

## CHAPTER 6

### Cumulative Effects Analysis

The Council on Environmental Quality regulations implementing the *National Environmental Policy Act* (NEPA) define cumulative effects as “the impact on the environment which results from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 Code of Federal Regulations [CFR] §1508.7). The regulations further explain that “cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.” The cumulative effects analysis presented in this Site-Wide Environmental Impact Statement (SWEIS) is based on the incremental actions in the region and the operations at Sandia National Laboratories/New Mexico (SNL/NM), as detailed in Chapter 5.

Based upon examination of the potential environmental effects of direct and indirect actions, coupled with other agency and U.S. Department of Energy (DOE) actions in the region and private actions, the DOE determined the following resource areas were likely to have a potential for cumulative effects and needed to be analyzed in detail: land use, infrastructure, water resources and hydrology, soils, biological and ecological resources, cultural resources, air quality, human health and worker safety, waste generation, transportation, noise and vibration, socioeconomics, and environmental justice. This chapter provides a detailed description of seven additional DOE facilities that are not included in the impact analysis presented in Chapter 5, a brief overview of U.S. Department of Defense (DoD) activities at Kirtland Air Force Base (KAFB), and the cumulative effects on resource areas of the activities at facilities selected for study in this SWEIS.

#### 6.1 METHODS OF ANALYSIS

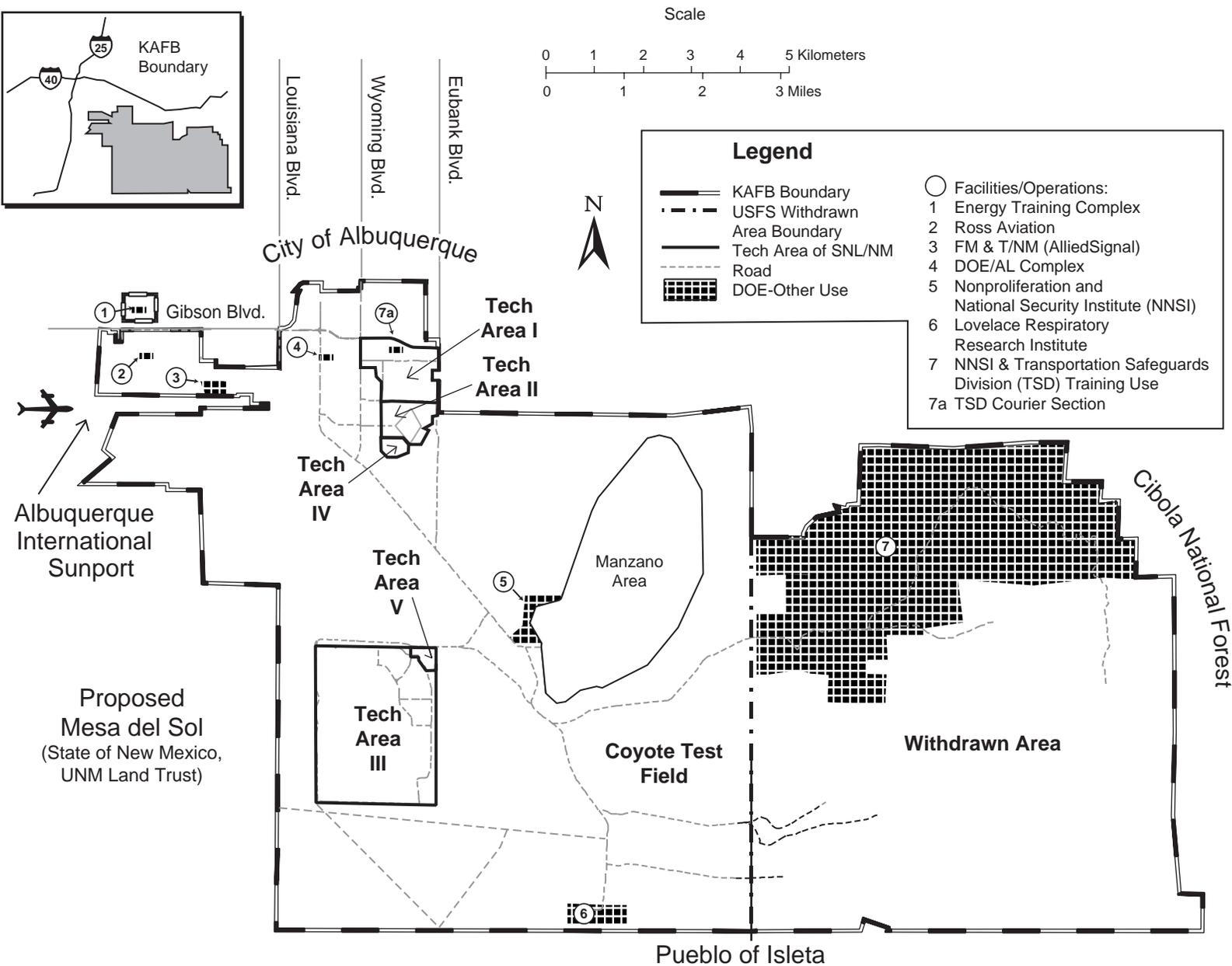
The DOE assessed cumulative effects by combining the potential effects of the Expanded Operations Alternative with the effects of other past, present, and reasonably foreseeable activities in the regions of influence (ROIs). The Expanded Operations Alternative was chosen to assess and present a bounding scenario of potential cumulative effects. This approach allowed a conservative analysis or a maximum estimation of cumulative

impacts. Differences in impacts from the other alternatives are noted if they would cause any variation in the analysis. The extent of the ROIs varies widely from one resource area to another. The ROIs used in the cumulative effects analysis are the same as the ROIs presented in Chapter 4.

#### 6.2 DOE FACILITIES/DoD ACTIVITIES

This section describes seven additional DOE facilities and their activities and operations. These include the DOE Albuquerque Operations Office (AL), Energy Training Complex (ETC), Transportation Safeguards Division (TSD), Nonproliferation and National Security Institute (NNSI), Ross Aviation, Inc. (Ross), Lovelace Respiratory Research Institute (formerly the Inhalation Toxicology Research Institute), and Federal Manufacturing & Technology/New Mexico (FM&T/NM) (also known as AlliedSignal) (Figure 6.2–1). The operations of these facilities and any contribution to impacts to specific resource areas are summarized in the sections that follow (Sections 6.2.1 through 6.2.7). Table 6.2–1 lists various parameters related to the operation of the additional DOE facilities.

In general, activities at the seven additional DOE facilities are similar to the activities described in Chapters 2 and 3. The potential impacts to resources described in Chapter 5 are largely representative of the type of impacts resulting from these seven DOE facilities. These seven facilities were not included in Chapter 5 because they are not SNL/NM’s activities. Routine operations of these facilities involve maintenance support services, ongoing custodial services, security services, and training services. None of these activities pose any major threat or harm to the environment, and the potential for environmental impacts is low. Standard safety procedures, environmental safeguards, and hazardous waste and materials management are conducted at the facilities in accordance with applicable U.S. Department of Transportation (DOT), DoD, DOE, and U.S. Environmental Protection Agency (EPA) requirements. Similarly, Section 6.2.8 describes DoD activities at KAFB, including operations and environmental quality.



