasanton Fire Department	Livermore	CA
Gittings, S.	Livermore Water Reclamation Plant	Livermore	CA
Kamena, Dr. Marshall, Mayor	City of Livermore	Livermore	CA
Lockhart, Janet, Mayor	City of Dublin	Dublin	CA
Miller, Mike, Public Services Director	City of Livermore	Livermore	CA
Peeler, Jerry, City Manager	City of Livermore	Livermore	CA
Pico, Tom, Mayor	City of Pleasanton	Pleasanton	CA
Police Chief	Livermore Police Department	Livermore	CA
Tatarka, Nancy, Mayor	City of San Ramon	San Ramon	CA
Individuals			
Harris, Joan		Albuquerque	NM
Mertes, Dr. David, Board Chair	ValleyCare Hospital	Livermore	CA
Mueller, Mike & Ann		Livermore	CA
Libraries/Newspapers			
	City of Pleasanton, Public Library	Pleasanton	CA
	City of Dublin, Branch Library	Dublin	CA
	City of San Ramon Library	San Ramon	CA
Aries, Jennifer	Chabot-Las Positas Community College District	Pleasanton	CA
Director	City of Livermore, Civic Center Library	Livermore	CA
Editor	Tri-Valley Herald	Pleasanton	CA
Editor	Valley Times	Walnut Creek	CA
Halliday, Karen, President	Las Positas College	Livermore	CA
Johnston, Susan, Librarian	City of Tracy Branch Library	Tracy	CA
Businesses			
Bouchard, Dave, President	Pleasanton Chamber of Commerce	Pleasanton	CA
Fagundes, George, Chairman	Dublin Chamber of Commerce	Dublin	CA
Haftel, Joy	Congressional Information Services	Bethesda	MD
Horner, Nadine, President	Livermore Chamber of Commerce	Livermore	CA

Name	Affiliation	City	State
Hughes, Karen, Chairwoman	Livermore Chamber of Commerce, Purple Orchid	Livermore	CA
O'Malley, Tom	Tri-Valley Business Council	Livermore	CA
Rapaport, Gary, President	Tracy Chamber of Commerce	Tracy	CA
Weiss, Paul	Congressional Information Services	Bethesda	MD
Winter, Christina, Chair	San Ramon Chamber of Commerce	San Ramon	CA
Organizations			
	Sierra Club, San Francisco Bay Chapter	Berkeley	CA
Cabasso, Jacqueline	Western States Legal Foundation	Oakland	CA
Erickson, Stan, Chair	Sierra Club, Tri-Valley Group		
Fienstein, Arthur	Golden Gate Audubon Society	Berkeley	CA
Kelley, Marylia	Tri-Valley CAREs	Livermore	CA
Mertes, Dr. Barbara, Chair	Valley Study Group	Livermore	CA
Riley, A. L.	California Natural Resource Foundation	Berkeley	CA

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CHAPTER 12

List of Agencies and People Contacted

Organization	Last Name	First Name	Title	Location	State
Sandia National Laboratories/ Livermore, California	Blevins	Linda		Livermore	CA
	Allendorf	Mark		Livermore	CA
	Keiffer	Patrick		Livermore	CA
	Hachman	John		Livermore	CA
	Henderson	Craig		Livermore	CA
	Didlake	John		Livermore	CA
	Armijo	Herman		Livermore	CA
	Barr	Vern		Livermore	CA
	Brynildson	Mark		Livermore	CA
	Garrett	Bob		Livermore	CA
	Brekke	David		Livermore	CA
Larsen	Barbara		Livermore	CA	

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CHAPTER 13

Glossary

This glossary lists terms that may not be familiar to some readers of this document. Several sources for definitions are available including Glossary of Terms used in the Department of Energy and National Environmental Policy Act Documents (DOE 1998c) and Environment, Safety and Health Thesaurus/Dictionary (DOE 1998d). The last citation is available through the Internet (<http://tis.eh.doe.gov/docs/dict/>).

– A –

Abatement: Reducing the degree or intensity of, or eliminating, pollution.

Accident: An unplanned event or sequence of events that result in undesirable consequences.

Advanced materials: A material that has been improved such that it is considered state-of-the-art.

Air pollutant: Generally, an airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance for which emissions or atmospheric concentrations are regulated or for which maximum guideline levels have been established due to potential harmful effects on human health and welfare.

Air Quality District: Geographic area established to regulate pollution on a local level.

Air quality standards: The level of pollutants prescribed by regulations that may not be exceeded during a specified time in a defined area.

Alluvial: Pertaining to deposition of sediments by rivers and streams.

Ambient air: Any unconfined portion of the atmosphere: open air, surrounding air. That portion of the atmosphere, external to buildings, to which the general public has access.

Aquifer: A body of rock or sediment under the earth's surface that is capable of transmitting groundwater and yielding usable amounts of groundwater to supply wells and springs. A saturated geologic unit through which significant quantities of water can migrate under natural hydraulic gradients.

Archaeological sites (resources): Any material remains of past human life or activities that are of archaeological interest.

Arroyo: The channel of an ephemeral or intermittent stream.

Artifact: An object produced or shaped by human workmanship that is of archaeological or historical interest.

As low as reasonably achievable (ALARA): An approach to radiation protection to manage and control exposures (both individual and collective) and releases of radioactive material to the environment to as far below applicable limits as social, technical, economic, practical, and public policy considerations permit. ALARA is not a limit, but a process for minimizing doses to as far below limits as is practicable.

