

Organization of the Site-Wide Environmental Impact Statement

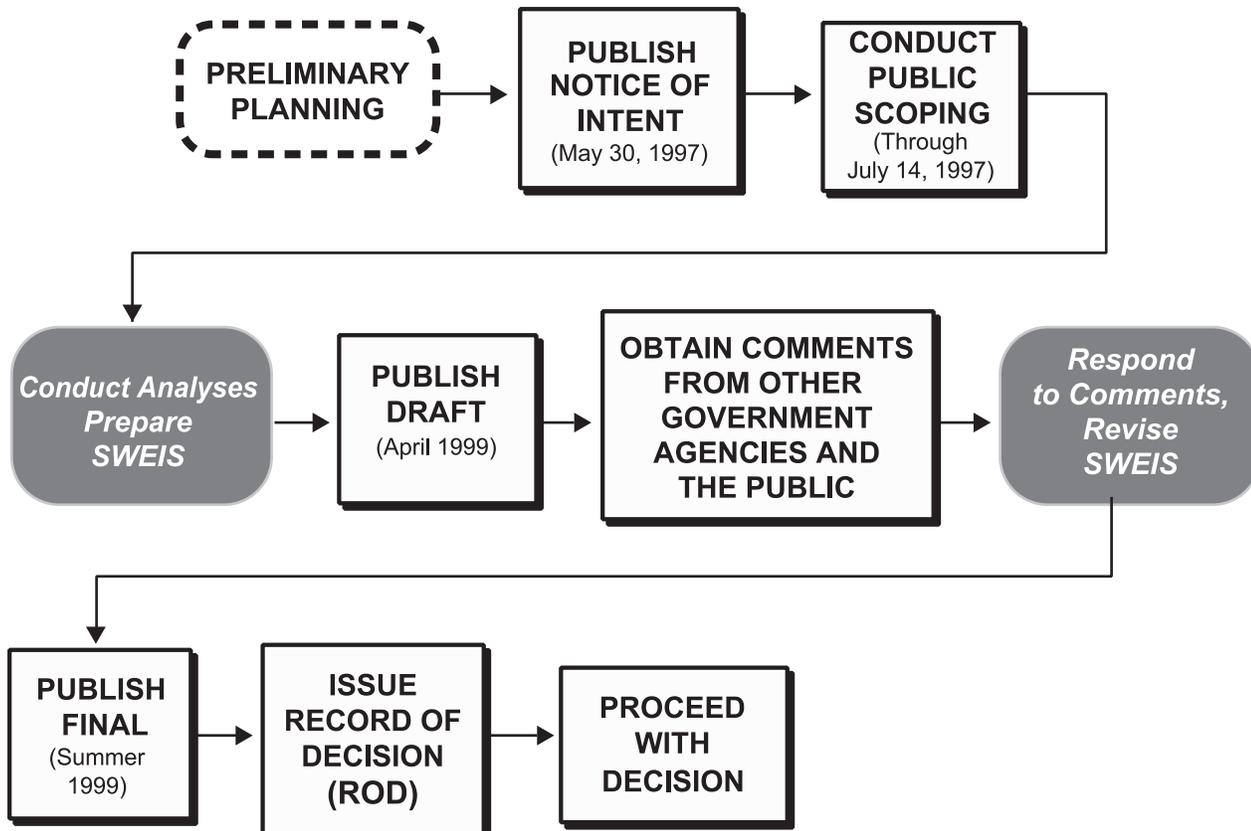
The Site-Wide Environmental Impact Statement (SWEIS) is divided into a Summary and two volumes.

The Summary provides an overview of material presented in the SWEIS, including background, purpose and need, alternatives, existing environment, and environmental impacts.

Volume I analyzes the three alternatives (including the No Action Alternative) as they relate to U.S. Department of Energy (DOE) missions assigned to Sandia National Laboratories/New Mexico (SNL/NM): national security, energy resources, environmental quality, science and technology. Volume I contains 15 chapters. Chapter 1 provides introductory information on background, site missions, purpose and need, decisions to be made, related *National Environmental Policy Act* analyses, and public participation. Chapter 2 describes programs and facility operations at SNL/NM (including selected facilities). Chapter 3 describes the alternatives. Chapter 4 provides a discussion of the affected environment, and Chapter 5 presents an analysis of environmental consequences of each of the proposed alternatives. Chapter 6 describes potential cumulative effects (including effects from other DOE-funded operations and other activities on Kirtland Air Force Base). Chapter 7 contains applicable laws, regulations, and other requirements. Chapters 8 through 15 include references; a list of preparers; conflict of interest statements; list of agencies, organizations, and individuals who received copies of the Draft SWEIS; list of agencies and people contacted; glossary; notice of intent; and index.

Volume II contains appendixes of technical details in support of the environmental analyses presented in Volume I. These appendixes contain information on the following issues: material inventory, water quality analysis, cultural resources, air quality analysis, human health analysis, accidents analysis, transportation analysis, and waste generation.

The SWEIS Process



COVER SHEET

RESPONSIBLE AGENCY: U.S. DEPARTMENT OF ENERGY (DOE)

COOPERATING AGENCY: U.S. AIR FORCE

TITLE: Draft Site-Wide Environmental Impact Statement for Sandia National Laboratories/New Mexico (DOE/EIS-0281)

CONTACT: For further information or to submit comments concerning the Draft Site-Wide Environmental Impact Statement (SWEIS), contact

Julianne Levings, NEPA Document Manager
U.S. DOE, Albuquerque Operations Office
P.O. Box 5400, Albuquerque, NM 87185
Telephone: 1-888-635-7305, Fax: 505-845-6392

For further information or to submit comments by way of electronic mail, contact

www.nepanet.com

For general information on DOE's *National Environmental Policy Act* (NEPA) process, contact

Carol Borgstrom, Director
Office of NEPA Policy and Assistance (EH-42)
U.S. DOE, 1000 Independence Avenue SW, Washington, DC 20585
Telephone: 202-586-4600 or leave a message at 1-800-472-2756

Abstract: The DOE proposes to continue operating the Sandia National Laboratories/New Mexico (SNL/NM) located in central New Mexico. The DOE has identified and assessed three alternatives for the operation of SNL/NM: (1) No Action, (2) Expanded Operations, and (3) Reduced Operations. In the No Action Alternative, the DOE would continue the historical mission support activities SNL/NM has conducted at planned operational levels. In the Expanded Operations Alternative, the DOE would operate SNL/NM at the highest reasonable levels of activity currently foreseeable. Under the Reduced Operations Alternative, the DOE would operate SNL/NM at the minimum levels of activity necessary to maintain the capabilities to support the DOE mission in the near term. Under all of the alternatives, the affected environment is primarily within 50 miles (80 kilometers) of SNL/NM. Analyses indicate little difference in the environmental impacts among alternatives.

Public Comments: Comments on the Draft SWEIS may be submitted through the end of the 60-day comment period (expected to be June 15, 1999), which will commence with the publication of the Environmental Protection Agency's *Federal Register* Notice of Availability for this document. Comments may be submitted in writing, orally, or by electronic mail to the DOE at the addresses and phone number indicated above. Oral or written comments may also be submitted at public meetings to be held during the comment period on dates and locations to be announced in the *Federal Register* and via other public media shortly after issuance of the Draft SWEIS. Comments submitted will be considered in preparation of the Final SWEIS.

This page was intentionally left blank.

SUMMARY

Table of Contents

Purpose and Need	S-1
Scoping Process	S-1
Alternatives	S-5
SNL/NM Facilities	S-5
Affected Environment	S-6
Location	S-6
Land Use and Visual Resources	S-6
Areas Surrounding KAFB	S-6
KAFB Land Ownership	S-8
USAF Activities on KAFB	S-8
SNL/NM Activities on KAFB	S-8
Infrastructure	S-8
Geology and Soils	S-10
Water Resources	S-10
Biological and Ecological Resources	S-10
Cultural Resources	S-10
Air Quality	S-10
Human Health and Worker Safety	S-11
Transportation	S-11
Waste Generation	S-11
Noise and Vibration	S-12
Socioeconomics	S-12
Environmental Justice	S-12
Environmental Consequences	S-12
Land Use and Visual Resources	S-12
Infrastructure	S-12
Geology and Soils	S-13
Water Resources and Hydrology	S-13
Biological and Ecological Resources	S-13
Cultural Resources	S-14
Air Quality	S-14
Human Health	S-14
Transportation	S-15
Waste Generation	S-15
Noise and Vibration	S-16
Socioeconomics	S-16

Environmental Justice	S-16
Accidents	S-16
Cumulative Effects	S-17
Other DOE Facilities	S-17
USAF Operations	S-17
NonDOE or USAF Operations	S-17
Analysis Results	S-17
Mitigation Measures	S-18

List of Figures

Figure S–1. DOE Funding of SNL/NM	S-3
Figure S–2. Site-Wide Environmental Impact Statement Preparation Timeline	S-4
Figure S–3. General Location of KAFB	S-7
Figure S–4. Locations of SNL/NM Technical Areas	S-9

List of Tables

Table S–1. DOE Mission Lines and DOE Office Mission Statements	S-2
Table S–2. Comparison of Potential Consequences of Continued Operations at SNL/NM	S-19
Table S–3. Comparison of Potential Consequences for Accident Scenarios at SNL/NM	S-24

Summary Acronyms, Abbreviations, and Units of Measure

ac	acre
BLM	Bureau of Land Management
CFR	<i>Code of Federal Regulations</i>
CWL	Chemical Waste Landfill
DOE	U.S. Department of Energy
DU	depleted uranium
ER	Environmental Restoration (Project)
FR	<i>Federal Register</i>
ft ³	cubic feet
FY	fiscal year
gal	gallon
IRP	Installation Restoration Program
KAFB	Kirtland Air Force Base
kg	kilogram
kw	kilowatt
M	million
MEI	maximally exposed individual
mi	mile
mrem	millirem
mrem/yr	millirems per year
MWh	megawatt hour
NEPA	<i>National Environmental Policy Act</i>
NESHAP	<i>National Emissions Standards for Hazardous Air Pollutants</i>
NOI	Notice of Intent
OEL	occupational exposure limits
PCB	polychlorinated biphenyl
R&D	research & development
rem	Roentgen equivalent, man
SNL/NM	Sandia National Laboratories/New Mexico
SWEIS	Site-Wide Environmental Impact Statement
TA	technical area
TCP	traditional cultural property
U.S.C.	<i>United States Code</i>
USAF	U.S. Air Force
USFS	U.S. Forest Service

Note: Italics are used to denote formal names or titles of acts, published documents, or computer models.