**Figure 6.2-1. Additional DOE Facilities at KAFB**  
 Other DOE operations, not related to SNL/NM, are located at KAFB.

Source: Original

**Table 6.2–1. Summary of Parameters and Activities of Additional DOE Facilities at KAFB**

PARAMETER	ALBUQUERQUE OPERATIONS OFFICE	ENERGY TRAINING CENTER	TRANSPORTATION SAFEGUARDS DIVISION	NNSI	ROSS AVIATION	LOVELACE RESPIRATORY RESEARCH INSTITUTE	FM&T/NM
<b>FTEs</b>	840	20	80	130	70	225	282
<b>Utilities</b>	Electric power from PNM; water from city; steam from SNL/NM sources; natural gas provided through KAFB; some diesel fuel storage for emergency generators	Electric power from PNM; water from city	Electric power from KAFB; water from KAFB and city	Electric power from KAFB; water from KAFB and city	Electric power from KAFB; water from KAFB and city	Electric power from KAFB; water from KAFB and city	Electric power from KAFB; water from KAFB and city
<b>Wastes<sup>a</sup></b>	Wastes managed through SNL/NM and KAFB	Wastes managed through KAFB	Wastes managed through SNL/NM and KAFB	Wastes managed through SNL/NM and KAFB	Wastes managed by Ross	Wastes managed through SNL/NM and KAFB	Wastes managed through SNL/NM and KAFB
<b>Special Materials</b>	None	None	Classified materials and explosives	Weapons, ordnance, oil, gasoline, paint, cleaning compounds, insecticides	Jet fuel, batteries, and some handling of radioactive materials	Radioactive materials	Paint, fuel, cleaning compounds, oil, pyrotechnic, and ammunition material

Sources: DOE 1998f, SNL/NM 1997j

FM&amp;T/NM: Federal Manufacturing &amp; Technology/New Mexico

FTE: full-time equivalent

KAFB: Kirtland Air Force Base

LLW: low-level waste

NNSI: Nonproliferation and National Security Institute

PNM: Public Service Company of New Mexico

TA: technical area

TRU: transuranic

<sup>a</sup>Waste volumes are accounted for in total volumes by waste category as managed by SNL/NM and KAFB (see balance of operations totals in Tables H.3–2 and H.3–8).

Site-wide municipal solid waste is covered in Table H.3–14. Individual facility waste generation rates by waste category were not reported (DOE 1998f) but are believed to be small due to the nature and scope of operations conducted at these facilities.

### 6.2.1 Albuquerque Operations Office

The DOE implements many of its mission lines and programs through assignments to field organizations. Since the establishment of the Atomic Energy Commission in 1946, AL's primary assignment has been the field management of the nation's nuclear weapons stockpile. AL performs this mission for Defense Programs (DP) and its customer, the DoD's Strategic Command. Other missions are restoring the environment and ensuring a strong scientific and technology base. AL uses Federal resources to accomplish mission objectives and to oversee the contractors who manage and operate major facilities located throughout the country. These facilities include research and engineering laboratories, nuclear weapons production plants, and environmental management sites.

The site is located on land owned by the Federal government. The main AL site is located on KAFB. Some DOE buildings are on property owned by the DOE, although many are on property owned by the U.S. Air Force (USAF) and permitted to the DOE. Two USAF buildings are also adjacent to DOE buildings. The AL complex occupies approximately 6 ac of DOE-owned land and 6.7 ac of land under a use permit from the USAF. Additionally, DOE owns an 86 ac parcel of vacant land located along the west side of Eubank Boulevard just outside the northern boundary of KAFB (see Section 4.3).

#### Facilities and Operations

The main AL site includes 40 buildings, of which 30 are bounded by a security fence. Buildings on the main site include five three-story office buildings, several portable trailers used as temporary office space, eight one-story buildings, an interconnect, one maintenance shop, a shipping and receiving building, a wellness center/snack bar, and a child development center. Most activities at AL are administrative in nature. Hazards are typical of an office environment that might result in falls on stairways, minor cuts or abrasions, back strains, and the like.

As of April 1998, approximately 840 personnel were located in this complex. Approximately 100 other DOE employees were located within SNL/NM Technical Area (TA)-I, in the AL Kirtland Area Office (KAO), and in a number of smaller offices associated with activities described below.

### 6.2.2 Energy Training Center

AL operates the ETC, located approximately 3 mi west of the main AL site previously described. The ETC consists of approximately 10 ac of land permitted to the DOE by the USAF. The facility is an historic complex registered with the New Mexico Historical Society. It was originally constructed in 1936 as the Sandia School, a group of buildings housing an all-girls school. Since that time, it has served during World War II as the location for an Army and USAF convalescent hospital, the first location of the New Mexico Institute of Mining & Technology, the location for some of Sandia Laboratories' first physicists, the offices of the Atomic Energy Commission, and the KAFB West Officers' Club. The facility has recently undergone major interior renovations to support DOE's technical training program functions, while maintaining its historical character.

The ETC has the capacity for multifaceted training and development and for large conferences and meetings. The ETC's operations are funded solely by the DOE; however, the Department shares the facilities with SNL/NM contractors; other Federal, state, and local agencies; and the local community, thereby generating ongoing cost savings for the Federal government, its laboratories, and its customers. The site includes eight buildings, with a gross building area of 53,996 ft<sup>2</sup>, and an adjacent parking lot. The ETC contains 15 training and meeting rooms accommodating up to 700 attendees, an auditorium with a 300-seat capacity, and a computer training room. The ETC also has a customer service complex, offering a variety of support services to accommodate training and meeting needs. Hazards existing at the ETC are those typical of an office building.

### 6.2.3 Transportation Safeguards Division

Established in 1975, the DOE's TSD provides for safe and secure movement and continual surveillance and accountability of government-owned special nuclear material, nuclear weapons, and weapon components throughout the U.S., by way of DOE-owned and -operated tractor trailers. There are three TSD facilities located in different areas of KAFB: the Albuquerque Courier Section, the Training Center and Annex, and the TSD Administrative Offices and Secure Communications Center (SECOM). These facilities are described below. SNL/NM manages and disposes of all hazardous waste generated by TSD. A description of the transport activity for weapon components and radioactive materials may be found in the *Stockpile Stewardship and*

*Management [SSM] Programmatic Environmental Impact Statement [PEIS] (DOE 1996a) and the Final Environmental Impact Statement [EIS] for Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons (DOE 1996k).*

### **Albuquerque Courier Section**

The TSD Albuquerque Courier Section is located in a fenced area within SNL/NM's TA-I. The facility consists of eight administrative buildings; one vehicle maintenance facility (VMF); a Mobile Electronic Maintenance Facility (MEMF); and a safe, secure transport (SST) parking area in support of TSD's operations. The buildings on the site are prefabricated metal buildings, approximately 30 ft by 60 ft, located on approximately 3 ac of land.

TSD's Albuquerque Courier Section has approximately 80 employees including both Federal and contractor personnel. Activities are mainly administrative in nature, but also include special agent trip preparation and vehicle maintenance. There is an armory located in one of the buildings. Limited amounts of Class 1.3 and 1.4 munitions are stored separately from the firearms for immediate protective force response. The MEMF functions primarily as an electronics equipment testing, maintenance, and repair facility for TSD vehicles. The VMF, which is adjacent to the Albuquerque Courier Section, is operated by SNL/NM to perform routine maintenance on the SSTs and escort vans. Most of TSD's functions are administrative or standard vehicle maintenance, and the associated hazards are typical of those activities.

### **Training Center and Annex**

TSD's Training Center and Annex consist of 11 administrative buildings, 1 armory, 8 storage bunkers, and an SST parking area in support of the TSD's operations. The Training Center and Annex are located in Coyote Canyon on approximately 619 ac of property leased from the USAF. The buildings are prefabricated metal, approximately 30 ft by 60 ft. There is an armory located in one of the buildings. DoD-approved and -licensed bunkers for housing munitions are located across the road from the Annex.

TSD's Training Center and Annex operations are performed by approximately 40 contractor personnel. Activities include administrative functions, special agent classroom training, engagement simulation system equipment storage, and firearm maintenance and storage.

The Training Center and Annex are used for training, development, and logistical support. Similar to TSD's Albuquerque Courier Section, most of the Training Center and Annex activities consist of office and classroom training and the typical hazards are those associated with such activities. As mentioned, munitions are stored onsite, but are not used in this area.

### **Administrative Office and Secure Communications Center**

The administrative offices of TSD are encompassed in the description of the main AL office site. SECOM is also located within this area. There are 15 TSD personnel who operate the equipment that continuously tracks the DOE's SST vehicles over the road, 24 hours a day, 7 days a week. SECOM provides management of nuclear material shipments, reliable communications, emergency response, and remote command and control of five relay stations. Backup tracking systems, including a voice system and a digital vehicle monitoring system, are also available for use in case the primary SECOM tracking system should fail. Hazards existing at TSD administrative offices are those typical of an office setting.