Attainment area: An area that the United States (U.S.) Environmental Protection Agency (EPA) has designated as being in compliance with one or more of the National Ambient Air Quality Standards (NAAQS) for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants but not for others.

– B –

Background radiation: Radiation from 1) cosmic sources; 2) decay of naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); and 3) global fallout from nuclear weapons as it exists in the environment (such as from the testing of nuclear explosive devices).

Balance of Operations: Operations and activities not specifically defined that usually provide support to large facilities and projects and incrementally impact side-wide utilities, emissions, discharges, and waste generation.

Baseline: The existing environmental conditions against which impacts of the alternatives can be compared. For this Site-Wide Environmental Assessment (SWEA), the environmental baseline is the environmental condition of the site, as it existed in 2000, unless otherwise stated.

Bioagent: Biochemical substance.

Biohazardous waste: Any waste that is capable of transmitting an infectious agent to a living organism. This includes discarded materials such as live and weakened vaccines, blood, excretions or secretions, animal carcasses and animal waste products, hypodermic needles, syringes, and broken glass items such as blood vials.

Biological resource: Plants, animals, and other living organisms.

– C –

Cancer: A group of diseases characterized by uncontrolled cellular growth with invasive characteristics, such that the disease can transfer from one organ to another.

Candidate species: Plants and animals that the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list, but cannot do so immediately because of the relative listing priority of candidates.

Carbon dioxide (CO₂): A colorless, odorless, nonpoisonous gas that is a normal component of the ambient air; it is a product of normal plant and animal respiration and of the decay of organic matter, and of fuel combustion.

Carbon monoxide (CO): A colorless, odorless gas that is toxic if breathed in high concentration over a period of time. It is formed as the product of the incomplete combustion of hydrocarbons (fuels).

Carcinogen: A substance that can cause or contribute to the production of cancer.

Chemical Information System: Chemical inventory system used by Sandia National Laboratories/Livermore, California (SNL/CA).

Clean room: An area that is maintained virtually free of contaminants (such as dust or bacteria); used in laboratory work and in the production of precision parts for electronic equipment.

Climatology: The science that deals with climates and investigates their phenomena and causes.

Collective dose: The sum of doses.

Committed dose equivalent: The dose equivalent to organs or tissues that will be received by an individual during the 50-year period following the intake of radioactive material. It does not include contributions from radiation sources external to the body.

Committed effective dose equivalent: The dose value obtained by multiplying the committed dose equivalent for the organ or tissues that are irradiated and the weighting factors applicable to those organs or tissues, and summing all the resulting products.

Comprehensive Test Ban Treaty: A proposed treaty prohibiting nuclear tests of all magnitudes.

Confining layer: A layer of sediment or rock overlying an aquifer that inhibits the vertical movement of water into or out of the aquifer.

Contaminant: Physical, chemical, biological, or radiological substances or matter that may have an adverse effect on air, water, or soil.

Criteria pollutants: An air pollutant that is regulated by NAAQS. The EPA must describe the characteristics and potential health and welfare effects that form the basis for setting or revising the standard for each regulated pollutant. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter.

Cultural resources: Prehistoric or historic sites, buildings, structures, districts, or other places or objects (including biota of importance) considered important to a culture, subculture, or community for scientific, traditional, or religious purposes or for any other reason. This includes archaeological sites, traditional use areas, and sacred or religious locations.

Cumulative impacts: The impacts on the environment that result when the impact of a proposed action is added to the impacts from other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions. Cumulative impacts can result from individually minor, but collectively more significant, actions taking place over a period of time.

– D –

Decommission: The process of withdrawing a building, equipment, or a facility from active service.

Decontamination: The actions taken to reduce or remove substances that pose a substantial present or potential future hazard to human health or the environment. Examples are removal of radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

Deflagration: Burning or causing to burn with intense heat and light.

Depleted uranium: Uranium whose content of the fissile uranium-235 isotope is less than the 0.7 percent (by weight) found in natural uranium, so that it contains more uranium-238 than natural uranium.

Dose (chemical): The amount of a substance administered to, taken up by, or assimilated by an organism. It is often expressed in terms of the amount of substance per unit mass of the organism, tissue, or organ of concern.

Dose (radiological): A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, and committed equivalent dose.

Dosimetry: The theory and application of the principles and techniques involved in measuring and recording radiation doses.

Drinking water standards: The prescribed level of constituents or characteristics in a drinking water supply that cannot be exceeded legally.

– E –

Ecosystem: A community of organisms and their physical environment interacting as an ecological unit.

Effluent: Treated or untreated air emissions or liquid discharges.

Eligible cultural resource: A cultural resource that has been evaluated and reviewed by an agency and the State Historic Preservation Officer (SHPO) and determined eligible for inclusion in the National Register of Historic Places (NRHP), based on the criteria of significance and eligibility.

Emission standards: Requirements established by a state, local government, or the EPA Administrator that limits the quantity, rate, or concentration of emissions of air pollutants on a continuous basis.

Emissions: Pollution discharged into the atmosphere from smoke stacks, other vents, and surface areas of commercial or industrial facilities, residential chimneys, and vehicle exhausts.

Endangered species: Plants or animals that are in danger of extinction throughout all or a significant portion of their ranges and that have been listed as endangered by the USFWS or the NMFS following the procedures outlined in the *Endangered Species Act* and its implementing regulations.

Environmental assessment (EA): A public document that a Federal agency prepares under NEPA to provide sufficient evidence and analysis to determine whether a proposed agency action would require preparation of an environmental impact statement (EIS) or finding of no significant impact (FONSI).