Metric Conversion Chart					
TO CONVERT FROM U.S. CUSTOMARY INTO METRIC			TO CONVERT FROM METRIC INTO U.S. CUSTOMARY		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length					
inches	2.540	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.03281	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.6214	miles
Area					
square inches	6.452	square centimeters	square centimeters	0.1550	square inches
square feet	0.09290	square meters	square meters	10.76	square feet
square yards	0.8361	square meters	square meters	1.196	square yards
acres	0.4047	hectares	hectares	2.471	acres
square miles	2.590	square kilometers	square kilometers	0.3861	square miles
Volume					
fluid ounces	29.57	milliliters	milliliters	0.03381	fluid ounces
gallons	3.785	liters	liters	0.2642	gallons
cubic feet	0.02832	cubic meters	cubic meters	35.31	cubic feet
cubic yards	0.7646	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.35	grams	grams	0.03527	ounces
pounds	0.4536	kilograms	kilograms	2.205	pounds
short tons	0.9072	metric tons	metric tons	1.102	short tons
Temperature					
Fahrenheit (°F)	subtract 32, then multiply by 5/9	Celsius (°C)	Celsius (°C)	multiply by 9/5, then add 32	Fahrenheit (°F)
kelvin (°k)	subtract 273.15	Celsius (°C)	kelvin (°k)	Multiply by 9/5, then add 306.15	Fahrenheit (°F)

Metric Prefixes			
PREFIX	EXPONENT CONVERTED TO WHOLE NUMBERS	PREFIX	EXPONENT CONVERTED TO WHOLE NUMBERS
atto-	$10^{-18} = 0.000,000,000,000,000,001$	deka-	$10^1 = 10$
femto-	$10^{-15} = 0.000,000,000,000,001$	hecto-	$10^2 = 100$
pico	$10^{-12} = 0.000,000,000,001$	kilo-	$10^3 = 1,000$
nano-	$10^{-9} = 0.000,000,001$	mega-	$10^6 = 1,000,000$
micro-	$10^{-6} = 0.000,001$	giga-	$10^9 = 1,000,000,000$
milli	$10^{-3} = 0.001$	tetra-	$10^{12} = 1,000,000,000,000$
centi	$10^{-2} = 0.01$	peta-	$10^{15} = 1,000,000,000,000,000$
deci-	$10^{-1} = 0.1$	exa-	$10^{18} = 1,000,000,000,000,000,000$
Note: $10^0 = 1$			

This page was intentionally left blank.

SUMMARY

PURPOSE AND NEED

As directed by the President and Congress, the U.S. Department of Energy (DOE) provides stewardship and management of our country's nuclear weapons stockpile. In addition, the DOE has national security, energy resources, environmental quality, and science and technology mission lines, which it performs at a number of facilities across the United States (Table S-1). The DOE directs and funds Sandia National Laboratories/New Mexico (SNL/NM) activities in support of its programs and missions (Figure S-1). In turn, SNL/NM's facilities and operations are designed to meet the requirements of the programs, projects, and activities assigned to the laboratory.

The DOE will need to continue to meet its responsibilities for national security, energy resources, environmental quality, and science and technology. These needs are met, in part, by national laboratories. The primary purpose for SNL/NM is to serve as a national resource for scientific, technical, and engineering expertise, with a special focus on national security. The DOE needs to continue to fulfill its responsibilities as mandated by statute, Presidential Decision Directive, and congressional authorization and appropriation. The DOE goal in meeting this need is to do so in a manner that protects human health and the environment. This Site-Wide Environmental Impact Statement (SWEIS) evaluates the environmental impacts associated with alternative levels of operation at SNL/NM that will meet these responsibilities.

As part of the DOE's strategy for implementing the *National Environmental Policy Act* (NEPA) (42 United States Code [U.S.C.] §4321), the Department prepares a SWEIS to examine environmental impacts of operations at multi-program sites (10 Code of Federal Regulations [CFR] §1021.330). In May 1977, the DOE (formerly Energy Research & Development Administration) prepared the *Environmental Impact Assessment, Sandia Laboratories, Albuquerque, New Mexico* for the operation of SNL/NM. Since that time, site programs and activity levels have changed. Based on these changes and SNL/NM's status as a multi-program site, the DOE has performed a thorough environmental analysis of ongoing SNL/NM operations and proposed operations to 2008. This SWEIS is the result of that analysis.

SCOPING PROCESS

Figure S-2 shows a timeline for the preparation of the SNL/NM SWEIS. A public scoping period began after the publication of the Notice of Intent (NOI) on May 30, 1997 (62 Federal Register [FR] 29332), and continued until July 14, 1997. The NOI informed the public that the DOE intended to prepare a SWEIS on SNL/NM operations and invited other Federal agencies, Native American tribes, state and local governments, and the public to participate in the scoping process.

The DOE presented information on its SWEIS proposal at public scoping meetings on June 23, 1997, in Albuquerque, New Mexico. The public was invited to present oral and/or written comments at the meetings or by mail, facsimile, electronic mail, or telephone. Twenty-nine individuals and organizations submitted requests for information or presented oral or written comments. These comments covered a range of issues, including the following:

- impacts of SNL/NM operations on natural and cultural resources, including air, groundwater, surface water, biological and ecological resources, and Native American cultural and religious sites;
- SNL/NM mission, policy, management, and alternatives for future operations;
- methods to be used for analyzing impacts and impartiality of the SWEIS;
- socioeconomic impacts including those affecting minority, low-income, and Native American populations (environmental justice);
- cleanup of known contamination or waste discharge and compliance with environmental regulations;
- potential seismic effects;
- health and safety of onsite workers and the surrounding community;
- impacts from SNL/NM operations on land use;
- level of public involvement in SWEIS preparation; and
- relationship of SNL/NM operations to city and county transportation planning policies.

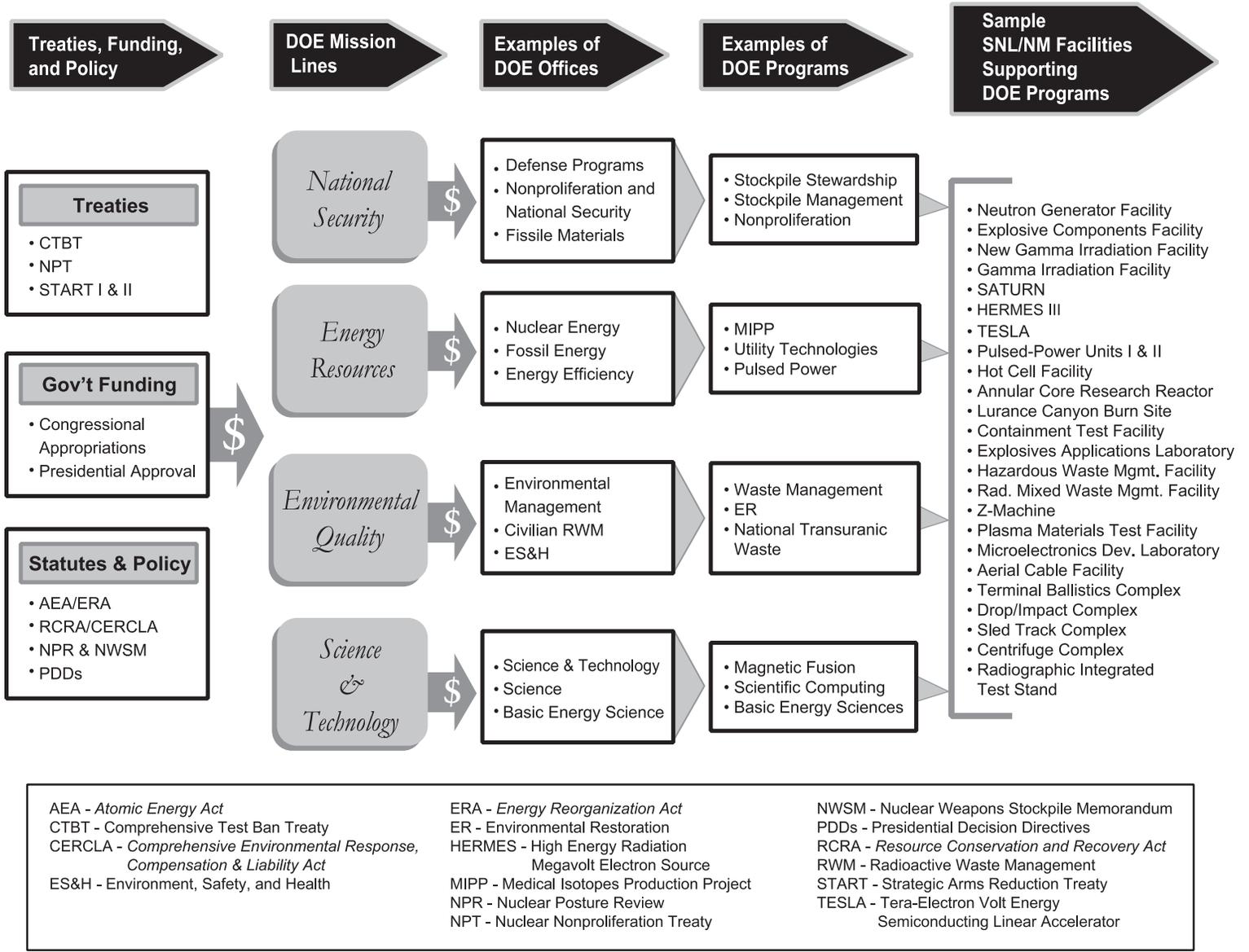
These comments were distributed to experts for each resource or issue area to ensure that they were considered during the preparation of the SWEIS.

Table S–1. DOE Mission Lines and DOE Office Mission Statements

DOE MISSION LINE	DOE OFFICE	MISSION STATEMENT
<i>National Security</i>	Defense Programs	To ensure the safety, reliability, and performance of nuclear weapons without underground testing
	Nonproliferation & National Security	To support DOE activities related to nonproliferation, nuclear safeguards and security, classification and declassification, and emergency management
	Fissile Materials Disposition	To reduce the global nuclear danger associated with inventories of surplus weapons usable fissile materials
<i>Energy Resources</i>	Nuclear Energy	To support the successful decontamination and decommissioning of nuclear reactor sites; certify next-generation nuclear power plants; ensure the availability of industrial and medical isotopes and radioisotope power systems for space exploration
	Fossil Energy	To enhance U.S. economic and energy security
	Energy Efficiency	To lead the nation to a stronger economy, a cleaner environment, and more secure future through development and deployment of sustainable energy technologies
<i>Environmental Quality</i>	Environmental Management	To develop a clear national cleanup strategy with a strong commitment to results that will gain the trust and confidence of Congress, the states, Native American tribes, and the public
	Civilian Radioactive Waste Management	To develop, construct, and operate a system for spent nuclear fuel and high-level radioactive waste disposal, including a permanent geologic repository, interim storage capability, and transportation system
	Environment, Safety, & Health	To protect the environment and the health and safety of workers at DOE facilities and the public
<i>Science & Technology</i>	Science & Technology	To manage and direct targeted basic research and focused, solution-oriented technology development
	Science	To improve and advance the science and technology foundations and effective use and management of DOE laboratories
	Basic Energy Science	To advance the scientific and technical knowledge and skills needed to develop and use new and existing energy resources in an economically viable and environmentally sound manner

Source: DOE 1997c

Figure S-1. DOE Funding of SNL/NM
The DOE's funding flows through various DOE offices to SNL/NM.