### **6.2.4 Nonproliferation and National Security Institute**

In May 1984, the Secretary of Energy authorized the establishment of the Central Training Academy (CTA), which is located on land owned by the USAF and permitted to the DOE. The CTA, now known as the NNSI, is composed of two facilities, the campus and the live-fire range. The campus is located in the foothills and canyons of the Manzanita Mountains on KAFB. The live-fire range is located in Coyote Canyon on 85 ac approximately 6 mi east of the campus. The land and buildings for both facilities are administered by KAFB, and the buildings occupy approximately 41 ac. The live-fire range is on U.S. Forest Service (USFS) land that has been withdrawn to the USAF and subsequently permitted to the DOE. Safety zones associated with the live-fire range also extend into the DOE portion of the Withdrawn Area.

The NNSI provides the effective and efficient training and professional development of safeguards security personnel throughout the DOE who are, or may become, involved in security training and program management for safeguards and security training at all DOE facilities. The NNSI provides training in various security disciplines such as tactical response, supervisor and instructor certification, advanced weaponry, threat

analysis, material control and accountability, and safety officer certification. SNL/NM manages and disposes of small quantities of hazardous waste generated at the live-fire range.

### Facilities and Operations

The NNSI campus consists of eight permanent buildings, used under a 15-year permit from the USAF, and several portable buildings. Under the terms of the permit, the USAF is responsible for all subsurface utilities and facilities such as sewer, water, fuel, telephone, and power lines.

There are five firearms ranges, including two pistol ranges, two rifle ranges, and a research and development (R&D) range. There are a number of support facilities for range operations such as a range administration building with a paramedic facility, three range control towers, a small tactical simulator tower, a tactical training facility, an armory, a machine shop, classroom space, a small ammunition bunker, and a structure used for weapons cleaning. Small quantities of chemicals, including paint, adhesives, fertilizer, oil, gasoline, cleaning compounds, and insecticides, are used and stored at these facilities.

Most of the campus activities are those associated with an educational facility or office environment and the typical hazards are those associated with such activities. Live-fire range instruction includes basic firearms instructor training, armorer training, rappelling, tactical movement with firearms, and safety officer range instruction. Activities at the NNSI firing range could involve hazards of types and magnitudes that are not as common. Because training at the live-fire range involves live ammunition, the possibility of a traumatic accident exists. Although these activities present certain risks, existing safety procedures reduce these risks. Overall, the risks are considered low. A paramedic is on duty during all potentially hazardous training courses and has advanced life support and emergency first aid equipment and trauma supplies on hand.

The NNSI has an Interdependent Support Agreement with KAFB to provide fire protection and other support activities. The risk of fire at the campus is consistent with that of any business or educational facility. Most of the buildings within the NNSI campus have fire detection systems in place. The risk of fire in the administrative area of the live-fire range is also low. In the range areas, the most likely fire-related incident is one wherein diversionary devices are used during training. The fire

potential has been recognized, and safe operating procedures require that diversionary devices be used only in designated areas. Organizations using pyrotechnic devices are required to provide their own fire watch and means of extinguishing fires. Very limited amounts of flammable liquids are maintained at the NNSI. Gasoline is stored in one 500-gal aboveground tank or in approved 5-gal safety cans and secured in National Fire Protection Association (NFPA)-approved flammable storage cabinets.

The live-fire range munitions storage area is inside a fenced enclosure east of the administration area. Aboveground storage containers are used for storage of small arms ammunition and diversionary devices. Munitions are stored in accordance with safe operating procedures, the DOE *Explosive Safety Manual* (DOE M 440.1-1), and the DOE *Firearms Safety Technical Standard* (DOE-STD-1091-96), which consider risks, quantities, distances, compatibility, and procedural requirements. Regular inspections are conducted to ensure compliance with storage and transportation requirements.

### 6.2.5 Ross Aviation, Inc.

Ross is the air transportation support services contractor for TSD. Ross has been involved in both operating and maintaining large transport-category and small multi-engine aircraft in support of DOE operations for over two decades. Ross operates from facilities and land owned by the 377<sup>th</sup> Air Base Wing, KAFB, and permitted to the DOE. The Ross site is located on KAFB and covers approximately 11.4 ac. Ross's facilities and operations on KAFB are described below. A description of the transportation of weapon components and radioactive materials may be found in the SSM PEIS (DOE 1996a) and the Pantex EIS (DOE 1996k).

#### Facilities and Operations

The facilities consist of the main 42,412-ft<sup>2</sup> aircraft hangar, two guard buildings, a portable modular building, a hazardous materials storage area, a parking lot, and a 3,200-ft<sup>2</sup> maintenance support facility, which houses various workshops. The aircraft that Ross operates in support of the DOE air service contract are government-owned.

Ross transports cargo to and from DOE production plants, national laboratories, test sites, and military facilities and provides special passenger and cargo flights on demand. Ross operates from facilities located on

KAFB land, permitted to the DOE by the USAF, adjacent to the Albuquerque International Sunport. Ross operates and maintains a fleet of seven aircraft that include the deHavilland DHC-6, Beechcraft B-200, Lear 35A, and Douglas DC-9 aircraft. The DHC-6 aircraft are used for research-related activities. The size and mix of the fleet are adjusted in response to DOE mission line requirements. Loading and unloading of radioactive materials at the Albuquerque location are frequently conducted on the south side of the runway at KAFB. On rare occasions, shipments are loaded at the Ross facility.

Ross maintains a Federal Aviation Administration (FAA)-approved repair station at this site and is certified to perform maintenance on each of the DOE's aircraft. All maintenance, except DC-9 major maintenance, is performed at Ross's facilities in the city of Albuquerque. The DC-9 major maintenance is performed under contract by Air Canada at their maintenance center located in Montreal, Canada.

There is no permanent or bulk storage of gasoline or jet fuel on the site. Jet fuel is purchased on an as-needed basis from the USAF and is kept in two 5,000-gal-capacity tank trucks until dispensed. In addition, 10,000 gal of jet fuel are kept in mobile fuel trucks. Ross operates and maintains the fuel trucks within the DOT requirements. During routine aircraft maintenance, some spent jet fuel and oil are generated and are recycled by a local contractor. Ross Aviation generates hazardous wastes in quantities less than 1,000 kg per month, and is, therefore, considered a small-quantity generator of hazardous wastes under the *Resource Conservation and Recovery Act (RCRA)* (42 United States Code [U.S.C.] §6901). Solid waste from the site is transported to the city of Albuquerque landfill by a commercial service provider under contract to the DOE. Cardboard and paper are recycled through the KAFB recycling program.

### 6.2.6 Lovelace Respiratory Research Institute

The Lovelace Respiratory Research Institute is located on land owned by the Federal government; administered by the U.S. Department of the Interior, Bureau of Land Management (BLM); and withdrawn for use by the USAF at KAFB. AL maintains a permit from the USAF for use of the land, which is renewed every five years. The primary permit includes the main site, a water line from SNL/NM TA-III, an elevated water tank site, and a high-voltage power transmission line. The site covers approximately 144 ac.

The buildings and most major equipment at the Lovelace Respiratory Research Institute are owned by the DOE. The facility was formerly a single-program laboratory under the DOE's Office of Energy Research and was operated for the DOE by the Lovelace Biomedical and Environment Research Institute, Inc. (LBERI), under a cost-reimbursable, no-fee management and operating (M&O) contract between DOE, LBERI, and The Lovelace Institute, LBERI's corporate parent. The M&O contract terminated in September 1996. On October 1, 1996, the DOE leased the buildings and equipment to LBERI for a period of five years, for operation of a private biomedical research institute now known as the Lovelace Respiratory Research Institute. The DOE has continued to fund work by LBERI under a five-year cooperative agreement that began in October 1996. The DOE, as the landlord, continues to be responsible for major maintenance at the facility. LBERI conducts private work at the facility funded through various grants, contracts, and philanthropic contributions. Use of the facility by LBERI must be within the scope of the DOE lease arrangement and the conditions of the USAF permit to DOE.