Environmental impact statement (EIS): The detailed written statement that is required by section 102(2) of NEPA for a proposed major Federal action significantly affecting the quality of the human environment. A DOE EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality (CEQ) NEPA regulations in 40 CFR Parts 1500-1508, and DOE NEPA regulations in 10 CFR Part 1021.

Environmental justice: 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. Fair treatment means no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies.

Ephemeral: Lasting for a brief period of time, as in a temporary stream.

Erosion: The wearing away of land surfaces by the action of wind or water.

Exotic species: Species of plants and animals that are not native to a region. They often displace native species and may become pests.

Explosion (conventional): A chemical reaction or change of state that occurs in an exceedingly short time with the generation of high temperatures and large quantities of gaseous reaction products.

Exposure pathway: The course a chemical or physical agent takes from the source to the exposed organism. An exposure pathway describes a mechanism by which an individual or population is exposed to chemicals or physical agents at or originating from the site.

– F –

Facility: All contiguous land, and structures, other operational areas, and improvements used for SNL/CA activities. A facility may consist of several buildings, structures, and operational equipment (e.g., one or more buildings, storage containers, or combinations of them).

Fault: A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred.

Finding of No Significant Impact (FONSI): A document prepared by a Federal agency, briefly presenting the reasons that a proposed action will not have a significant effect on the human environment; and, therefore, will not require an environmental impact statement.

Fissile material: Any material fissionable by low-energy neutrons consisting of or containing one or more of the fissile (capable of being split or divided) radionuclides: plutonium-239 and -241 and uranium-233 and -235. Neither natural nor depleted uranium is a fissile material.

Fissile materials are classified according to the controls needed to provide nuclear criticality safety during storage and transportation.

Fissionable: A synonym for fissile material; the meaning of this term has been extended to include material that can be fissioned by fast neutrons such as uranium-238.

Floodplain: The lowlands and relatively flat areas adjoining inland and coastal waters and the flood-prone areas of offshore islands including, at a minimum, that area inundated by a 1-percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1-percent) floodplain. The critical action floodplain is defined as the 500-year (0.2-percent) floodplain.

Fume hood: An enclosed ventilation system used to protect workers from inhaling fumes or vapors.

Fusion: A nuclear reaction during which light nuclei are fused together to form a heavier nucleus, accompanied by the release of immense amounts of energy and fast neutrons.

– G –

Geology: The science of the earth: the materials, processes, environments, and history of the planet, including the rocks and their formation and structure.

Groundwater: Subsurface water supply in the saturated zone below the level of the water table.

– H –

Habitat: The place or area where populations of plants, animals, and other organisms normally live.

Hazardous air pollutants: Air pollutants that are not covered by ambient air quality standards, but that may present a threat of adverse human health effects or adverse environmental effects.

Hazardous chemical: Under 29 CFR Part 1910.1200(c), a hazardous chemical is defined as “any chemical, which is a physical hazard or a health hazard.” Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

Hazardous material: A material, including a hazardous substance, as defined by 49 CFR Part 171.8, which poses an unreasonable risk to health, safety, and property when transported or handled.

Hazardous/toxic waste: Any solid waste (can also be semisolid or liquid or contain gaseous material) having one or more characteristics of ignitability, corrosivity, toxicity, or reactivity, or any other waste specifically regulated as a hazardous waste defined by the *Resource Conservation and Recovery Act* (RCRA) or by the *Toxic Substances Control Act* (TSCA).

High explosives: A type of explosive that detonates under the influence of a high-pressure shock or by the explosion of a suitable primary explosive (for example, trinitrotoluene [TNT] and nitroglycerin).

Hydrology: The science dealing with the properties, distribution, and circulation of natural water systems.

– I –

Infrastructure: The basic facilities, services, and installations needed for the functioning of a city, plant, or other facility (such as transportation and communication systems).

Ion: An atom or molecule with a positive or negative electrical charge.

Irradiate: Exposing a substance to radiation.

Isotope: Any of two or more variations of an element in which the nuclei have the same number of protons but a different number of neutrons so that their atomic masses differ.

– J –

Joining: A process that combines materials, such as bonding.

– L –

Lacustrine: The term “lacustrine” is related to the word “lake” - thus a lacustrine wetland is, by definition lake-associated. This category may include freshwater marshes, aquatic beds as well as lakeshores.

Latent cancer fatality (LCF): Death from cancer resulting from, and occurring some time after, exposure to ionizing radiation or other carcinogens.

Low-level waste (LLW): Radioactive waste that is not high-level waste, transuranic waste, spent nuclear fuel, or by-product tailings from the processing of uranium or thorium.

– M –

Maximum contaminant level (MCL): The maximum permissible level of a contaminant in water delivered to any user of a public water system.

Meteorology: The science dealing with the dynamics of the atmosphere and its phenomena, especially relating to weather.

Microelectronics: Integrated circuits and electronic devices constructed of individual circuit elements with dimensions of micrometers (10^{-6} meters [m]) on a carrier with dimensions of a centimeter (10^{-2} m).

Mission: An objective. The DOE has four missions (or business lines): national security, energy resources, environmental quality, and science and technology.

Mitigation: Mitigation includes: 1) avoiding an impact altogether by not taking a certain action or parts of an action; 2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; 3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; 4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or 5) compensating for an impact by replacing or providing substitute resources or environment.

Mixed waste: Waste that contains both “hazardous waste” and “radioactive waste” as defined in this glossary.

– N –

National Ambient Air Quality Standards (NAAQS): Standards defining the highest allowable levels of certain pollutants in the ambient air. Because the EPA must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants.