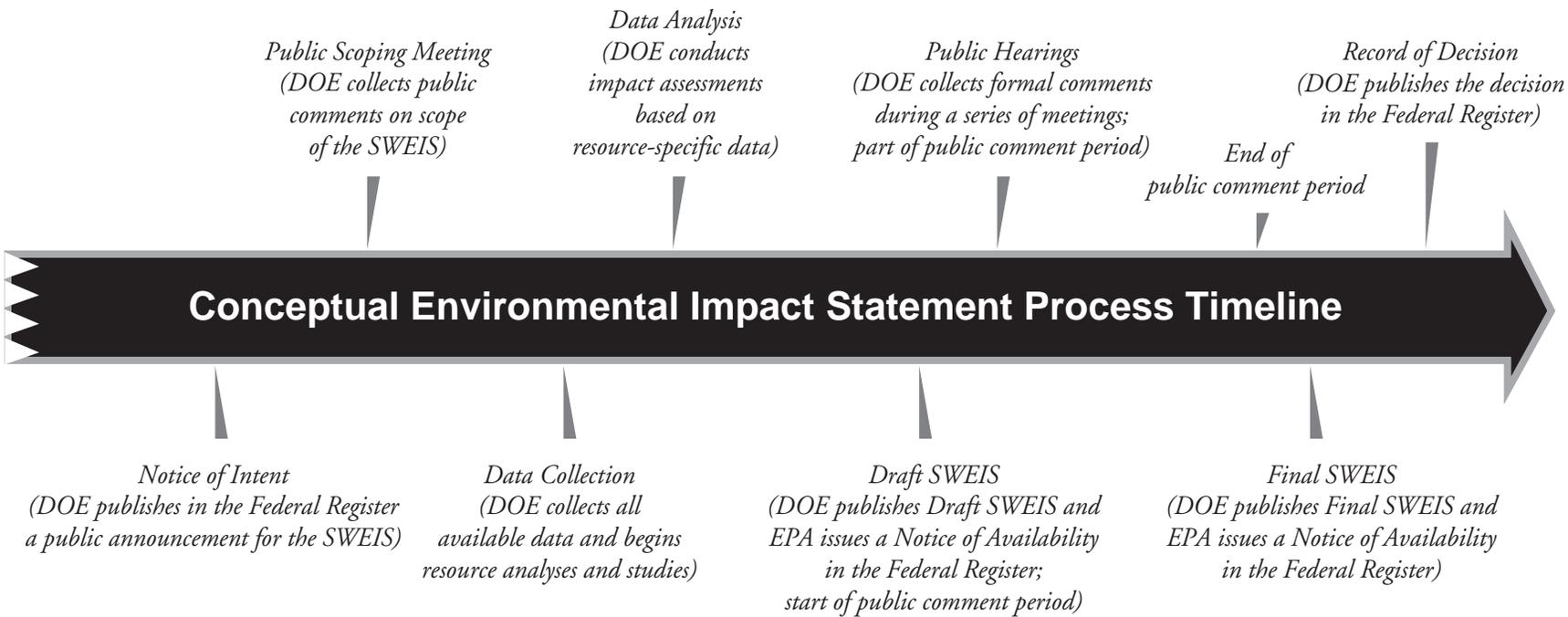


Figure S-2. Site-Wide Environmental Impact Statement Preparation Timeline
SWEIS preparation will follow the typical NEPA timeline.

ALTERNATIVES

The DOE identified the following three alternatives that would meet its purpose and need, as well as support existing and potential future programs at SNL/NM: No Action, Expanded Operations, and Reduced Operations.

The NOI proposed that the SWEIS consider the No Action and Expanded Operations Alternatives. However, the DOE added the Reduced Operations Alternative to show a broader range of alternatives and respond to comments received from the public during the scoping process. These alternatives were chosen for analysis because they cover the range of potential operations at SNL/NM. The SWEIS analyzes the environmental impacts of activities associated with these three alternatives at SNL/NM over a 10-year period of operations from 1998 to 2008. The DOE has not selected a preferred alternative.

Alternatives Evaluated in the SNL/NM SWEIS

No Action Ongoing DOE and interagency programs and activities at SNL/NM would continue the status quo, that is, operating at planned levels as reflected in current DOE management plans. 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 and have existing NEPA documentation.

Expanded Operations DOE and interagency programs and activities at SNL/NM would increase to the highest reasonable activity levels that could be supported by current facilities and the potential expansion and construction of new facilities for future actions specifically identified in the SWEIS.

Reduced Operations DOE and interagency programs and activities at SNL/NM would be reduced to the minimum level of operations needed to maintain SNL/NM facilities and equipment in an operational readiness mode.

SNL/NM FACILITIES

SNL/NM 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 many 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 DOE chose to group the operations to be analyzed by facility.

To accomplish this objective, the DOE used the results of a detailed questionnaire distributed throughout SNL/NM to develop a database containing pertinent information about the approximately 670 buildings and outdoor test facilities where SNL/NM operations are conducted.

This database was then assessed and refined by qualitatively evaluating the types of operations performed, identifying those with the highest potential for environmental impacts or concerns, and then grouping them according to function and location.

Finally, a set of facilities was selected for detailed analysis. To be selected, a facility had to meet one or more of the following criteria:

- be known to have generated an important public concern;
- conduct operations that have the potential to affect the environment, safety, and health;
- be a critical element of one of SNL/NM's principal missions; and/or
- be anticipated to expand over the next 10 years, likely resulting in the need for additional NEPA documentation.

Based on these criteria, the DOE selected 10 facilities or facility groups for in-depth analysis.

- *Neutron Generator Facility*—Manufactures neutron generators, which provide a controlled source of neutrons.

- *Microelectronics Development Laboratory*—Performs research and development (R&D) and fabricates custom and radiation-hardened microelectronics.
- *Advanced Manufacturing Processes Laboratory*—Performs R&D of technologies, practices, and unique equipment and fabricates prototype hardware for advanced manufacturing processes.
- *Integrated Materials Research Laboratory*—Performs R&D of semiconducting and other specialized materials, including silicon processing and equipment development and materials synthesis, growth, processing, and diagnostics.
- *Explosive Components Facility*—Performs R&D and testing of explosives components, neutron generators, batteries, and explosives.
- *Physical testing and simulation facilities group*—Performs physical testing and simulation of a variety of natural and induced environments at four facilities consisting of numerous principal buildings and structures. These facilities include extensive environmental test facilities, such as sled tracks, centrifuges, and a radiant heat facility.
- *Accelerator facilities group*—Performs inertial-confinement fusion research and pulsed-power research at 10 facilities. The accelerators are also used to conduct research on inertial-confinement fusion and particle-beam weapons.
- *Reactor facilities group*—Performs R&D and testing at five experimental and engineering nuclear reactors and electron-beam accelerators in a highly secure, remote research area. Some of these facilities are being converted to production facilities for medical radioactive isotopes.
- *Outdoor test facilities group*—Conducts physics, explosives, and burn testing at five facilities located in remote areas of Kirtland Air Force Base (KAFB).
- *Selected infrastructure facilities group*—Supports steam generation, waste management, and waste disposal activities at four facilities.

The operations within these facilities or facility groups are the basis for differentiating among the three alternatives analyzed in the SWEIS and for any associated environmental impacts between alternatives.

Taken together, these facilities and facility groups represent the majority of exposure risks associated with continuing operations at SNL/NM. They represent

- over 99 percent of all radiation doses to SNL/NM personnel.

- over 99 percent of all radiation doses to the public.
- from 81 to 99 percent of stationary source criteria pollutants (nitrogen dioxide, carbon monoxide, particulate matter less than 10 microns in diameter [PM₁₀], sulfur dioxide), depending on the alternative. This does not include hazardous air pollutants or toxic air pollutants, which instead are analyzed on a facility-wide basis in the SWEIS. The remaining stationary source criteria pollutants would be associated with backup generators.
- all radioactive waste volumes, including medical isotopes production, Environmental Restoration (ER) Project wastes, and hazardous waste, which are accounted for in analyses of infrastructure, radiological air quality, transportation, and waste generation.

Some activities at SNL/NM are not likely to change regardless of which alternative the DOE selects for continued operations. Although included within the analysis of all alternatives, these activities were projected to remain at currently planned levels over the 10-year period analyzed. Examples of these activities are maintenance support, material management and operations, waste management and operations, natural resource management, environmental restoration, and science and engineering work at nonselected (balance of operations) facilities.