The initial research program at Lovelace Respiratory Research Institute focused on the human health consequences associated with the inhalation of airborne radioactive fission products. In the late 1960s and early 1970s, the research program expanded to include research on the transuranic (TRU) alpha-emitting radionuclides. In the mid-1970s, the research program was broadened further to examine the potential health effects of airborne chemicals released from energy use and energy production sources such as coal combustion and gasification, solar collectors, and light-duty diesel engines. Since 1980, the program focus has shifted to include more basic research, with an emphasis on understanding the fundamental biological response of the respiratory tract to inhaled materials.

#### Site Description

The Lovelace Respiratory Research Institute complex is located approximately 10 mi south of the city of Albuquerque on KAFB. The main site covers approximately 144 ac, of which approximately 40 ac are developed. In addition to the main site, 9 ac are associated with water pumping, storage, and distribution, and electrical power distribution. The site is on a high, semi-arid alluvial fan, surrounded by KAFB to the north, east, and west, and by the Pueblo of Isleta to the south.

## Facilities and Operations

Most of the Lovelace Respiratory Research Institute's research operations and facilities are concentrated within a 20-ac area, with the remaining acreage used for roads, storage, buffer area, environmental monitoring, and utilities. Total building square footage is approximately 290,000 ft<sup>2</sup>. Approximately 50 percent of the space is devoted to bench-scale laboratory operations. Facilities for animal housing occupy about 25 percent of the space. Warehouse storage; engineering and maintenance shops; environment, safety, and health facilities; and waste storage buildings comprise the remainder of the space. The site includes unique facilities for conducting long-term inhalation toxicology studies using laboratory animals under carefully controlled conditions. These facilities are designed with specialized air handling systems, are isolated from other laboratories, and may be used for research on radioactive or potentially carcinogenic materials. The scale of the work is best portrayed by the fact that materials under investigation are used in concentrations to which people are, or may be, typically exposed, and that about half of the work involves materials that are common air pollutants.

There are three main categories of operations at the facility. About 5 to 10 percent of laboratory operations is devoted to work with aerosols. Characterization of aerosols is conducted for purposes such as designing atmospheric pollutant detectors, identifying the effectiveness of respirator filters, and developing effective medication delivery carriers for inhaler devices. Aerosols are prepared for use in animal exposure tests for determination of effects from inhalation of various chemicals and nuclear materials.

Much of the work (approximately 40 percent) includes conducting exposure studies using test aerosols with laboratory animals, primarily rodents. Work is typically conducted with microgram to milligram quantities of materials and is carried out within enclosures for health protection measures and to treat air exhaust. Examples of this type of research include

- determining radiation dose and injury to critical lung cells following exposure to radon, *in vivo* and *in vitro*;
- characterizing xenobiotic-metabolizing enzymes produced from exposure to cigarette smoke in the respiratory tract of rodents;
- determining the relationship between airway dimensions and airflow following exposure to various energy-related aerosols; and

- conducting histopathological examination of lung tissue collected from uranium miners.

An additional 15 to 20 percent may be described as analytical chemistry operations. Work in this category is typically related to characterizing the biochemical mechanisms of respiratory disease. Examples of this type of research include

- testing the metabolic action of benzene and its metabolites in the liver and bone marrow of rodents,
- developing cellular models of radiation-induced carcinogenesis in rodents,
- identifying intrinsic human genes that govern susceptibility to radon-induced cancer, and
- investigating the cellular mechanisms of granulomatous disease from inhaled beryllium.

A wide variety of hazardous chemicals, some of which are carcinogenic, biological agents, and radioactive materials in small quantities, are handled in the facility. Air effluents are treated with various techniques such as high-efficiency particulate air (HEPA) filtration, activated charcoal filtration, and thermal oxidation. Air effluents are permitted under a Title V operating permit with the Albuquerque/Bernalillo County Air Quality Control District (A/BC AQCD).

Sanitary wastewater is discharged to the KAFB main line and a monitoring station is located upstream of that juncture. The facility is a small-quantity generator under RCRA regulations. Occasional small quantities of low-level waste are shipped to the Nevada Test Site (NTS), and very small amounts of TRU waste are occasionally shipped to SNL/NM. Hazardous and sanitary waste disposal is contracted to a local firm.

### 6.2.7 Federal Manufacturing & Technology/New Mexico (AlliedSignal)

FM&T/NM (also known as AlliedSignal) is an operating division of AlliedSignal FM&T in Kansas City, Missouri. FM&T/NM is an M&O contractor to the DOE. FM&T/NM operates six facilities, two in the city of Albuquerque and four at various locations on KAFB.

FM&T/NM is primarily tasked with producing or procuring nonnuclear components for the DOE's national security mission at the Kansas City Plant. FM&T/NM is an applied-science and engineering organization engaged in research, analysis, testing, and field operations that principally support the TSD, as well

as the national laboratories, other DOE contractors, the DoD, and other Federal agencies.

FM&T/NM provides a wide range of technical support activities to the DOE and other Federal agencies in multi-disciplined fields. Activities include technical support in electronic and mechanical fabrication; electronic, mechanical, and optical design and development; accelerator design; experimental physics; software development, data gathering, and analysis; computer-based training; security system development and installation; security force training; drafting; videography; calibration; and support to the nation's nuclear SST system. These activities routinely involve field operations within the U.S. and occasionally involve worldwide field operations. FM&T/NM often uses the significant manufacturing capabilities of the Kansas City Plant to provide support to their customers.

#### Facilities and Operations

FM&T/NM operates facilities at the following sites in Bernalillo county, New Mexico: NC-135 Area, KAFB; Craddock Facility at 2540 Alamo SE; Mobile Electronic Maintenance Facility, Building 854, TSD Albuquerque Courier Section, KAFB; Electronics Site, KAFB; Transportation Safeguards Training Center Annex (2 buildings), KAFB; and Air Park Facility at 2100 Air Park SE.

The main facility is the NC-135 area. This site covers 20.5 ac with 3 concrete flight pads and multiple buildings totaling 56,728 ft<sup>2</sup>. FM&T/NM administrative operations are located here, including engineering functions; various electronic equipment testing, repair, and fabrication areas; a spray paint shop; a small machine shop; and a facility maintenance area.

The Craddock Facility is a leased facility used for machine and metal work. The Air Park Facility is a leased facility used for classroom training. The remaining locations support TSD operations and are described under those operations.

All operations and processes conducted at FM&T/NM are of a type and nature routinely encountered by the public in general industry. Small quantities of chemicals typical of machining and electronics repair are used. FM&T/NM meets the definition of a small-quantity generator or conditionally exempt small-quantity generator.

#### 6.2.8 U.S. Department of Defense Activities

The following section describes DoD activities at KAFB. The description of activities and the analysis of potential environmental impacts is not meant to be exhaustive or be totally inclusive of all DoD activities and operations. KAFB maintains an environmental management division that is independent of the DOE's environmental management division. KAFB is responsible for ensuring USAF compliance with all applicable Federal, state, and local environmental regulations.

##### Operations

KAFB is an Air Force Materiel Command base sharing installation facilities and infrastructure with over 200 associate organizations, including AL, KAO, and SNL/NM. DoD units on the base serve a variety of operational, research, and development missions, representing all branches of the DoD. The base covers approximately 51,560 ac in Bernalillo county adjacent to the southeast boundary of the city of Albuquerque.

The host organization at KAFB is the 377<sup>th</sup> Air Base Wing. The mission of the wing is to provide munitions maintenance, readiness, and base operating support to base associate organizations. Base support functions include civil engineering, transportation, medical, financial, and personnel services. The 898<sup>th</sup> Munitions Squadron, which operates the Kirtland Underground Munitions and Maintenance Storage Complex (KUMMSC), is a significant organization within the 377<sup>th</sup> Air Base Wing. Their mission is to receive, store, maintain, modify, and ship weapons and components. This function is available to all uniformed services and to the DOE worldwide.

Following are other major DoD associate organizations at KAFB and their missions.