National Emission Standards for Hazardous Air Pollutants (NESHAP): Emissions standards set by the EPA for air pollutants that are not covered by the NAAQS and that at sufficiently high levels, may cause increased fatalities, irreversible health effects, or incapacitating illness.

National Pollutant Discharge Elimination System (NPDES): A provision of the *Clean Water Act* that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the EPA; a state; or, where delegated, a tribal government on an Indian reservation. The NPDES permit lists either permissible discharge, the level of cleanup technology required for wastewater, or both.

National Register of Historic Places (NRHP): The official list of the Nation’s cultural resources that are considered worthy of preservation. The National Park Service (NPS) maintains the list under direction of the Secretary of the Interior. Buildings, structures, objects, sites, and districts are included in the National Register (NR) for their importance in American history, architecture, archeology, culture, or engineering. Properties included on the NR range from large-scale, monumentally proportioned buildings to smaller scale, regionally distinctive buildings.

Neutron: An uncharged elementary particle with a mass slightly greater than that of the proton, found in the nucleus of every atom heavier than hydrogen-1.

Nonattainment area: An area that the EPA has designated as not meeting (that is, not being in attainment of) one or more of the NAAQS for criteria pollutants. An area may be in attainment for some pollutants, but not others.

Nonhazardous chemical waste: Chemical waste not defined as a RCRA hazardous waste.

Nonnuclear component: Any one of thousands of parts, not containing radioactive or fissile material (plutonium-239, uranium-233, or uranium-235), that are required in a nuclear weapon.

Nonproliferation: Preventing the spread of nuclear weapons, nuclear weapon materials, and nuclear weapon technology.

Notice of Intent (NOI): A notice published in the *Federal Register* (FR) that a NEPA document would be prepared and considered. An NOI describes the proposed action and alternatives and the Federal agency’s scoping process, and states the name and address of the person within the agency who can answer questions about the proposed action and EA.

Nuclear material: A composite term applied to 1) special nuclear material; 2) source material such as uranium or thorium or ores containing uranium or thorium; and 3) by-product material, which is any radioactive material that is made radioactive by exposure to the radiation incident to the process of producing or using special nuclear material.

Nuclear Nonproliferation Treaty: A treaty with the aim of controlling the spread of nuclear weapons technologies, limiting the number of nuclear weapons states, and pursuing, in good faith, effective measures relating to the cessation of the nuclear arms race. The treaty does not invoke stockpile reductions by nuclear states, and it does not address actions of nuclear states in maintaining their stockpiles.

Nuclear weapon: Any weapon in which the explosion results from the energy released by reactions involving atomic nuclei (fission, fusion, or both).

– O –

Occupational Safety and Health Administration

(OSHA): The Federal agency that oversees and regulates workplace health and safety, created by *Occupational Safety and Health Act* of 1970.

Organic chemicals: Chemicals that are based on bonds with the carbon atom. Organics can have certain properties, such as volatility, that are not typically associated with inorganics.

Organic polymer: Nonmetallic compounds that are basic molecular building blocks.

Ozone (O₃): The triatomic form of oxygen. In the stratosphere, ozone protects the earth from the sun's ultraviolet rays; but in lower levels of the atmosphere, ozone is considered an air pollutant.

– P-Q –

Particulate matter: Any finely divided solid or liquid material, other than uncombined water.

Perched aquifer: Groundwater separated from an underlying body of groundwater by unsaturated rock.

Person-rem: A unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in a specified population or group.

Plasma: a gas containing free *ions* and *electrons*, and therefore capable of conducting electric currents.

Plating: A process in which chemicals are used to coat a surface (typically metallic) with another material. The purpose is typically to improve the material properties such as rust protection.

Plutonium: A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years. Its most important isotope is fissile plutonium-239.

Prehistoric resource: For the SWEA, cultural resources produced before the arrival of the Spanish.

Programmatic Environmental Impact Statement

(PEIS): A broad-scope environmental impact statement that identifies and assesses the environmental impacts of a DOE program.

Proliferation: The spread of nuclear weapons and the materials and technologies used to produce them.

Proposed species: Any species of fish, wildlife, or plant that is proposed in the FR to be listed under Section 4 of the *Endangered Species Act*.

– R –

Radiation absorbed dose (rad): A unit of radiation absorbed dose. One rad is equal to an absorbed dose of 0.01 joules per kilogram (kg).

Radiation: The particles (alpha, beta, neutrons, and other subatomic particles) or photons (such as gamma rays and X-rays) emitted from the nucleus of unstable atoms as a result of radioactive decay.

Radioactive waste: In general, waste that is managed because of its radioactive content. Waste material that contains special nuclear or by-product material is subject to regulation as radioactive waste under the *Atomic Energy Act* (AEA).

Radioactivity: The spontaneous decay or disintegration of unstable atomic nuclei, accompanied by the emission of radiation.

Radiograph: An image produced by X-rays passing through an object.

Radionuclide or Radioisotope: An unstable isotope that undergoes spontaneous transformations, emitting radiation.

Recharge: The processes by which water is absorbed and added to an aquifer.

Record of Decision (ROD): A public document that records a Federal agency's decision on a proposed action for which the agency has prepared an environmental impact statement. A ROD identifies the alternatives considered in reaching the decision, the environmentally preferable alternative(s), factors balanced by the DOE in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not.

Region of influence (ROI): A geographic area within which project activities may affect a particular resource.

Rem: See "Roentgen equivalent, man."