AFFECTED ENVIRONMENT

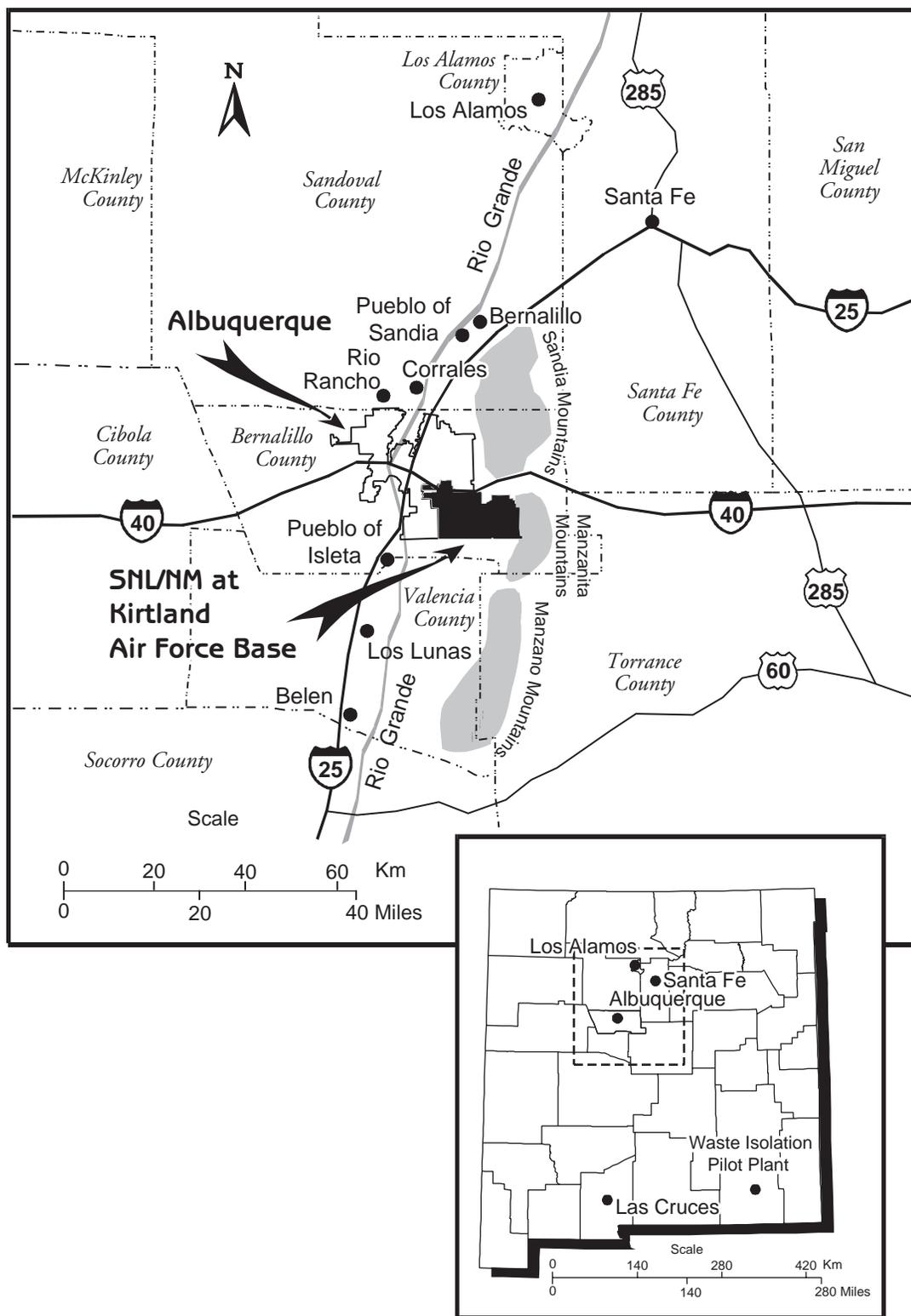
Location

SNL/NM is located on KAFB, approximately 7 mi southeast of downtown Albuquerque, New Mexico (Figure S-3). SNL/NM comprises approximately 8,800 ac of Federal land on KAFB. Albuquerque is in Bernalillo county, in north-central New Mexico, and is the state's largest city, with a population of approximately 420,000. The Sandia Mountains are immediately north and east of the city, with the Manzanita Mountains extending to the southeast. The Rio Grande runs southward through Albuquerque and is the primary river traversing central New Mexico. Nearby communities include Rio Rancho and Corrales to the northwest, the Pueblo of Sandia and town of Bernalillo to the north, and the Pueblo of Isleta and towns of Los Lunas and Belen to the south.

Land Use and Visual Resources

Areas Surrounding KAFB

Areas immediately surrounding KAFB on the north and northwest consist of single- and multi-family residential neighborhoods, mixed/minor commercial



Source: SNL/NM 1997j

Figure S-3. General Location of KAFB
KAFB is located southeast of the city of Albuquerque in Bernalillo county.

establishments, and light industrial/wholesale operations. The eastern boundary of KAFB almost entirely abuts Cibola National Forest. Some private land, scattered residential dwellings, and industrial operations are present northeast of KAFB. Single-family residences are present just beyond the national forest, approximately 1 mi east of the KAFB eastern boundary. The southern portion of KAFB borders a wide expanse of open rangeland owned by the Pueblo of Isleta. To the west, adjacent land consists of the Albuquerque International Sunport (the city's major airport), some city and county open space, and a large parcel of open space for an extensive future planned community known as Mesa del Sol. Under agreements with the Pueblo of Isleta and the state of New Mexico, two areas, encompassing over 9,000 ac adjacent to the southwestern boundary of KAFB, are designated as buffer zones for SNL/NM testing activities.

KAFB Land Ownership

KAFB land is owned primarily by the U.S. Air Force (USAF), DOE, Bureau of Land Management (BLM), and U.S. Forest Service (USFS). The USAF owns the majority of acreage comprising the western half of KAFB. The DOE also owns land in this area, which is occupied almost entirely by SNL/NM facilities. Some land owned by the BLM, also in the southwestern half, has been withdrawn from public access by the USAF. The eastern portion of KAFB, commonly referred to as the Withdrawn Area, consists of more than 20,480 ac of USFS land within the Cibola National Forest that has been withdrawn from public use by the USAF and the DOE in separate actions.

USAF Activities on KAFB

KAFB land occupied by the USAF is used for a wide variety of purposes, including equipment maintenance, research, munitions storage, residential housing, recreational facilities, medical activities, and administration. In addition, large areas of land on KAFB, particularly in the Withdrawn Area, do not support specific facilities or programs, but are used as safety zones for USAF training activities.

SNL/NM Activities on KAFB

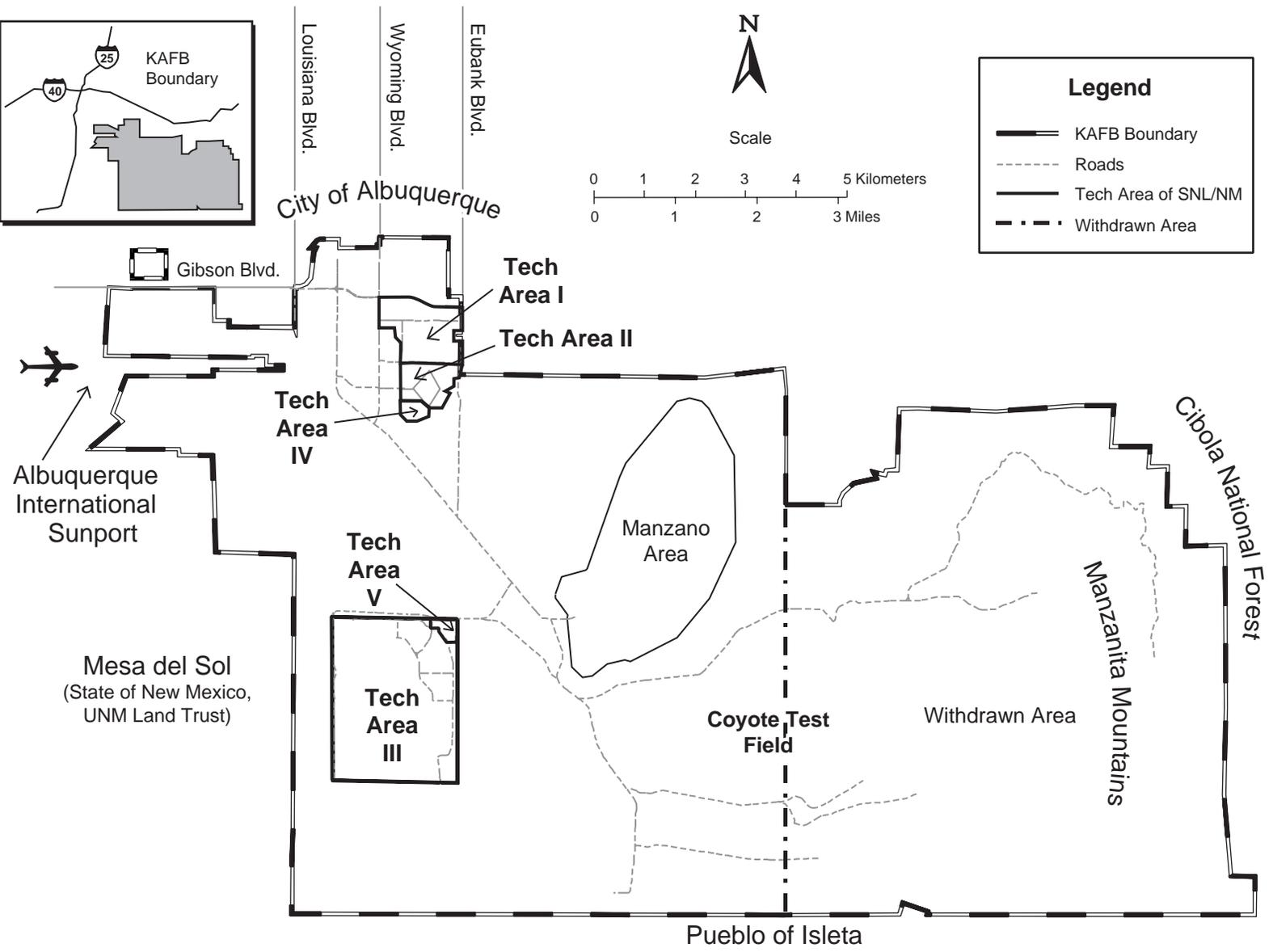
SNL/NM facilities and activities are located primarily in five technical areas (TAs) (Figure S-4). TAs-I, -II, and -IV encompass approximately 645 ac. TAs-III and -V encompass approximately 1,900 ac.

- TA-I is located in the northeast part of KAFB. It is the most densely developed and populated of the TAs, with over 6,600 employees and 370 structures. The structures within TA-I consist of laboratories, shops, offices, warehouses, and other storage buildings used for administration, site support, technical support, basic research, defense programs, component development, microelectronics, energy programs, exploratory systems, technology transfer, and business outreach.
- TA-II is immediately south of TA-I. Like TA-I, the area is urbanized but less densely developed, with approximately 440 employees in over 30 structures that consist of several laboratories, limited office space, and numerous storage buildings.
- TA-III is approximately 5 mi south of TA-I in the southwest portion of KAFB. Approximately 224 people work in the area, which is composed of 20 test facilities devoted to large-scale physical testing and simulating a variety of natural and induced environments. Over 150 structures are located within TA-III, most of which are grouped in small units separated by extensive open spaces.
- TA-IV is immediately south of TA-II. TA-IV is urbanized but less densely developed than TA-I with 546 employees occupying about 70 structures. The area is primarily an R&D site for pulsed-power sciences and particle-beam fusion accelerators.
- TA-V is adjacent to the northeast corner of TA-III. TA-V consists of about 35 closely grouped structures where experimental and engineering nuclear reactors are located. Approximately 160 personnel work in the area.

In addition to the TAs, SNL/NM conducts activities in the Coyote Test Field (Figure S-4), a large undeveloped area on KAFB that contains a variety of remote testing sites and facilities. Approximately 173 structures consisting of laboratories, mobile offices, and storage areas are widely dispersed throughout the area.

Infrastructure

Infrastructure consists of buildings, services, maintenance, utilities, material storage, and transportation systems and corridors that support the operations of a facility. Specifically, SNL/NM's infrastructure consists of water, sanitary sewer, storm drain, steam, fossil fuels, chilled water, electrical transmission, electrical distribution, communications, roads, and parking that support the TAs and other DOE facilities at KAFB. From 28 to 36 percent of system



Source: SNL/NM 1997j

Figure S-4. Locations of SNL/NM Technical Areas
SNL/NM conducts most operations in five technical areas and the Coyote Test Field.

capacity was used to supply water, wastewater, electricity, and natural gas in 1996.

Geology and Soils

Seismic activity, slope stability, and soil contamination were evaluated in the geology and soils resource area. Albuquerque is in a region expected to experience moderate earthquakes that could result in damage to buildings. The largest magnitude earthquake in Albuquerque this century measured 4.7 on the Richter scale.

Most SNL/NM facilities are constructed on level ground or gentle slopes. Slope stability has not been an issue at SNL/NM facilities.

SNL/NM identified 182 locations of potential soil contamination at KAFB resulting from past activities. Of these, 122 have been proposed to the New Mexico Environment Department as requiring no further action because no contamination was found, contaminants were below risk- or regulatory-based criteria, or cleanup has been completed. Investigation or cleanup continues at the other sites.

