



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 (ft<sup>3</sup>).

#### **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)<sup>a</sup>**

Calendar Year	Total Reportable Cases Rate	Lost Work Day Cases Rate	Lost Work Days Rate
1999	5.1 (6.3) <sup>a</sup>	1.2 (3.1) <sup>a</sup>	0.8 (1.9) <sup>a</sup>
2000	4.2 (6.5) <sup>a</sup>	0.6 (3.3) <sup>a</sup>	0.3 (2.0) <sup>a</sup>
2001 <sup>b</sup>	2.9	1.1	0.1
3-Year Average	4.1 (6.5) <sup>c</sup>	1.0 (3.2) <sup>c</sup>	0.4 (2.0) <sup>c</sup>

Source: SNL 2001b, 2002a

<sup>a</sup>State of California Injury and Illness data is for all industries including State and local government.

<sup>b</sup>State of California Injury and Illness data is for 2001 were not available at the time of the Draft SWEA.

<sup>c</sup>Three 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