Remediation: The process, or a phase in the process, of rendering areas contaminated by radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

Resource area: Analyses in the SWEA are grouped into two categories: resource areas (for example, infrastructure, geology and soils, and water resources) and topic areas (for example, transportation, waste generation, and accidents).

Resource Conservation and Recovery Act (RCRA)

hazardous waste: A hazardous waste, as defined by RCRA, is a solid waste, or combination of solid wastes, which, because of its quantity, concentration, physical, chemical, or infectious characteristics may 1) cause or significantly contribute to an increasing mortality or increase in serious irreversible, or incapacitating irreversible, illness; or 2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Riparian: Areas adjacent to rivers and streams that have a high density, diversity, and productivity of plant and animal species relative to nearby uplands.

Risk: The probability of a detrimental effect from exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of the event. However, separate presentation of probability and consequences is often more informative.

Roentgen: A unit of exposure to ionizing X- or gamma radiation equal to or producing 1 electrostatic unit of charge per cubic centimeter of air. It is approximately equal to 1 rad (a standard unit of absorbed dose of radiation).

Roentgen equivalent, man (rem): A unit of dose equivalent. The dose equivalent in rems equals the absorbed dose in rads in tissue multiplied by the appropriate quality factor and possibly other modifying factors.

Runoff: The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

– S –

Scoping: An early and open process for determining the scope of issues to be addressed in an environmental impact statement and for identifying the significant issues related to a proposed action.

Section 106 process: A *National Historic Preservation Act* (16 U.S.C. §470 *et seq.*) review process used to identify, evaluate, and protect cultural resources eligible for nomination to the National Register of Historic Places that may be affected by Federal actions or undertakings.

Seismic: Pertaining to any earth vibration, especially related to an earthquake.

Semiconductors: Any of various solid crystalline substances having electrical conductivity greater than insulators but less than good conductors.

Site-Wide Environmental Impact Statement

(SWEIS): A type of PEIS that analyzes the environmental impacts of all or selected functions at a DOE site. As part of its regulations for implementation of NEPA, the DOE prepares site-wide EISs for certain large, multiple-program DOE sites; it may prepare EISs or EAs for the other sites to assess the impacts of all or selected functions at those sites (10 CFR Part 1021.330 [c]).

Socioeconomics: The science or study of social and economic effects.

Species of Concern: Species for which further biological research and field studies are needed to resolve their conservation status.

START I and II: Terms that refer to negotiations between the U.S. and Russia (the former Soviet Union during START I negotiations) aimed at limiting and reducing nuclear arms. START I discussions began in 1982 and eventually led to a ratified treaty in 1988. The START II protocol, which has not been fully ratified, will attempt to further reduce the acceptable levels of nuclear weapons ratified in START I.

State Historic Preservation Officer (SHPO): A position in each U.S. state that coordinates state participation in the *National Historic Preservation Act* (16 U.S.C. §470 *et seq.*). The SHPO is a key participant in the Section 106 process, assisting in identifying eligible resources, evaluating effects of undertakings, and developing mitigation measures or management plans to reduce any adverse effects to eligible cultural resources.

Stockpile stewardship: Stockpile stewardship comprises the activities associated with research, design, development, and testing of nuclear weapons, and the assessment and certification of their safety and reliability.

Stratigraphy: Pertaining to the formation, composition, and sequence of stratified rocks.

Surface water: Water on the earth's surface, as distinguished from water in the ground (groundwater).

– T –

Threatened species: Any plants or animals that are likely to become an endangered species within the foreseeable future throughout all or a significant portion of their ranges and that have been listed as threatened by the USFWS or the NMFS.

Threshold limit values: The recommended concentration of contaminants workers may be exposed to according to the American Council of Governmental Industrial Hygienists (ACGIH).

Throughput: The number of items undergoing a process, or the amount of material consumed by a process.

Total effective dose equivalent: The sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Transuranic (TRU): An atom with an atomic number greater than uranium (92). Examples include plutonium and californium.

TRU waste: Without regard to source or form, waste contaminated with alpha-emitting TRU radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram at the time of assay.

Tritium: A radioactive isotope of hydrogen whose nucleus contains one proton and two neutrons.

Toxic Substances Control Act (TSCA) hazardous waste: TSCA hazardous waste is waste generated from TSCA materials exceeding identified limits in the Act and supporting regulations. SNL/CA manages two TSCA-regulated materials: PCBs and asbestos. The bulk of TSCA wastes generated at SNL/CA come from decontamination and decommissioning activities.

Turbidity: A cloudy condition in water due to suspended silt or organic matter.

– U –

Unsaturated zone: A subsurface porous region of the earth in which the pore space is not filled with water.

– V –

Volatile organic compounds (VOCs): A broad range of organic compounds, often halogenated, which vaporize at typical background or relatively low temperatures, such as benzene, chloroform, and methyl alcohol, and other solvents.

– W –

Wafer: Another word for a computer chip.

Wetland: An area that is inundated by surface or ground-water with a frequency sufficient to support and, under normal circumstances, does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Travel corridor: Passageways used by animals to move between various parts of their home range or, during migration, to move from summer (breeding) to winter ranges.

– X-Y-Z

X-ray: A high-energy photon.

Administration, U.S. Department of Commerce at (202) 482-5225. This meeting is physically accessible to people with disabilities. Requests for sign language interpretation or other auxiliary aids should be directed to ETI.

Dated: January 29, 2002.

Carlos F. Montouliou,
Director, Office of Environmental
Technologies Industries.