Water Resources

Groundwater beneath KAFB is in the Albuquerque-Belen Basin aquifer, the sole source of drinking water for Albuquerque and surrounding communities. At SNL/NM TAs, depth to groundwater is 400 to 500 ft. Basinwide groundwater levels have been decreasing for more than 30 years, the result of groundwater withdrawal by municipal and private wells exceeding the rate of groundwater recharge. In 1996, SNL/NM used 440 million gal of water. Concentrations of contaminants above Federal drinking water standards have been detected in groundwater near several SNL/NM facilities. Of these contaminants, concentrations of trichloroethene (TCE) at one site are attributed to past SNL/NM waste disposal practices. This site is 4 mi from the nearest water supply well.

Surface water at KAFB is almost exclusively ephemeral, that is, present in onsite drainages only during periods of heavy rainfall in the summer “monsoon” season (July through September). Surface water flowing through KAFB could discharge to the Rio Grande, 6 mi downstream from the KAFB boundary.

Biological and Ecological Resources

At least 267 plant species and 195 animal species occur on KAFB. This diversity is due in part to the variety of habitats, which include cliff faces, caves, abandoned mines, and drainages, as well as the four major vegetation associations (grassland, woodland, riparian, and altered habitat). Only one Federally listed threatened or endangered species has been observed on KAFB. This was a single sighting of a Peregrine Falcon (Federally endangered), probably a migrant. Sixteen other animal and two plant species present or observed on KAFB are listed by the Federal government as species of concern or sensitive species, or by the state of New Mexico as threatened or sensitive.

Cultural Resources

Cultural resources at KAFB include prehistoric archaeological sites, which in the Albuquerque area date to before A.D. 1540 (the initiation of Spanish exploration of the area), historic archaeological sites (sites, buildings, and structures from A.D. 1540 to 1948). Within the boundaries of KAFB and DOE buffer zones are 284 recorded prehistoric and historic archaeological sites. No traditional cultural properties (TCPs) have been identified at KAFB.

Air Quality

Major sources of air emissions in the Albuquerque area are motor vehicles, wood burning stoves and fireplaces, and open burning. The SNL/NM steam plant, which provides heat to a large number of SNL/NM facilities, accounts for more than 90 percent of the total SNL/NM emission of pollutants from fixed facilities regulated by the *Clean Air Act*. All emissions are within permitted levels and result in concentrations of these pollutants that are below standards set to protect health with an ample margin of safety. Actual emissions are only a fraction of permitted levels. Hazardous chemical air emissions are small and are not required to be individually monitored. Vehicle carbon monoxide emissions are the dominant source of this pollutant from SNL/NM and are of concern because the Albuquerque/Bernalillo county area is a U.S. Environmental Protection Agency (EPA)-designated “maintenance” area for carbon monoxide. All other sources of carbon monoxide at SNL/NM are small, and the total carbon monoxide emissions are about 3 percent of the total carbon monoxide emissions in the county.

Currently, 16 SNL/NM facilities emit radionuclides. The maximum calculated total dose of radiation from

Exposure to Radiation

All people are constantly exposed to some form of radiation. This radiation can be from different sources: cosmic from space, medical from X-rays, internal from food, and external from rocks and soil (such as radon in homes). The "Roentgen equivalent, man" (rem) unit is a measurement of the dose from radiation and its physical effects and is used to predict the biological effects of radiation on the human body. Therefore, one rem of one type of radiation is presumed to have the same biological effects as one rem of any other type of radiation. This allows comparison of the biological effects of radiological materials that emit different types of radiation. A commonly used dose unit of measure is millirem (mrem), which is equal to 0.001 rem.

atmospheric emissions at all SNL/NM facilities to an individual is 0.007 mrem/yr, which is much lower than the regulatory limit of 10 mrem/yr. This dose is also small compared to an individual background radiation dose from all sources of 360 mrem/yr received by residents of the Albuquerque area.

Human Health and Worker Safety

SNL/NM has the potential of affecting human health from radiological or hazardous materials that could reach either workers or the public. Of the average background radiation dose of 360 mrem/yr, more than 80 percent is from natural sources such as radon. The major nonnatural source of radiation is medical testing, which accounts for 15 percent of the total dose. The maximum 1996 dose estimate from air emissions at SNL/NM facilities for an individual in a publicly accessible area is 0.007 mrem/yr, which is 0.002 percent of the background radiation dose. This dose is associated with an increased lifetime cancer risk of 1 in 285 million. The 1996 collective dose to the population within 50 mi is 0.14 person-rem. Based on current environmental monitoring data, radiation exposures would not be expected through media such as surface water, soil, groundwater, and natural vegetation.

Nonradiological chemical air pollutants are released from SNL/NM facilities that house chemistry laboratories or chemical operations. Concentrations of these pollutants are below safety levels established for workers in industrial areas and are known to diminish with increasing distance from the sources. Environmental

monitoring data indicate that the public is not in contact with chemical contamination through surface water, soil, or groundwater.

Workers in some SNL/NM facilities receive an additional dose of radiation, measured by personal radiation monitoring devices (dosimetry badges). The average annual collective radiation dose to the entire group of radiation workers is 12 person-rem per year, based on 1992 through 1996 data. This dose is associated with a latent cancer fatality risk to the radiation worker population of 1 in 200. At this risk level, no additional fatal cancers would be likely to occur within the radiation worker population.

SNL/NM's nonfatal injury/illness rate has ranged between 2.3 and 4.1 per 100 workers per year from 1992 through 1996. This is significantly less than national (7.4 to 8.9) or New Mexico (7.3 to 8.5) private industry rates. SNL/NM had no fatal occupational injuries from 1992 through 1996.

Transportation

Normal transportation activities can affect air quality and cause noise, vibration, and traffic congestion.

Transportation activities at SNL/NM involve the receipt, shipment, and transfer of hazardous and nonhazardous materials and waste. The most frequently received hazardous materials are chemicals. In 1997, SNL/NM received more than 25,000 chemical containers in approximately 2,800 shipments.

From 1994 through 1997, SNL/NM had 10 transportation-related incidents involving onsite transfer or offsite shipment or receipt of hazardous material. None resulted in the release of a hazardous cargo to the environment or exposure of the workforce or the public to hazardous materials.

Waste Generation

Waste generation activities consist of managing, storing, and preparing waste for offsite disposal in accordance with applicable Federal and state regulations, permits, and DOE Orders. Waste generated onsite under current operations include radioactive waste, hazardous waste, biohazardous (medical) waste, asbestos, polychlorinated biphenyls (PCBs), nonhazardous solid waste, and process wastewater. Waste generated in 1996 included 25,600 ft³ of radioactive waste, 48,000 kg of hazardous waste, 52,000 kg of PCBs, and 77,000 kg of asbestos. Additional waste will be generated by the ER Project. Several waste transfer and storage facilities exist at

SNL/NM to handle this waste for onsite or offsite disposal.

Noise and Vibration

SNL/NM produces sounds from the detonation of explosives or sonic booms from sled track activities. The distance at which these so-called “impulse” sounds can be heard varies depending on the intensity of the initial blast, meteorological conditions, terrain, and background noise levels. These sounds are sometimes heard beyond the KAFB boundary. In 1996, SNL/NM produced 1,059 impulse noise events, only a small fraction of which were of sufficient magnitude to be heard beyond the KAFB boundary. Offsite damage from vibrations associated with these noise events would be unlikely.

Socioeconomics

SNL/NM is the fifth-largest private employer in New Mexico. For Fiscal Year (FY) 1997, the SNL/NM payroll in the local four-county region was \$417 million for 6,824 full-time personnel. During the same year, SNL/NM spent approximately \$309 million in procurements in the region. The total operating and capital budget for SNL/NM for FY 1996 was approximately \$1.4 billion, of which an estimated \$877 million was spent in central New Mexico.

Environmental Justice

Presidential Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on minority and low-income populations. According to a 1990 report, *Poverty Thresholds*, from the U.S. Bureau of the Census, 49 percent of New Mexico’s population was minority, and 21 percent was listed as in poverty or designated as having low income. Areas with greater than the state average of minority population border KAFB to the northeast, west, and south. Areas with greater than the state average of low-income populations border KAFB to the west and south.

ENVIRONMENTAL CONSEQUENCES

This section summarizes, by resource area, the environmental consequences of operating SNL/NM facilities according to the levels of activity specified in the

three alternatives. Table S–2 also provides a comparison of impacts across alternatives for each resource area. Table S–3 provides this comparison for accidents.

Land Use and Visual Resources

No adverse impacts to land resources are expected as a result of the No Action, Expanded Operations, or Reduced Operations Alternatives. The extent of DOE land and USAF-permitted acreage currently available for use by SNL/NM facilities on KAFB would remain approximately the same. Operations would remain consistent with industrial and research park uses and would have no foreseeable effects on established land use patterns or requirements. Buffer zones would continue to remain at their current size and location. New SNL/NM facilities, expansions, and upgrades would be limited and would not require changes to current land ownership or classification status because these activities would be planned in or near existing facilities, within already disturbed or developed areas, or on land already under DOE control. There would be no adverse impacts to visual resources that change the overall appearance of the existing landscape, obscure views, or alter the visibility of SNL/NM structures. New facilities, expansions, and upgrades would be planned in or near existing facilities in areas with common scenic quality. Efforts initiated by SNL/NM to incorporate a campus-style design would continue.

Infrastructure

Annual projected utility demands for all alternatives would be well within system capacities. Electrical consumption would range from 185,000 MWh (Reduced Operations Alternative) to 198,000 MWh. Projected water usage would range from 416 million gal to 495 million gal per year. Actual water usage probably would be lower because SNL/NM has implemented a conservation program to reduce usage by 30 percent by 2004. For comparison purposes, a conservation scenario is provided under the No Action Alternative. Other infrastructure-related factors, including maintenance, roads, communications, steam, natural gas, and facility decommissioning, would be similar for each alternative and would not be adversely affected by the projected levels of SNL/NM operations. The Expanded Operations Alternative considered a 10-percent margin, which shows that utility systems supporting SNL/NM maintain adequate capacities.

Geology and Soils

No activities planned for any of the alternatives would present a potential for slope destabilization. Slope instability has not been an issue in past SNL/NM operations and would likely not be a concern in the future. Existing soil contamination is being cleaned up through SNL/NM's ER Project, which is scheduled for completion by 2004. Under the Expanded Operations Alternative, there would be the potential for increased deposition of soil contaminants in outdoor testing areas. Potential contaminants would include depleted uranium (DU) fragments, explosive residue, and metals contained in weapons that are used in the tests. SNL/NM performs periodic sampling and radiation surveys in these testing areas. DU fragments are collected after tests. Potential contaminants have not been detected at concentrations above background at current testing levels. These areas are not accessible to the general public.

Water Resources and Hydrology

Groundwater contamination attributable to known SNL/NM activities is present at one site, the Chemical Waste Landfill (CWL) in TA-III. Investigation and cleanup planning are ongoing at this site, and any final plans must be approved by the New Mexico Environment Department. Under a no-cleanup scenario, the only contaminant exceeding EPA concentration limits in groundwater would be TCE, which occurs in a plume extending 410 ft from the CWL. This would not impact drinking water supplies because the nearest water supply well is approximately 4 mi from the CWL. Although the resulting impact is due to past waste management practices rather than current operations, it is considered to be adverse. Groundwater investigation would continue at several additional locations where the source of potential contamination has not been identified. Investigation and cleanup at locations with groundwater contamination would continue at the same rate under any of the three alternatives.