- *Headquarters, USAF Operational Test and Evaluation Center*—Responsible for planning and conducting realistic, objective, and impartial testing and evaluation of USAF weapons systems, in an operational setting, to determine their effectiveness and suitability in meeting the needs of the USAF mission.
- *Field Command, Defense Special Weapons Agency (FCDSWA)*—As the field element of the Defense Nuclear Agency, the FCDSWA's major responsibilities include maintaining the database on all nuclear weapons in the national stockpile and conducting nuclear weapons effects tests using high

explosives, thermal, electromagnetic pulse, and radiation simulation facilities. FCDSWA also operates the Interservice Nuclear Weapons School at KAFB, which provides both classroom instruction and field exercises in handling emergency situations involving nuclear weapons.

- *The Air Force Research Laboratory (AFRL)*—Headquartered at Wright-Patterson Air Force Base, Ohio, AFRL (formerly known as the Phillips Laboratory) is responsible for space system, ballistic missile, geophysics, and directed energy system research. AFRL operations at KAFB are as follows:
- *AFRL Directed Energy Directorate*—Demonstrates the technical feasibility of lasers and imaging systems; also involved in the development of high-energy plasmas, microwave technology, electromagnetic pulse hardening, and advanced techniques and computer simulations for weapon effects.
- *AFRL Space Vehicle Directorate*—Develops spacecraft and ballistic missile technologies. The primary focus is on structures, power and thermal management, sensors, electronics, and geophysics.
- *The 58<sup>th</sup> Special Operations Wing (58<sup>th</sup> SOW)*—The 58<sup>th</sup> SOW is one of two flying wings at KAFB and is responsible for training all USAF helicopter and HC-130 Special Operations crews and pararescue specialists, handling over 1,000 students per year.
- *Headquarters, New Mexico Air National Guard*—Provides ready units and personnel as needed to support Federal, state, and community requirements out of a number of locations throughout New Mexico.
- *The 150<sup>th</sup> Fighter Wing (New Mexico Air National Guard)*—The other flying wing at KAFB, flying F-16 C/D aircraft in support of the Air National Guard's overall mission.
- *The Air Force Safety Center (AFSC)*—AFSC manages the USAF Mishap Prevention Program and the USAF Nuclear Surety Program. The AFSC field operating agency develops regulatory guidance, provides technical assistance in all safety disciplines, and maintains the USAF safety database. AFSC also maintains an Aircraft Crash Investigation site on KAFB.
- *The Air Force Inspection Agency*—Provides objective and independent assessments of USAF leadership and management functions to enhance readiness, discipline, efficiency, and effectiveness.

The Manzano Area is a major facility at KAFB. The Manzano Area was built in 1947 and became functional

in 1950 as a location for storing and maintaining weapons during the Cold War. The Manzano Area consists of four weapons maintenance plants located inside the Manzanita Mountains as well as 122 storage magazines, 81 of which are covered with earth, and 41 are tunneled into the side of the mountain.

In June 1992, the Manzano Area was deactivated. The associated material and function was moved to the KUMMSC and the 898<sup>th</sup> Munitions Squadron. Currently, the maintenance bays are used primarily for classified research and development activities, and the bunkers are used for storing a variety of materials and administrative records.

The Manzano Area remains a controlled-access facility with a perimeter fence and a cipher-locked gate. Since 1992, SNL/NM has provided security. The perimeter intrusion detection and alarm system was deactivated with the termination of the main mission in 1992, although individual facilities continue to have intrusion alarms.

## Environmental Quality

### *Hazardous Waste*

Air Force installations typically generate waste solvents, oils, paints, paint sludges, and some R&D chemical wastes that are regulated as hazardous waste. KAFB's hazardous waste management plan sets local management procedures for managing hazardous waste and preventing pollution. The plan incorporates Federal (including Air Force), state, and local requirements regarding hazardous waste and applies to all host and associate organizations that generate hazardous waste on KAFB.

### *Solid Waste*

KAFB collects all refuse, through a private contractor, from military family housing units and all support and associate-occupied areas of the installation. Collected refuse is then disposed of at a regional landfill off KAFB.

### *Fuel Storage Tanks*

Fuel storage tanks represent a potential threat to the environment. Existing underground storage tanks have a phaseout schedule based on age, and all are scheduled to be upgraded with cathodic protection and spill/overflow control by December 1998.

Aircraft are fueled and defueled using tanker trucks. This also represents a potential for spills and leaks to the

environment. KAFB has an annual throughput of about 15.7 M gal of JP-8 fuel, 257,000 gal of gasoline, and 243,500 gal of low-sulfur diesel fuel. JP-4 fuel is stored in two external roof tanks (one 2-M gal and one 4-M gal) located at the bulk fuel storage area. One 10,000-gal gasoline aboveground tank and two (one 10,000-gal and one 5,000-gal) low-sulfur diesel fuel aboveground tanks are also located at the bulk fuel storage area.

Used oil is periodically collected by a commercial contractor for offsite recycling. Used oil is randomly sampled by KAFB Environmental Management for the presence of polychlorinated biphenyls (PCBs) and RCRA constituents.

#### *Environmental Restoration Program*

KAFB conducts an environmental restoration program under the Air Force's Installation Restoration Program (IRP). There are currently 70 IRP sites and 12 areas of concern.

#### *Air Emissions Sources and Inventory*

Air Force installations typically have numerous sources of air pollutant emissions that are regulated and may require permits for construction and operation. Primary emissions sources are steam and hot water generation plants, paint shops, aircraft 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 and lists over 340 "significant" sources. Approximately 150 of these sources are aerospace ground equipment, largely transportable generators, heaters, and cooling units, that are used intermittently. Another 60 are backup generators used to supply power to buildings during outages.

The SWEIS analysis (see Chapter 5, Air Quality) of chemical 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* (42 U.S.C. §7401) or local air quality regulations. Carbon monoxide emissions from vehicle are the primary air pollutant of concern. Total carbon monoxide from SNL/NM and KAFB show decreasing trends and, combined, are less than 10 percent of the total carbon monoxide emissions in the area.