[FR Doc. 02-2569 Filed 2-1-02; 8:45 am]

BILLING CODE 3510-DR-P

DEPARTMENT OF DEFENSE

Office of the Secretary

Overseas Dependents' School National Advisory Panel (NAP) on the Education of Dependents with Disabilities

AGENCY: Department of Defense.

ACTION: Notice.

SUMMARY: Pursuant to Pub. L. 92-463, as amended, the Federal Advisory Committee Act, notice is hereby given that a meeting of the NAP on the Education of Dependents with Disabilities is scheduled to be held from 8:30 a.m. to 4 p.m. on April 16-18, 2002. The meeting is open to the public and will be held in the Holiday Inn Hotel conference room at 4610 North Fairfax Drive, Arlington, Virginia 22203. The purpose of the meeting is to review the responses to the panel's recommendations from its May 8-10, 2001 meeting; review and comment on data and information provided by DoDEA; and review and comment on reports from subcommittees. Persons desiring to attend the meeting or desiring to make oral presentations or submit written statements for consideration by the panel must contact Ms. Diana Patton at (703) 696-4387 extension 1947.

Dated: January 28, 2002.

L.M. Bynum,
Alternate OSD Federal Register Liaison
Officer, Department of Defense.
[FR Doc. 02-2590 Filed 2-1-02; 8:45 am]
BILLING CODE 5001-08-M

DEPARTMENT OF DEFENSE

Office of the Secretary

Defense Science Board

AGENCY: Department of Defense.

ACTION: Notice of advisory committee meeting date change.

SUMMARY: On Friday, December 14, 2001 (66 FR 64810), the Department of

Defense announced closed meeting of the Defense Science Board (DSB) Task Force on Defense Against Terrorists' Use of Biological Weapons. One of the announced meetings has been rescheduled from February 18-19, 2002, to February 19-20, 2002, due to the holiday. The meeting will be held at Strategic Analysis Inc., 3601 Wilson Boulevard, Suite 600, Arlington, VA.

Dated: January 28, 2002.

Patricia L. Toppings,
Alternate OSD Federal Register Liaison
Officer, Department of Defense.

[FR Doc. 02-2591 Filed 2-1-02; 8:45 am]

BILLING CODE 5001-08-M

DEPARTMENT OF ENERGY

National Nuclear Security Administration; Notice of Intent To Prepare a Sitewide Environmental Assessment for Sandia National Laboratories, California

AGENCY: Office of Kirtland Site Operations, National Nuclear Security Administration, Department of Energy.

ACTION: Notice of intent.

SUMMARY: The Department of Energy (DOE), National Nuclear Security Administration (NNSA), Office of Kirtland Site Operations (OKSO), announces its intent to prepare a Site-Wide Environmental Assessment (SWEA) for its Sandia National Laboratories/California (SNL/CA), a DOE research and development laboratory located east of Livermore, California. The SWEA will address operations and activities that DOE foresees at SNL/CA for approximately the next 5 to 10 years. The purpose of this Notice of Intent (Notice) is to invite public participation in the SWEA scoping process and to encourage public dialogue on alternatives that should be considered.

DATES: The public scoping period starts with the publication of this Notice in the **Federal Register** and will continue until March 6, 2002. Public scoping meetings are scheduled to be held February 20, 2002.

ADDRESSES: Public scoping meetings are scheduled to be held as follows: February 20, 2002, 1 p.m.-4 p.m. and 6 p.m.-9 p.m., at Lawrence Livermore National Laboratory, Visitors Center Auditorium (T-6525) at the Eastgate entrance from Greenville Road.

The purpose of these meetings is to receive oral and written comments from the public. The meetings will use a format to facilitate dialogue between DOE and the public and will provide an

opportunity for individuals to provide written or oral statements. The DOE will publish additional notices on the date, times, and location of the scoping meeting in local newspapers in advance of the scheduled meeting. Any necessary changes will be announced in the local media. In addition to providing oral comments at the public scoping meetings, all interested parties are invited to record their comments, ask questions concerning the SNL/CA SWEA, or request to be placed on the SNL/CA SWEA mailing or document distribution list.

The DOE invites other Federal agencies, Native American tribes, State and local governments, and the general public to comment on the scope of this SWEA. DOE will consider all comments received or postmarked by that date in defining the scope of this SWEA. Comments received or postmarked after that date will be considered to the extent practicable.

Written comments or suggestions concerning the scope of the SNL/CA SWEA should be directed to: Ms. Susan D. Lacy, U.S. Department of Energy, National Nuclear Security Administration, Office of Kirtland Site Operations, P.O. Box 5400, Albuquerque, New Mexico 87185-5400, by facsimile at (505) 845-4710, or email at slacy@doeal.gov. Please mark envelopes, faxes, and email: "Sandia National Laboratories, California Site-Wide Environmental Assessment Comments." For express delivery services, the appropriate address is Pennsylvania and H Streets, Kirtland Air Force Base, Albuquerque, NM 87116.

FOR FURTHER INFORMATION CONTACT: Susan Lacy at the address and facsimile number listed above.

For Information On DOE's NEPA Process Contact: Ms. Carol Borgstrom, Director, Office of NEPA Policy and Assistance (EH-42), U.S. Department of Energy, 1000 Independence Avenue SW., Washington, DC 20585.

Ms. Borgstrom can be reached at (202) 586-4600, by facsimile at (202) 586-7031.

SUPPLEMENTARY INFORMATION: Copies of all written comments and transcripts of all oral comments will be available at the following location:

Sandia National Laboratories,
California, 7011 East Avenue, Visitor
Entrance, Building 911 Lobby,
Livermore, California.

and
Livermore Public Library, 1000 South
Livermore Avenue, Livermore,
California.