The estimated SNL/NM portion of local (in the immediate vicinity of KAFB) aquifer drawdown from 1998 to 2008 would range from 11 to 12 percent for all alternatives. Local drawdown would range from less than 1 to 28 ft across KAFB during this period. The impact resulting from SNL/NM's contribution to drawdown in the aquifer derives from both past and present water usage and is considered to be adverse. This drawdown would not have an immediate effect on other water users, spring flow, or land subsidence. Long-term effects would be greatly mitigated by the city of Albuquerque's

conversion to surface water use, scheduled to begin in 2004. Water demand under each alternative would be within existing KAFB water rights.

Potential sources of surface water contamination at SNL/NM would be storm water runoff from ER Project sites (including active testing areas) and runoff from developed areas. However, no contaminants attributable to SNL/NM activities have been detected in surface water samples collected onsite. The elevated levels of naturally occurring metals detected in the storm water samples have not been attributed to SNL/NM. No SNL/NM activities are projected under any of the alternatives that would contribute contaminants to surface water.

SNL/NM has little effect on the quantity of surface water in arroyos or the Rio Grande. The combined excess storm water runoff from SNL/NM facilities and discharge to Albuquerque's Southside Water Reclamation Plant would contribute from 0.06 to 0.07 percent to the annual Rio Grande flow under all alternatives, with no measurable impacts to the Rio Grande.

Biological and Ecological Resources

Beneficial impacts to biological and ecological resources would occur under all alternatives. Restricted access and limited development and use have benefited biological resources at KAFB. For example, the absence of livestock grazing has improved the quality of the grasslands in relation to the region.

SNL/NM operations in TAs-I, -II, and -V would continue to occur primarily inside buildings. Under all alternatives, small areas of vegetation would be removed (see Section 2.3.5), but this removal would not affect the viability of the plant communities. Proposed activities could result in the local displacement of wildlife. There would be slightly increased levels of noise and activity under the Expanded Operations Alternative. However, data from raptor surveys of KAFB indicate that they have become accustomed to the noise and activities that currently exist, as raptor species at KAFB return to the same nest sites each year. Outdoor activities at TA-III and the Coyote Test Field would continue to affect small localized areas.

Limited site access and management of the biological resources by SNL/NM, KAFB, and the USFS would continue to benefit the animals and plants, including sensitive species on KAFB.

Cultural Resources

Restricted access in association with activities at certain facilities would continue to have a beneficial effect on prehistoric and historic archaeological resources because it would protect the resources from vandalism, theft, or unintentional damage. For all three SWEIS alternatives, there would continue to be a potential for impacts to prehistoric and historic archaeological resources. These impacts would derive from explosive testing debris and shrapnel produced as a result of outdoor explosions, off-road vehicle traffic, and unintended fires and fire suppression. However, the potential for impacts due to these factors would be minimal under all three alternatives.

As a result of the ongoing consultation with 15 Native American tribes; no TCPs have been identified at SNL/NM; however, several tribes have requested that they be consulted under the *Native American Graves Protection and Repatriation Act* (NAGPRA) if human remains are discovered within the region of influence. These consultations will continue. If specific TCPs are identified, any impacts of SNL/NM activities on the TCP and any impacts of restricting access to the TCP would be determined in consultation with Native American tribes, and further NEPA review would be conducted, if appropriate.

Air Quality

Concentrations of criteria and chemical pollutants in air would be below regulatory standards and human health guidelines. Maximum concentrations of criteria pollutants from operation of the steam plant, electric power generator plant, boiler and emergency generator in Building 701, and 600-kw-capacity generator in Building 870b would represent a maximum of 96 percent of the allowable regulatory limits of several criteria pollutants (nitrogen dioxide, total suspended particulates, and particulate matter less than 10 microns in diameter) at a public access area.

These standards, in general, are set to provide an ample margin of safety below any pollutant concentration that might be of concern. The methodology used in the criteria pollutant analysis also produces projections that are conservative maximum concentrations.

Based on the analysis of stationary and mobile source emissions, carbon monoxide emissions from SNL/NM would be less than 1996 emissions under any alternative. Emissions would remain below the 10-percent threshold

that denotes a regionally significant action in a nonattainment area. As a result, the DOE has determined that a conformity determination under 40 CFR Part 93 Subpart B is not required.

With the exception of one chemical (chromium trioxide), concentrations of noncarcinogenic chemicals emitted from 12 facilities on SNL/NM were projected to be below screening levels based on occupational exposure limit (OEL) guidelines generally referenced to determine human health impacts. Concentrations of carcinogenic chemical emissions would pose little cancer risk (less than 1 in 1 million) to onsite workers or the general public. Chemical emissions would be highest for the Expanded Operations Alternative, although they would still be below levels that would affect public health.

The impact from emissions of criteria pollutants for the No Action and Expanded Operations Alternatives would be essentially the same. The major source of criteria pollutants (other than mobile sources) would be the steam plant, which supplies steam to the facilities for heating. No increase in floor space is anticipated under the Expanded Operations Alternative; therefore, no increase in steam production would be required. The Reduced Operations Alternative would require less steam, resulting in lower emissions from the steam plant.

The radiological dose impacts due to the annual air emissions from SNL/NM facilities during normal operations under each of the alternatives would be much lower than the regulatory National Emissions Standards for Hazardous Air Pollutants (NESHAP) limit of 10 mrem/yr to a maximally exposed individual (MEI). The calculated radiological dose to an MEI would be 0.15 mrem/yr under the No Action Alternative; 0.51 mrem/yr under the Expanded Operations Alternative; and 0.02 mrem/yr under the Reduced Operations Alternative. The dose to an MEI under each alternative would be small in comparison to the average individual background radiation dose of 360 mrem/yr.

The calculated collective dose to the population within 50 mi of SNL/NM from the annual radiological air emissions due to the SNL/NM operations under each alternative would be 5.0 person-rem per year under the No Action Alternative; 15.8 person-rem per year under the Expanded Operations Alternative; and 0.80 person-rem per year under the Reduced Operations Alternative. The collective dose would be much lower than the collective dose of 263,700 person-rem to the same population from background radiation.

Human Health

Routine releases of hazardous radiological and chemical materials would occur during SNL/NM operations. These releases would have the potential to reach receptors (workers and members of the public) by way of different environmental pathways. The levels of exposure to chemicals and radionuclides were assessed for each environmental medium determined to be a pathway for these releases.

The SWEIS impact analyses identified air as the primary environmental pathway having the potential to transport hazardous material from SNL/NM facilities to receptors in the SNL/NM vicinity. In the assessment of human health risk from air emissions, a number of receptor locations and possible exposure scenarios were analyzed. The total composite cancer health risk is the sum of potential chemical and radiation exposures, calculated from the radiation cancer health risk to the MEI, plus the upper bound chemical cancer health risk from a hypothetical worst-case exposure scenario. This very conservative estimate of maximum health risk is greater than any of the individual health risks based on more likely exposure estimates at specific receptor locations.

Both the composite cancer health risk estimate of 1 in 385,000, and the cancer health risk estimates for specific receptor locations are below levels that regulators consider protective of public health. No adverse health effects would be expected from any of the three alternatives for SNL/NM. The small amounts of chemical carcinogens and radiation released from SNL/NM facilities would increase the MEI lifetime risk of cancer by less than 1 chance in 434,000 under the No Action Alternative and by less than a possible 1 chance in 126,000 under the Expanded Operations Alternative. Noncancer health effects would not be expected based on hazard index values of less than 1. No additional nonfatal cancers, genetic disorders, or latent cancer fatalities (LCFs) would be expected in the population living within a 50-mi radius.

Transportation

The SNL/NM material and waste truck traffic offsite would be projected to increase from 14.5 shipments per day (1996) to 34.4 shipments per day under the Expanded Operations Alternative. However, the SNL/NM truck traffic would comprise less than 0.03 percent of the total traffic, including all types of vehicles entering and leaving the Albuquerque area by way of interstate highways. Therefore, the impact under the Expanded Operations Alternative would be minimal. The total local traffic on roadways would be expected to

increase by a maximum of 3.6 percent overall under the Expanded Operations Alternative.

The overall maximum lifetime fatalities from SNL/NM annual shipments of all types of materials and wastes due to SNL/NM operations were estimated to be 1.7 fatalities under the Expanded Operations Alternative. Of these estimates, 1.3 fatalities would be due to traffic accidents; 0.33 fatalities would be due to incident-free transport of radiological materials and wastes; and 0.06 fatalities would be due to air pollution from truck emissions.

The maximum lifetime LCFs in the population within a 50-mi radius were estimated, based on a population dose of 4.93 person-rem, to be 0.0025 from the annual transport of radiological materials and wastes.

Waste Generation

Generation of radioactive waste, hazardous waste, process wastewater, and nonhazardous solid waste was reviewed. The goal of the review was to determine the adequacy of existing onsite and offsite storage and treatment and disposal capabilities. Storage capacity for all anticipated waste types would be adequate. Limited onsite hazardous and mixed waste treatment capacity would be within current permit limits. Most hazardous waste would be treated and disposed of offsite within the commercial sector. Commercial offsite capacity is currently adequate and would exceed anticipated future demand.

Recycling of wastes was not included in the modeling to bound actual projected waste quantities. Radioactive

Radioactive Waste Categories

Low-Level Waste—Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or byproduct 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, provided that the concentration of transuranic is less than 100 nanocuries per gram.

Low-Level Mixed Waste—Waste that contains both hazardous waste regulated under the *Resource Conservation and Recovery Act* (42 U.S.C. §6901) and low-level waste.

material management practices would be required to reduce quantities of material that could inadvertently become contaminated. Low-level waste (LLW) and low-level mixed waste (LLMW) (see text box) would increase by a maximum of 198 and 69 percent, respectively, under the Expanded Operations Alternative. One new operation, the Medical Isotopes Production Project, would be the major contributor to this increase. Capacity currently exists to manage the waste generated from all operations at the Expanded Operations Alternative level.

Trends for all hazardous waste clearly show a significant reduction due to the implementation of pollution prevention protocols at SNL/NM. New procedures and recycling for the solid waste and process wastewater would have similar impacts on the nonhazardous waste volumes being generated.

Noise and Vibration

The No Action Alternative would enable SNL/NM to operate at current planned levels, which include baseline background noise levels and short-term noise impacts from SNL/NM test activities. Impulse noise-producing test activities would increase an estimated 35 percent over the 1996 number of test activities by 2008.

Projections under the Expanded Operations Alternative indicate a 250 percent increase in the number of impulse noise tests over 1996 levels. This would result in an average of approximately 1 impulse noise event per hour for an 8-hour work day, based on a 261-day work year.

The projected frequency of impulse noise events for the Reduced Operations Alternative would be 65 percent less than the 1996 levels, resulting in an average of 1.5 impulse noise tests per day.