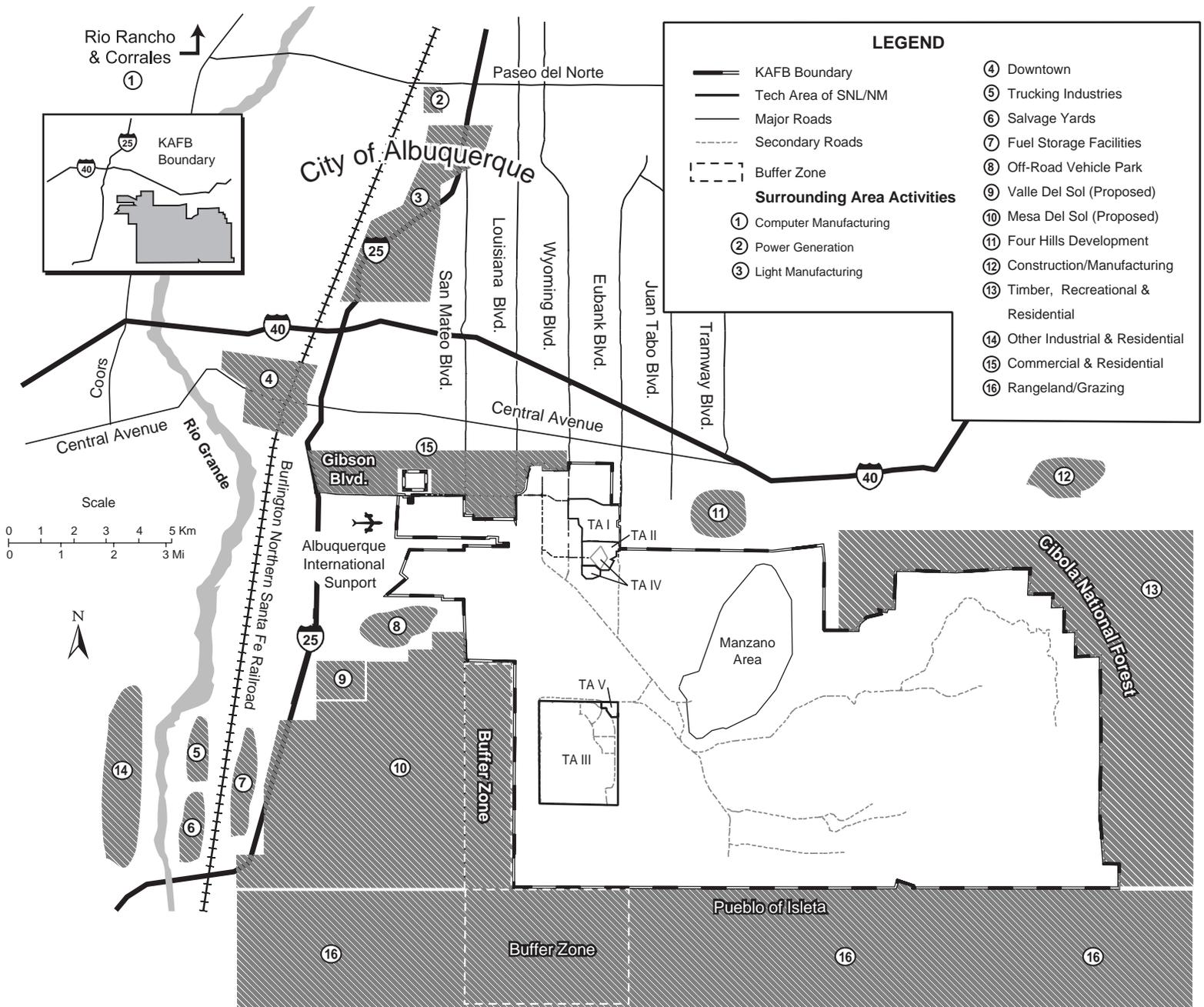
### **6.3 OTHER ACTIVITIES IN THE REGION OF INFLUENCE**

Numerous other activities exist in the KAFB ROI that are not DOE- or DoD-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 ROI has numerous existing and planned industrial facilities and residences with permitted air emissions and discharges to surface waters. Permitted sources generally include electric generating stations, computer chip production, construction materials industries, and other manufacturing facilities. The approximate locations of these activities are highlighted in Figure 6.3-1. 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 (such as USFS, city, and county).

The activities described in the SWEIS are by no means inclusive, but serve to highlight some major influences in the region and to provide perspective on the contribution to the environmental impacts posed by activities at KAFB within the various ROIs. Activities considered in the cumulative effects analysis include city-wide water use, residential land developments, regional transportation activities, energy utilities, and various construction materials industries.

#### *Transportation Corridor Projects*

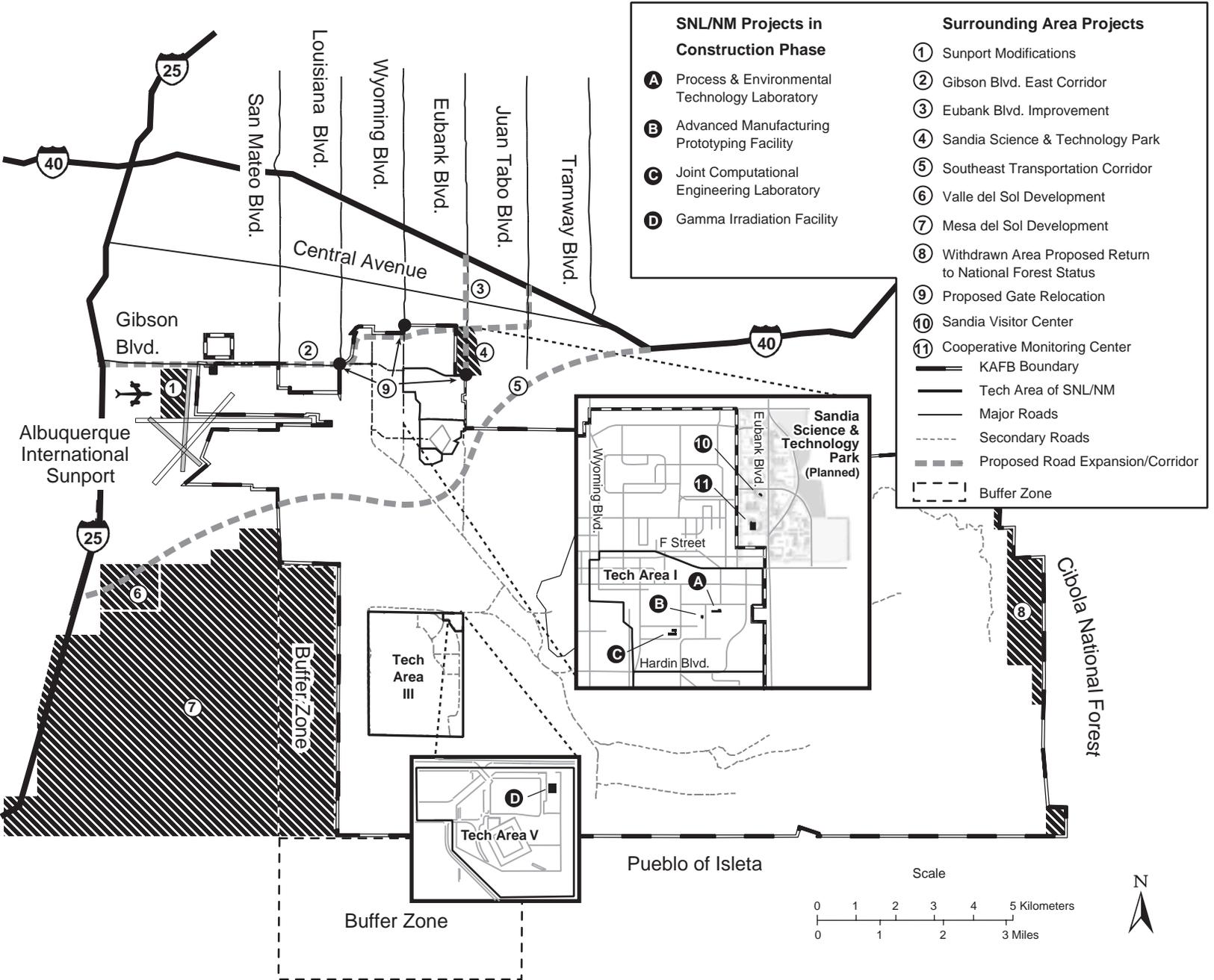
The Southeast Transportation Corridor is part of Bernalillo county's long-range transportation plans. This corridor is planned as part of a loop road system southeast of the Albuquerque International Sunport. The proposed corridor roughly follows the alignment of the Tijeras Arroyo (Figure 6.3-2). In addition, a proposed Gibson Boulevard Corridor would extend the corridor from the Gibson/Interstate I-25 interchange eastward to an intersection with Juan Tabo Boulevard. Gibson Boulevard currently terminates at Louisiana Boulevard. A major infrastructure project funded by the city of Albuquerque, the corridor is planned as the southern segment of a system of roadways that would eventually ring large portions of the metropolitan area. Segments of the corridor may be planned as a limited-access, high-capacity arterial, and other segments may retain their current character as commercial corridors. Gibson Boulevard runs parallel to segments of KAFB's and



Source: Original

**Figure 6.3-1. Additional Activities Near KAFB**

Numerous other activities exist in the KAFB regions of influence that are not related to the U.S. Department of Energy or the U.S. Department of Defense.



Source: Original

**Figure 6.3-2. Near-Future Projects on and near KAFB**

There are new and proposed construction projects in the region of influence.

Albuquerque International Sunport's perimeters. The improvements will enhance east-west vehicle circulation and may provide additional buffering to KAFB's northern boundary. The project is likely to occur prior to 2000 and would result in the relocation of some gates and the demolition of some KAFB housing.

### *Petroleum Products Pipeline*

The Navajo Refining Company recently submitted a right-of-way application to the Bureau of Land Management (BLM) for a proposed petroleum product pipeline that would cross KAFB. The proposed pipeline could affect DOE activities on KAFB, such as SNL/NM, the NNSI, and the TSD.

The BLM's Albuquerque Field Office coordinated a review of the right-of-way application for the proposed petroleum products pipeline with local officials from KAFB, the DOE KAO, and the USFS Sandia Ranger District. The DOE determined that the proposed route would impact current DOE research and development test activities that pose national security and personnel safety concerns. Testing by the DOE and its contractors could not be scheduled and coordinated with private interests due to national security issues, and an easement giving access to private interests could not be provided. In addition, the proposed route would pass through existing explosive safety zones and environmental restoration sites.