SNL/CA's Mission

Sandia Corporation is a prime contractor to the Department of Energy (DOE). Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates Sandia National Laboratories (SNL), with principal facilities in Albuquerque, NM; Livermore, CA; Tonopah, NV; and Kauai, HI. As one of the United States' multipurpose national laboratories, SNL develops solutions to a wide range of problems facing the country. SNL's mission includes advanced military technology, energy and environmental research, arms control/nonproliferation, and advanced manufacturing technology. Operations at SNL's California facilities in Livermore comprise four broad areas:

Vital Role in Weapons: This program involves work in support of our nation's nuclear weapons program. These activities include weapon systems, weapon components/subsystems (gas transfer, use control, and instrumentation), reliability assessments, engineering sciences, advanced computing/networking, and supporting research.

Integrated Systems and Technologies: This program applies strong systems engineering practices and selected Sandia technologies to providing solutions for evolving national security needs, as well as to contributing to our nation's economic competitiveness. Work includes detection, nonproliferation, and demilitarization of weapons of mass destruction; development of secure, distributed information systems; applied research and development on combustion systems and other energy-intensive industrial processes; and advances in microsystems and micro-fabrication. Partnering with industry is an important and integral aspect of many of these activities.

Strong Research Base: This program performs world-class science in key competencies such as materials and engineering sciences, chemical sciences, information sciences, and an emerging competency in biological sciences. The work builds on both modeling and experimentation to provide linkages to global science and to ensure a seamless transition to many applications within the Laboratories Weapons, and Integrated Systems and Technologies roles.

Exemplary Operations: This program partners with the three business areas described above to ensure an infrastructure that provides a competitive advantage in implementing the site strategy. Most of the site's

support and operations services are included in this business area. The site operates under the scope of Federal, State, and local regulatory authorities and has obtained all applicable operating permits.

SNL/CA has an annual budget of approximately \$130 million and employs approximately 1,080 people. It occupies 410 acres in Alameda County California adjacent to the City of Livermore.

In addition to SNL/CA, Lawrence Livermore National Laboratory, a DOE/NNSA Laboratory, is located in close proximity to SNL/CA. The environmental impacts of operations at both the DOE/NNSA laboratories will be included in the discussion of cumulative impacts in the SWEA. DOE welcomes comments on this approach.

Role of the SWEA in the DOE NEPA Compliance Strategy

The SWEA will be prepared pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality's NEPA regulations (40 CFR parts 1500–1508) and the DOE NEPA regulations (10 CFR Part 1021). The DOE has a policy (10 CFR 1021.330) to prepare site-wide documents for certain large, multiple-facility sites, such as SNL/CA. The purpose of a SWEA is to provide DOE and its stakeholders with an analysis of the environmental impacts caused by ongoing and reasonably foreseeable new operations and facilities and reasonable alternatives at a DOE site, to provide a basis for site-wide decision making, and to improve and coordinate agency plans, functions, programs, and resource utilization. The SWEA provides an overall NEPA baseline so that the environmental effects of proposed future changes in programs and activities can be compared with the baseline. A SWEA also enables DOE to "tier" its NEPA documents at a site to eliminate repetitive discussion of the same issues in future project-specific NEPA studies, and to focus on the actual issues ready for decisions at each level of environmental review. The NEPA process allows for Federal, Native American, state and local government, and public participation in the environmental review process. The Final Environmental Impact Statement and Environmental Impact Report for Continued Operation of Lawrence Livermore National Laboratory and Sandia National Laboratories, Livermore [DOE/EIS-0157], August 1992, is the existing site-wide environmental document for SNL/CA.

Related NEPA Reviews

The following is a list of recent NEPA documentation that affects the scope of this SWEA. The summaries below are intended to familiarize the reader with the purpose of these other NEPA reviews and how SNL/CA is considered in them.

Programmatic NEPA Reviews

The Waste Management Programmatic Environmental Impact Statement (PEIS) (DOE/EIS-0200) analyzes the DOE plan to formulate and implement a national integrated waste management program. The Final PEIS was published in May 1997. The Nonnuclear Consolidation Environmental Assessment [DOE/EA-0792] was published in June, 1993. A Finding of No Significant Impact on the Consolidation of the Nonnuclear Component within the Nuclear Weapons Complex was signed on September 8, 1993. The Stockpile Stewardship and Management PEIS was published in 1996 [DOE/EIS-0236] and a Record of Decision (ROD) was signed by the Secretary of Energy on December 19, 1996. Inherent in the many decisions made in the ROD was to continue the operations of the three national weapons laboratories, SNL being one of the three. The ROD emphasized stockpile stewardship as an essential program to maintain the safety and reliability of the stockpile in the absence of underground nuclear testing, therefore requiring enhanced experimental capabilities in the future at the three national weapons laboratories.

Preliminary Alternatives

The scoping process is an opportunity for the public to assist the DOE in determining the alternatives and issues for analysis in the SWEA. DOE welcomes specific comments or suggestions on the content of the proposed preliminary alternatives, or on other alternatives that could be considered. DOE is proposing to continue current operations at SNL/CA. Two preliminary alternatives were identified during internal scoping: the No Action alternative and the Expanded Operations alternative. DOE also considered a Reduced Operations alternative. However, current activities at SNL/CA are at the minimum level of operations needed to protect the technical capability and competency to support the site's assigned missions. Therefore, the Department plans to include the Reduced Operations alternative in the SWEA as an alternative considered but eliminated from further analysis.