Only a small fraction of these tests would be loud enough to be heard or felt beyond the site boundary. The vast majority of tests would be below background noise levels for locations beyond the KAFB boundary and would be unnoticed in neighborhoods bounding the site. Ground vibrations would remain confined to the immediate test area.

Socioeconomics

Direct SNL/NM employment projections range from 7,422 (Reduced Operations Alternative) to 8,417 (Expanded Operations Alternative), in comparison to 7,652 full-time SNL/NM employees in the base year. These employment changes would change regional population, employment, personal income, and other

socioeconomic measures in the region by less than 1 percent.

Environmental Justice

Based on the analyses of other impact areas, the DOE would not expect any environmental justice-related impacts from the continued operation of SNL/NM under any of the alternatives. Resource areas of potential concern were evaluated on an individual basis with respect to minority populations and low-income populations, as appropriate.

No TCPs have been identified at SNL/NM. If specific TCPs are identified, Native American tribes will be consulted.

Accidents

At SNL/NM, accidents could occur that would affect workers and the public. Potential accidents with the largest impacts would involve radioactive materials in TA-V facilities and hazardous chemicals in TA-I facilities. In most instances, involved workers (those individuals located in the immediate vicinity of an accident) would incur the largest risk of serious injury or fatality. This is because, for most accidents, the magnitude of the damaging effects are highest at the point of the accident and diminish with increasing distance. This would apply, for example, to releases of radioactive and chemical materials, explosions, fires, airplane crashes, earthquakes, and similar events. In some situations, however, the mitigating effects of structural barriers, personal protection equipment, and engineered safety features may offer greater protection for close-in workers than others in the general vicinity of the accident.

In TA-I, under all three alternatives, there could be numerous situations in laboratory rooms where workers could be accidentally exposed to small amounts of dangerous chemicals. The potential also exists in TA-I for a catastrophic accident, such as an airplane crash into a facility or an earthquake, in which multiple dangerous chemicals could be released and expose onsite individuals to harmful or fatal chemical concentrations. Large quantities of hydrogen stored in outside areas of TA-I could also explode as a result of a catastrophic event and cause serious injury or fatality to involved workers and other nearby onsite individuals. The probability of a catastrophic chemical or explosive accident with serious consequences is low (less than once in a thousand years). Should such an accident occur, emergency procedures, mitigating features, and administrative controls would minimize its adverse impacts.

The potential for accidents would exist in TA-V that would cause the release of radioactive materials, causing injury to workers, onsite individuals, and the public. The magnitudes of impacts for the worst-case accident, an earthquake, would be minimal for all alternatives. If an earthquake occurred, the impacts would range from a 1 in 33 increase in probability of an LCF for a noninvolved worker on the site to 1 in 120,000 for a maximally exposed member of the public. For the entire population residing within 50 mi of SNL/NM, one or two additional LCFs would be expected. Involved workers, as in the case of chemical accidents, would incur the largest risk of injury or fatality in the event of almost any accident because of their close proximity to the hazardous conditions.

Cumulative Effects

Cumulative effects result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions. To conduct this analysis, the DOE examined the effects associated with the continued and expanded operation of SNL/NM, and then added the effects of other past, present, and reasonably foreseeable future actions to assess the cumulative effects to various resource areas. These additional effects are primarily because of the presence of USAF and other DOE facilities at KAFB and the environmental effects caused by residents and businesses in the city of Albuquerque.

Other DOE Facilities

There are seven other DOE facilities at KAFB: the DOE Albuquerque Operations Office, Energy Training Complex, Transportation Safeguards Division, Nonproliferation and National Security Institute (formerly the Central Training Academy), Lovelace Respiratory Research Institute (formerly the Inhalation Toxicology Research Institute), Federal Manufacturing & Technology/New Mexico (also known as AlliedSignal), and Ross Aviation, Inc. The potential for environmental impacts from these facilities would be low. These facilities do not have stationary sources of air pollutants designated as “major” by Federal or local air quality regulations. Criteria pollutant air emissions from these facilities were modeled in combination with those for SNL/NM in the 1996 operating permit application required by 20 NMAC 11.42, and potential concentrations of pollutants from these emissions were found to be below levels designed to protect human health with an ample margin of safety. Emissions from

these facilities are expected to be below these maximum potential levels. Hazardous air pollutant emissions are minimal, and only small quantities of chemicals are purchased. Emissions of carbon monoxide from vehicles were included with the analysis for vehicles associated with SNL/NM.

None of the activities at these facilities would pose any significant adverse threat to the environment.

USAF Operations

USAF installations typically generate waste solvents, oils, paints, paint sludges, and some R&D chemical wastes that are regulated as hazardous waste. The KAFB Hazardous Waste Management Plan sets local management procedures for managing hazardous waste and preventing pollution. The plan incorporates Federal, state, and local requirements regarding hazardous waste, and applies to all host and associate organizations that generate hazardous waste on KAFB.

USAF installations typically have numerous sources of air pollutant emissions that are regulated and might require permits for construction and operation. Primary emission sources are steam plants, paint shops, air craft and ground vehicles, and processes and test activities. KAFB currently has two air permits in effect. The Title V permit application was submitted in December 1995. KAFB also conducts environmental restoration under the USAF’s Installation Restoration Program (IRP). There are currently 70 IRP sites and 12 areas of concern.

NonDOE or USAF Operations

A number of other activities in the area surrounding KAFB are not DOE- or USAF-related. The city of Albuquerque and its suburbs form the state’s largest metropolitan area with a population over 500,000. Over 400 local manufacturers produce a wide range of products including electronic components, baked goods, computers, construction materials, and heavy trailers. The counties surrounding SNL/NM have numerous existing and planned industrial facilities and residences with permitted air emissions and discharges to surface waters. These facilities comprise electric generating stations (including Cobisa Power Station), computer chip manufacturers, construction materials industries, and other manufacturing facilities. KAFB has residential and commercial centers onsite, as well as to the north, south, west, and northeast. There are many local and regional influences as well as private and public activities.

Analysis Results

The analysis found that cumulative effects to the environment resulting from SNL/NM activities would be small.

No adverse cumulative impacts to land use would occur. Land in the area surrounding KAFB would continue to be developed at its present rate of growth regardless of the presence of the DOE and SNL/NM. In addition, no adverse impacts to infrastructure would occur.

Consumption of natural gas, fuel oil, and electricity at KAFB would decline slightly or remain at recent historic levels. Adequate capacities exist for all utilities.

No adverse cumulative effects to transportation routes would be expected. However, traffic congestion and transportation construction projects would continue to affect local transportation.

Cumulative effects to water resources would be small. Total SNL/NM withdrawal of groundwater would be approximately 1 percent of basin-wide withdrawal and 12 percent of local withdrawal.

Cultural resources would not be adversely affected by SNL/NM or DOE activities. The restricted public access at KAFB would result in the protection of cultural resources.

Cumulative effects to air quality would be small. A comprehensive analysis of air emissions from SNL/NM show no individual or aggregate emissions of concern to human health. Emissions from KAFB are also unlikely to be of concern to human health because, like SNL/NM, hazardous chemical air emissions are below levels requiring monitoring by the *Clean Air Act* or local air quality regulations. Carbon monoxide emissions from vehicles are the primary air pollutant of concern. Carbon monoxide emissions from SNL/NM and KAFB show decreasing trends and, combined, are less than 10 percent of the total carbon monoxide emissions in the county. There would be no adverse cumulative impacts due to radiological air emissions. In addition, there would be no adverse impacts to human health or safety.

Slight increases in ambient noise levels would occur due to intermittent testing at KAFB; however, no long-term increases in noise or vibration levels would occur.

Beneficial cumulative impacts would result from direct and indirect socioeconomic effects. The DOE expects that overall expenditures and employment at SNL/NM would expand gradually at a steady rate over the next 10 years, which would tend to maintain demographic patterns in the region.

MITIGATION MEASURES

The regulations promulgated by the Council on Environmental Quality to implement the procedural provisions of NEPA require that an environmental impact statement include a discussion of appropriate mitigation measures. Mitigation includes the following (40 CFR Part 1508.20):

- avoiding an impact by not taking an action or parts of an action;
- minimizing impacts by limiting the degree of magnitude of an action and its implementation;
- rectifying an impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

The mitigation measures in this SWEIS are built into the alternatives. These measures address the range of potential impacts of continuing to operate SNL/NM. Based on the results of the analyses, the DOE does not anticipate implementing additional mitigation measures. The following list contains examples of SNL/NM programs, plans, and projects that are integral to the SWEIS alternatives:

- Environmental Surveillance and Compliance Program (monitors SNL/NM for permit and environmental management requirements)
- Threatened and Endangered Species Habitat Management Plan
- Natural Resource Management Plan (in development)
- Public and worker health studies in and around SNL/NM
- Groundwater Protection Management Program Plan
- Safeguards and Security Program
- Emergency management and response capability enhancement
- Fire Protection Program
- Pollution Prevention and Waste Minimization Programs
- Water and Energy Conservation Programs
- ER Project plans

Table S–2. Comparison of Potential Consequences of Continued Operations at SNL/NM

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
<i>Land Use</i>		No changes projected in classification or ownership	Same as No Action Alternative	Same as No Action Alternative
<i>Visual Resources</i>		Changes would be minor and transitory. Projected new construction in already developed areas	Same as No Action Alternative	Same as No Action Alternative
<i>Infrastructure</i>		All projected activities within capacities of existing road, waste management, and utility systems	Same as No Action Alternative	Same as No Action Alternative
<i>Water Use</i>		440-463 M gal/yr	495 M gal/yr	416 M gal/yr
<i>Geology and Soils</i>	Slope Stability	SNL/NM activities are not anticipated to destabilize slopes.	Same as No Action Alternative	Same as No Action Alternative
	Soil Contamination	Minimal deposition of contaminants to soils and continued removal of existing contaminants under the ER Project	Same as No Action Alternative	Same as No Action Alternative
<i>Water Resources and Hydrology</i>	Groundwater Quality	TCE above MCL from SNL/NM disposal activities is present in groundwater near the Chemical Waste Landfill (TA-III). No future activities are anticipated to cause further groundwater contamination.	Same as No Action Alternative	Same as No Action Alternative
	Groundwater Quantity	SNL/NM groundwater use is projected to account for 11% of local aquifer drawdown and 1% of basin-wide use. The potential consequence is considered adverse.	SNL/NM groundwater use is projected to account for 12% of local aquifer drawdown and 1% of basin-wide use.	Same as No Action Alternative
	Surface Water Quality	No contaminants attributable to SNL/NM activities have been detected in water samples collected onsite. No future activities are anticipated to cause surface water contamination.	Same as No Action Alternative	Same as No Action Alternative
	Surface Water Quantity	SNL/NM's projected portion of Rio Grande flow is 0.07%.	Same as No Action Alternative	Projected portion of Rio Grande flow is 0.06%

Table S–2. Comparison of Potential Consequences of Continued Operations at SNL/NM (continued)