The proposed petroleum pipeline was also determined to be inconsistent with the intended land use. The withdrawn lands permitted to DOE on KAFB are designated for research and development and testing activities.

### **6.3.1 Land Development**

Numerous existing residential and commercial developments surround KAFB. New projects outside of KAFB are also ongoing. Several proposed developments include Valle del Sol to be located southwest of KAFB, which calls for an extension of University Boulevard. Development would occur on approximately 520 acres. Mesa del Sol is another planned community south of KAFB that encompasses approximately 13,000 acres of undeveloped land. Current development plans estimate a maximum population of 97,500 persons. These developments are discussed further in Section 6.4.1.

## **6.4 CUMULATIVE EFFECTS BY RESOURCE AREA**

This section describes the environmental effects of implementing the Expanded Operations Alternative on selected resource areas when combined with effects resulting from past and present activities at SNL/NM and other identified past, present, and reasonable foreseeable actions taken by public and private entities in the ROI. Activities examined include DOE activities at SNL/NM, DOE activities at the seven additional facilities, KAFB and DoD activities, and local and regional influences. Table 6.4–1 summarizes estimated parameters associated with SNL/NM, DOE, and KAFB activities. These parameters are presented to illustrate a comparison of the contributions of each entity. The parameters presented for SNL/NM represent annual figures under the Expanded Operations Alternative. The parameters presented for the seven other DOE facilities and KAFB represent 1998 data. Parameters for certain waste streams were in some cases not available. Estimates, including results of qualitative analysis, were used as necessary.

### **6.4.1 Land Use**

The presence of a small incremental effect to land use resulting from operations of the DOE, SNL/NM, and KAFB would not significantly contribute to impacts resulting from other past, present, or reasonably foreseeable actions taken by public and private entities in the ROI. The analysis of cumulative land use effects is an examination of the DOE Expanded Operations Alternative at SNL/NM and near-future projects on and near KAFB (Figure 6.3–2). The ROI is defined as land SNL/NM uses in and adjacent to KAFB. This includes lands belonging to the city of Albuquerque, Bernalillo county, state of New Mexico, USFS, and the Pueblo of Isleta. Cumulative land use effects take into consideration the use of open land, adequacy of buffer zones surrounding site activities, and any potential conflicts between existing or projected onsite and offsite programs and operations. The extent of land used by SNL/NM in and adjacent to KAFB is sufficient for current and future requirements. While urban growth and development is expected to continue in specific areas around KAFB, these activities do not hinder, nor are they restrained by, SNL/NM operations.

### **DOE Operations**

In accordance with DOE policy to manage its land and facilities as valuable national resources, a Future Use

**Table 6.4–1. Parameters for SNL/NM, DOE, and KAFB Activities**

PARAMETERS	UNITS	SNL/NM <sup>a</sup> EXPANDED OPERATIONS ALTERNATIVE	SEVEN OTHER DOE FACILITIES	KAFB/DoD
<i>Number of Workers</i>	FTEs	8,417	2,138 <sup>b</sup>	9,863 <sup>c</sup>
<i>Water</i>	gal/yr	495 M	21.3 M <sup>b</sup>	910 M <sup>d</sup>
<i>Wastewater</i>	gal/yr	322 M	2.78 M <sup>b</sup>	335 M <sup>d</sup>
<i>Electric Power</i>	MWh	198,000	12.5 <sup>b</sup>	307,000 <sup>d</sup>
<i>Annual Radiation Population Dose</i>	person-rem	15.8	1.3x10 <sup>-4b</sup>	5.0
<i>Discharge to Sanitary Sewer</i>	gal/yr	322 M	2.78 M <sup>b</sup>	335 M <sup>d</sup>
<i>RCRA Hazardous Waste</i>	kg/yr	97,331	Negligible (see note)	43,455 <sup>e</sup>
<i>LLW</i>	m <sup>3</sup> /yr	280	Negligible	100 <sup>h</sup>
<i>LLMW</i>	m <sup>3</sup> /yr	7.31	Negligible	0.5 <sup>i</sup>
<i>MTRU Waste</i>	m <sup>3</sup> /yr	0.74	Negligible	1 <sup>j</sup>
<i>Groundwater Withdrawal</i>	M ft <sup>3</sup> /yr	59.3	2.53	85.16
<i>Vehicular Traffic (individual)</i>	Individual trips	29,880	NA	48,290
<i>Solid Waste</i>	m <sup>3</sup> /yr	2,022	Small (see note)	2,900
<i>Recycled Hazardous Waste</i>	kg/yr	NA	NA	53,253
<i>Vehicles (Number of)</i>	vehicles	14,940 <sup>f</sup>	2,000 <sup>b</sup>	24,145 <sup>d</sup>
<i>ER/IRP Sites (Number of)</i>	sites	182	NA	70 <sup>g</sup>
<i>(Proposed NFA)</i>	sites	122	NA	8 <sup>g</sup>
<i>(Approved NFA)</i>	sites	48	NA	28 <sup>g</sup>

Sources: <sup>a</sup>SNL/NM 1998a, <sup>b</sup>DOE 1998a, <sup>c</sup>UNM 1997a, <sup>d</sup>USAF 1998a, <sup>e</sup>Houston 1998,<sup>f</sup>SNL/NM 1997a, <sup>g</sup>Gooch 1998<sup>h</sup>Converted using 0.1 m<sup>3</sup>/Ci from Ci/yr—LLW.<sup>i</sup>Converted using 1,500 lb/m<sup>3</sup> from 720 lb/yr—LLMW.<sup>j</sup>Converted using 1,500 lb/m<sup>3</sup> from 1,500 lb/m<sup>3</sup>—MTRU.

Ci: Curie

DoD: U.S. Department of Defense

DOE: U.S. Department of Energy

ft<sup>3</sup>: cubic feet

FTE: full-time equivalent

gal: gallon

IRP: Installation Restoration Program

KAFB: Kirtland Air Force Base

kg: kilogram

lb: pound

LLMW: low-level mixed waste

LLW: low-level waste

M: million

m<sup>3</sup>: cubic meter

MTRU: mixed transuranic

MWh: megawatt-hour

NA: not available

NFA: no further action

RCRA: *Resource Conservation and Recovery Act*

SNL/NM: Sandia National Laboratories/New Mexico

yr: year

Note: Negligible –Actual quantities are not reported; however, due to nature and scope of operations, waste volumes are assumed to be negligible.

Small – Actual quantities are not reported; however, due to nature and scope of operations, waste volumes are assumed to be small.

Initiative was established in 1994 to define appropriate short- and long-term future uses for DOE land and facilities on KAFB. The initiative emphasizes environmental restoration and site development planning activities. This initiative created the Future Use Logistics and Support Working Group, consisting of

representatives from the DOE and its affiliates, USAF, USFS, U.S. Environmental Protection Agency (EPA), and New Mexico Environment Department (NMED). A citizens advisory board played a key role as a contributor of public input (Keystone 1995, SNL 1997a).

Preliminary recommendations recognized the high probability of continued Federal activity within KAFB for the foreseeable future. Under this continued use scenario, the Federal government would maintain institutional control of the site and restrict access. DP is the landlord for DOE laboratory operations on DOE-owned land and is expected to continue the use of the property in support of its missions. Based on current and expected future use and conditions, interim recommendations by the working group with input from the citizens advisory board have been given to DOE (Keystone 1995, SNL 1997a).

#### **Sandia National Laboratories/New Mexico**

SNL/NM is the largest of the DOE affiliates on KAFB and represents a major portion of continuing Federal investment. In general, future plans for SNL/NM include improved pedestrian and vehicular circulation and transportation and infrastructure upgrades planned in coordination with the USAF and the city of Albuquerque (SNL 1997c).