No Action. NEPA regulations require analysis of the No Action alternative to provide a benchmark for comparison with environmental effects of the other alternatives. The No Action alternative would continue current facility operations throughout SNL/CA in support of assigned missions, and for this SWEA, it is also the proposed action. With respect to the Defense Programs mission, the future role of SNL was defined at the programmatic level by the Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SSM PEIS) Record of Decision (ROD) (61 FR 68014) (December 26, 1996).

Expanded Operations. This alternative would reflect an increase in facility operations to the highest levels that can be supported by current facilities. This could require construction projects to address safety, security and environmental compliance as well as to support reconfiguration of facility equipment and operations to optimize use of current facilities' capabilities. This alternative will set the bounding conditions for assessing the environmental impacts.

Preliminary Issues Identified by Internal Staffing

The issues listed below have been identified for analysis in this SWEA as being applicable to the operation of SNL/CA. The list is tentative and is intended to facilitate public comment on the scope of this SWEA. It is not intended to be all-inclusive, nor does it imply any predetermination of potential impacts. The SWEA will describe the potential environmental impacts of the alternatives, using available data where possible and obtaining additional data where necessary. In accordance with the Council on Environmental Quality Regulations (40 CFR 1500.4 and 1502.21), other documents, as appropriate, may be incorporated into the impacts analyses by reference, in whole or in part. DOE specifically welcomes suggestions and comments for the addition or deletion of items on the following list of potential effects:

- Potential effects on the public and workers from exposures to radiological and hazardous materials during normal operations and from reasonably postulated accidents;
- Potential effects on air and groundwater quality from normal operations and potential accidents;
- Potential cumulative effects of past, present, and future operations at SNL/CA (this SWEA will include effects of current and reasonably foreseeable federal actions including Lawrence Livermore National Laboratory);

- Effects on waste management practices and activities, including pollution prevention, waste minimization, and waste stream characterization; and

- Potential impacts of noise levels to the ambient environment and sensitive receptors.

Classified Material

DOE will review classified material while preparing this SWEA. Within the limits of classification, DOE will provide to the public as much information as possible. Any classified material required to explain the purpose and need for action, or the uses, materials, or impacts analyzed in this SWEA, will be segregated into a classified appendix or supplement.

Issued in Albuquerque, New Mexico on January 29, 2002.

Michael J. Zamorski,

Director, U.S. Department of Energy, Office of Kirtland Site Operations.

(FR Doc. 02-2700 Filed 2-1-02; 8:45 am)

BILLING CODE 6450-01-P

DEPARTMENT OF ENERGY

Office of Science Financial Assistance Program Notice 02-15; Low Dose Radiation Research Program—Basic Research

AGENCY: Department of Energy.

ACTION: Notice inviting grant applications.

SUMMARY: The Office of Biological and Environmental Research (OBER) of the Office of Science (SC), U.S. Department of Energy (DOE) and the Office of Biological and Physical Research (OBPR), National Aeronautics and Space Administration (NASA), hereby announce their interest in receiving grant applications for well justified research that supports the DOE/OBER Low Dose Radiation Research Program, and that may include complementary research of direct interest to the NASA/OBPR Space Radiation Health Program that is of sufficient scientific merit to qualify for partial NASA support. These Programs use modern molecular tools to develop a better scientific basis for understanding exposures and risks to humans from low dose and low fluence radiation.

Research areas of particular programmatic interest include:

- Endogenous oxidative damage versus low dose radiation-induced damage
- Radio-adaptive responses
- Bystander effects
- Individual genetic susceptibility to low dose radiation exposure

Please review the Supplementary Information section below for further discussion of programmatic needs.

DATES: Preapplications (letters of intent) are strongly encouraged, but not mandatory. A response to preapplications discussing the potential program relevance of a formal application will be communicated within one week.

The deadline for receipt of formal applications is 4:30 P.M., E.S.T. April 16, 2002, in order to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2002 and Fiscal Year 2003.

ADDRESSES: One-page preapplications referencing Program Notice 02-15, should be sent by e-mail to joanne.corcoran@science.doe.gov, or by facsimile transmission to (301) 903-8521. Preapplications will also be accepted if mailed to the following address: Ms. Joanne Corcoran, Office of Biological and Environmental Research, SC-72, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290.

Formal applications, referencing Program Notice 02-15, should be sent to: U.S. Department of Energy, Office of Science, Grants and Contracts Division, SC-64, 19901 Germantown Road, Germantown, MD 20874-1290, ATTN: Program Notice 02-15. This address must be used when submitting applications by U.S. Postal Service Express, commercial mail delivery service, or when hand carried by the applicant.

FOR FURTHER INFORMATION CONTACT: Dr. Noelle Metting for general scientific or technical questions, telephone: (301) 903-8309, e-mail: noelle.metting@science.doe.gov, Office of Biological and Environmental Research, SC-72, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290. For specific information on NASA/OBPR interests, contact Dr. Walter Schimmerling, telephone: (202) 358-2205, e-mail: wschimmerling@hq.nasa.gov, NASA Headquarters, Mail Code UB, Washington, DC 20546-0001.

SUPPLEMENTARY INFORMATION: The DOE/OBER Low Dose Radiation Research Program is faced with the challenge of conducting research that can be used to inform the development of future national radiation risk policy for the public and the workplace. For the present solicitation, DOE/OBER is chiefly concerned with very low doses of low Linear Energy Transfer (LET) radiation (electrons, x- and gamma-rays). The focus of research should be

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