RESOURCE AREA	NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
<i>Biological and Ecological Resources</i>	Impacts projected for biological or ecological resources are low to negligible.	Same as No Action Alternative	Same as No Action Alternative
<i>Cultural Resources</i> ^a	Potential for impacts to cultural resources is low to negligible. Explosive testing debris and shrapnel, off-road vehicle traffic, and unintended fires present a low to negligible potential for impacts. SNL/NM security would likely result in continued protection of archaeological sites.	Same as No Action Alternative	Same as No Action Alternative
<i>Air Quality</i>	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
Stationary Source Criteria Pollutants	Modeling results (summary)		
	Carbon Monoxide (8 hours) 57% of standard		
	Lead (quarterly) 0.07% of standard		
	Nitrogen dioxide (annually) 30% of standard		
	Total suspended particulates (annually) 69% of standard		
	Sulfur dioxide (annually) 4% of standard		
Nonradiological Air Quality			
Chemical Pollutants	Concentrations are below regulatory standards and human health guidelines.	Same as No Action Alternative	Same as No Action Alternative
Mobile sources (percent of Bernalillo county mobile-source carbon monoxide emissions)	4.6	5.1	4.5
Fire testing facilities	Chemical concentrations are below OEL/100 guideline.	Same as No Action Alternative	Same as No Action Alternative

Table S–2. Comparison of Potential Consequences of Continued Operations at SNL/NM (continued)

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
<i>Air Quality (continued)</i>				
Radiological Air Quality	MEI dose	0.15 mrem/yr	0.51 mrem/yr	0.02 mrem/yr
	Collective ROI dose	5.0 person-rem/yr	15.8 person-rem/yr	0.80 person-rem/yr
	Average individual dose within ROI	6.8×10^{-3} mrem/yr	2.16×10^{-2} mrem/yr	1.1×10^{-3} mrem/yr
<i>Human Health and Worker Safety</i>	MEI public risk (from radiation)	7.5×10^{-8} LCF/yr	2.6×10^{-7} LCF/yr	8.0×10^{-9} LCF/yr
	ROI population risk to public (from radiation)	2.5×10^{-3} LCF/yr	7.9×10^{-3} LCF/yr	4.0×10^{-4} LCF/yr
	Fatal SNL/NM worker occupational injuries	none	Same as No Action Alternative	Same as No Action Alternative
	Average radiation-badged SNL/NM worker dose (risk)	47 mrem/yr (1.9×10^{-5} LCF/yr)	Same as No Action Alternative	Same as No Action Alternative
	Nonfatal SNL/NM worker occupational injuries/illnesses	311/yr	326/yr	287/yr
	Occupational SNL/NM worker chemical exposures	1-2/yr	Same as No Action Alternative	Same as No Action Alternative
	Environmental risk to public (from chemical exposures)	$<1 \times 10^{-6}$ ELCR	Same as No Action Alternative	Same as No Action Alternative

Table S–2. Comparison of Potential Consequences of Continued Operations at SNL/NM (continued)

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Transportation	Transportation population risk within ROI (from radiation)	8.3x10 ⁻⁴ LCF/yr (1.7 person-rem)	2.5x10 ⁻³ LCF/yr (4.9 person-rem)	2.0x10 ⁻⁴ LCF/yr (0.4 person-rem)
	Total transportation population risk (from radiation)	0.1 LCF/yr	0.33 LCF/yr	4.5 x10 ⁻² LCF/yr
	Traffic accident fatalities	0.49/yr	1.3/yr	0.18/yr
	Total transportation population risk (from truck emissions)	0.03 LCF/yr	0.06 LCF/yr	0.01 LCF/yr
Waste Generation (Annual)	Management capability (infrastructure)	All projected activities are within capacities of existing facilities and systems.	Same as No Action Alternative	Same as No Action Alternative
	Total radioactive waste	Up to 176 m ³	Up to 289 m ³	Up to 106 m ³
	Total chemical waste	Up to approximately 379,000 kg	Up to approximately 441,000 kg	Up to approximately 306,000 kg

Table S–2. Comparison of Potential Consequences of Continued Operations at SNL/NM (concluded)

RESOURCE AREA	NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE	
Noise and Vibration	Impulse noise-producing test activities projected to increase 35% over 1996 level to 1,435 tests by 2008. Effects would be limited to windows rattling or startle reaction. Background noise levels would continue at current levels from generators, air conditioners, and ventilation systems, but increase due to additional vehicular traffic, aircraft noise, and temporary construction projects (range from 50 to 70 dB).	There would be a 250% increase in test activities over 1996 levels, to 2,638 per year, approximately one impulse noise event per hr for an 8-hr work day and a 261-day work year. Only a small fraction of these tests would be of sufficient magnitude to be heard or felt beyond the site boundary. The vast majority of tests expected to be below background noise levels for receptor locations beyond the KAFB boundary and would, therefore, be unnoticed in neighborhoods bounding the site.	Test activities would be 65% less than the 1996 level, 371 tests per year, an average of approximately 1.5 impulse noise tests per day. Only a small fraction of these tests would be of sufficient magnitude to be heard or felt beyond the site boundary. The vast majority of tests expected to be below background noise levels for receptor locations beyond the KAFB boundary and would, therefore be unnoticed in neighborhoods bounding the site.	
Socioeconomics^b	SNL/NM employment ^c	8,035	8,417	7,422
	SNL/NM total economic activity within the ROI	\$4.13 B/yr	\$4.33 B/yr	\$3.81 B/yr
	Percent of ROI total economic activity	9.7	10.1	9.0
Environmental Justice^a	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: TtNUS 1998
 B: billion
 dB: decibel
 ELCR: excess lifetime cancer risk
 gal: gallon
 hr: hour

kg: kilogram
 LCF: latent cancer fatality
 M: million
 m³: cubic meter
 MCL: maximum contaminant level
 MEI: maximally exposed individual

mrem: millirem
 ROI: region of influence
 TA: technical area
 TCE: trichloroethene
 TCP: traditional cultural property
 yr: year

^aNo TCPs have been identified at SNL/NM. If specific TCPs are identified, Native American tribes will be consulted.
^bBounding analysis is based on parameters presented in DOE 1997j.
^cSection 4.12, Affected Environment, differs slightly, using 6,824 full-time employees. Base year in Section 5.3.12, Environmental Consequences (also see Table 3.6–2), used 7,652 full-time employees.

**Table S–3. Comparison of Potential Consequences
for Accident Scenarios at SNL/NM**

RESOURCE AREA	NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
SITE-WIDE EARTHQUAKE			
RADIOLOGICAL IMPACTS			
50-Mile Population (Additional Latent Cancer Fatalities)	8.1x10 ⁻²	7.5x10 ⁻²	7.5x10 ⁻²
Maximally Exposed Individual (Increased Probability of Latent Cancer Fatality)	8.6x10 ⁻⁶	7.7x10 ⁻⁶	7.7x10 ⁻⁶
Noninvolved Worker (Increased Probability of Latent Cancer Fatality)	3.1x10 ⁻²	3.0 x10 ⁻²	3.0x10 ⁻²
CHEMICAL IMPACTS			
Distance (feet) to reach ERPG-2 Levels	3,800	3,800	3,800
CATASTROPHIC ACCIDENT SINGLE FACILITY			
RADIOLOGICAL IMPACTS			
ACRR Medical Isotopes Production			
50-mile population (additional latent cancer fatalities)	1.6x10 ⁻⁶ to 4.9x10 ⁻³	1.6x10 ⁻⁶ to 4.9x10 ⁻³	1.6x10 ⁻⁶ to 4.9x10 ⁻³
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.0x10 ⁻¹⁰ to 6.1x10 ⁻⁷	1.0x10 ⁻¹⁰ to 6.1x10 ⁻⁷	1.0x10 ⁻¹⁰ to 6.1x10 ⁻⁷
Noninvolved Worker (increased probability of latent cancer fatality)	4.9x10 ⁻⁸ to 7.6x10 ⁻⁵	4.9x10 ⁻⁸ to 7.6x10 ⁻⁵	4.9x10 ⁻⁸ to 7.6x10 ⁻⁵
Hot Cell Facility			
50-mile population (additional latent cancer fatalities)	1.6x10 ⁻⁶ to 7.9x10 ⁻²	1.6x10 ⁻⁶ to 7.9x10 ⁻²	1.6x10 ⁻⁶ to 7.9x10 ⁻²
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.0x10 ⁻¹⁰ to 6.6x10 ⁻⁶	1.0x10 ⁻¹⁰ to 6.6x10 ⁻⁶	1.0x10 ⁻¹⁰ to 6.6x10 ⁻⁶
Noninvolved Worker (increased probability of latent cancer fatality)	4.2x10 ⁻⁹ to 7.4x10 ⁻⁶	4.2x10 ⁻⁹ to 7.4x10 ⁻⁶	4.2x10 ⁻⁹ to 7.4x10 ⁻⁶
Sandia Pulsed Reactor			
50-mile population (additional latent cancer fatalities)	1.2x10 ⁻³ to 9.2x10 ⁻³	1.2x10 ⁻³ to 9.2x10 ⁻³	1.2x10 ⁻³ to 9.2x10 ⁻³
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.5x10 ⁻⁷ to 8.4x10 ⁻⁷	1.5x10 ⁻⁷ to 8.4x10 ⁻⁷	1.5x10 ⁻⁷ to 8.4x10 ⁻⁷
Noninvolved Worker (increased probability of latent cancer fatality)	2.5x10 ⁻⁴ to 3.8x10 ⁻³	2.5x10 ⁻⁴ to 3.8x10 ⁻³	2.5x10 ⁻⁴ to 3.8x10 ⁻³

Table S–3. Comparison of Potential Consequences for Accident Scenarios at SNL/NM (concluded)

RESOURCE AREA	NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
ACRR-Defense Programs Configuration			
50-mile population (additional latent cancer fatalities)	1.3x10 ⁻³ to 9.0x10 ⁻³	1.3 x10 ⁻³ to 9.0x10 ⁻³	Not operational
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.7x10 ⁻⁷ to 1.0x10 ⁻⁶	1.7x10 ⁻⁷ to 1.0x10 ⁻⁶	Not operational
Noninvolved Worker (increased probability of latent cancer fatality)	1.2x10 ⁻⁵ to 2.2x10 ⁻⁴	1.2x10 ⁻⁵ to 2.2x10 ⁻⁴	Not operational
CHEMICAL IMPACTS			
Technical Area-I			
Distance (feet) to reach ERPG-2 Levels ^a	1,440 - 4,884	1,440 - 4,884	1,440 - 4,884
EXPLOSIVE IMPACTS			
Technical Area-I			
Distance (feet) to reach 2 psi (Damage to cinder block walls)	370	370	370
Distance (feet) to reach 10 psi (rupture of 50% of eardrums)	126	126	126
Distance (feet) to reach 50 psi (50% fatalities)	61	61	61

Source: Original

ERPG: emergency response planning guideline

ACRR: Annular Core Research Reactor

psi: pounds per square inch

^a For the three largest worker (people) densities within ERPG-2 levels related to Buildings 858, 883, and 893

This page was intentionally left blank.

This page was intentionally left blank.

This page was intentionally left blank.