The main areas for limited future facility development include the east periphery of TA-I and TA-II. TA-I will have increased redevelopment potential as temporary and substandard structures are removed, such as buildings that have exceeded their useful life and cannot be cost effectively retained in service, or major renovations are achieved. ER sites within TA-II are planned for cleanup or are being proposed to the EPA for no further action (NFA). The success of these efforts will greatly increase the redevelopment potential of this area. TA-IV continues to have development opportunities, but its growth is limited by the Tijeras Arroyo to the east and south and USAF operations to the west. Due to buffer zones required by continuing activities in TA-III and TA-V, development opportunities will remain limited in those areas (SNL 1997c).

A number of near future facilities in SNL/NM's Five-Year Plan, which are in various phases of construction, have been reviewed under NEPA and approved. Most approved projects occur within the TAs in areas that are considered previously disturbed or underdeveloped. Examples include the Process and Environmental Technology Laboratory, Joint Computational Engineering Laboratory, and Advanced Manufacturing Prototyping Facility, all located within TA-I, and the New Gamma Irradiation Facility, located in TA-V (SNL 1997a).

Two additional facilities, the Sandia Visitor Center and Cooperative Monitoring Center, are not within TA boundaries, but are planned on undeveloped land owned

by the DOE adjacent to Eubank Boulevard, in association with the proposed Sandia Science and Technology Park (SNL 1997a). A decision to develop this land will be addressed in future NEPA documentation.

The Sandia Science and Technology Park was initiated by SNL/NM to develop a high-technology campus that would strengthen alliances and advance partnerships with industry. Adjacent to KAFB on both sides of Eubank Boulevard, the planning area encompasses approximately 200 ac, with land ownership divided among the DOE, New Mexico State Land Office, Albuquerque Public Schools, and two private landowners. The project's planning and feasibility group consists of representatives from SNL/NM, the DOE, KAFB, the city of Albuquerque, and the state of New Mexico.

#### **Additional DOE Facilities**

In addition to SNL/NM, seven other DOE facilities are located on KAFB, as described in Section 6.2. The majority of these facilities operate on land owned by the USAF and permitted to the DOE; however, AL is partially located on DOE-owned land and the Lovelace Respiratory Research Institute is located on land withdrawn from the BLM by the USAF and permitted to the DOE. None of these operations affect land use based on current and projected operations for the foreseeable future (DOE 1998f).

#### **U.S. Air Force Operations**

Major portions of existing land use patterns on KAFB are the result of combining previously separate military installations. The most developed area is in the northwest where a variety of activities take place in association with day-to-day operations. Associated land uses that are likely to continue include airfield and aircraft operations/maintenance, housing units, industrial areas, community commercial and service functions, administration and research areas, training sites, associate-owned land (such as the DOE) and open space (USAF 1998a).

Because of the variety of military activities on KAFB, a major emphasis of continued development by the USAF is to merge related land uses and similar functions. There are a number of sites available for future use that are either vacant or have been previously developed but scheduled for demolition or realignment of function. Future changes to the overall land use pattern on KAFB will be incremental and focus on consolidation (USAF 1998a).

### U.S. Forest Service

The USFS has proposed opening portions of the Cibola National Forest currently withdrawn from public use by the USAF and the DOE in the preferred alternative of its *Environmental Analysis Ecosystem Management Plan for National Forest Lands in and Adjacent to the Military Withdrawal* (USFS 1996). The area under consideration consists of approximately 200 ac and 900 ac within the DOE and USAF withdrawals, respectively, and represents 5.3 percent of the total of 20,486 ac withdrawn from public access. The returned land would allow for the establishment and authorized public use of a ridge-top trail system. The DOE and USAF do not oppose the return of this property for recreational purposes and are currently in communication with the USFS. No time frame for completion of this action has yet been established (USFS 1996).

### State of New Mexico

One potential impact to land use in the ROI is represented by the proposed Mesa del Sol development initiated by the state of New Mexico. Mesa del Sol is a planned community encompassing approximately 13,000 ac of undeveloped land south of the Albuquerque International Sunport and west of the KAFB boundary. The land is held in trust by the New Mexico State Land Office for the University of New Mexico and New Mexico Public Schools and was annexed by the city of Albuquerque in 1993, increasing the land area of the city by 20 percent. Current development assessments estimate a maximum population of 97,500 persons with 39 neighborhoods in urban and rural villages and in other activity centers (NMSLO 1997). A regional recreation center, consisting of a square-mile area of playing fields and other amenities anchored by an outdoor performing arts amphitheater, is the only project designed to date (USAF 1998a).

Due to USAF and DOE activities in areas adjacent to Mesa del Sol, the New Mexico State Land Office is reserving a 2,700-ac area along the development's eastern border for future planning. This effort is being made to ensure that land uses in that area, historically leased by the DOE as a buffer zone, are compatible for all parties concerned (NMSLO 1997).

### Bernalillo County

Valle del Sol is a proposed affordable housing project on approximately 520 ac within the Tijeras Arroyo area of unincorporated Bernalillo county, southwest of KAFB and north of Mesa del Sol. The USAF has joined the city of

Albuquerque in opposing the project, which would require significant site engineering to accommodate residential use. In addition, the development would place homes in an area adversely affected by noise resulting from current airport traffic (NMSLO 1997, USAF 1998a).

The Southeast Transportation Corridor is a proposed transportation link. The corridor would connect Interstates-25 and -40, bypassing the current interchange as shown in Figure 6.3-2. It is anticipated that this project would require an EIS involving several state, Federal, and local agencies.

### Pueblo of Isleta

The expanse of land immediately south of KAFB, owned by the Pueblo of Isleta, has historically been and remains open rangeland used for grazing. Over 6,300 ac are currently leased by the DOE as a buffer zone in connection with SNL/NM operations at TA-III. It is likely that the surrounding area will remain open space, as the majority of Pueblo development has occurred and is expected to continue in the vicinity of the Broadway Boulevard/Interstate-25 interchange. Casino gambling and golfing activities have also been established there (NMSLO 1997, USAF 1998a).

### City of Albuquerque

As the largest metropolitan entity in the area, the city of Albuquerque is engaged in several projects that could potentially affect land use adjacent to KAFB. Activities associated with the Albuquerque International Sunport and city road networks are most influential.

The city's Aviation Department is considering extending the northwest-southeast runway (Runway 12-30) to improve movement of air freight vehicles. This proposal may result in land use conflicts with existing topography and current KAFB transportation networks in the area. The north-south runway (Runway 17-35) is being studied for closure, which may result in redevelopment of the area for new or extended airport terminal facilities (COA 1997a) or new aircraft/transportation complexes (USAF 1998a).

The city's Public Works Department is currently involved in two transportation projects: the Gibson Boulevard East Corridor Study and the Eubank Boulevard Extension. The former proposes a high-speed, limited-access arterial, approximately 8 mi long, extending from the Gibson Boulevard/Interstate-25 interchange eastward along existing Gibson Boulevard, through a portion of KAFB, along existing Southern Boulevard, and northward to the

Juan Tabo Boulevard/Interstate-40 interchange. The corridor would enter KAFB at Louisiana Boulevard and run east along its northern boundary. The project is intended to enhance the city's east-west traffic and may also provide additional buffering to KAFB. Construction would result in the relocation of several KAFB entry gates and the demolition of some military housing. The USAF supports the project, as long as provisions for gates are maintained, demolished structures are replaced, and the effects of noise and lighting on adjacent military housing areas are mitigated (USAF 1998a).

The city also proposes to widen Eubank Boulevard from four to six lanes along the segment that runs north from the KAFB boundary to Central Avenue. This project is intended to improve general access into the area and would be of particular benefit if the Sandia Science and Technology Park were to go forward, as well as for general urban renewal and economic development planning efforts in the area. Improvements to the Eubank Gate area could also be made, extending Eubank Boulevard on KAFB to Pennsylvania Avenue, thereby improving traffic flow to the southern portion of the installation (SNL 1997a, USAF 1998a).

#### 6.4.2 Infrastructure

This section describes the impacts to infrastructure from DoD activities at KAFB, activities within the Albuquerque area, activities at SNL/NM (as discussed in Chapter 5), additional DOE activities at KAFB, and cumulative impacts on infrastructure. A primary area of concern is regional demands on the Albuquerque-Belen Basin aquifer. With or without conservation measures, demand exceeds aquifer recharge. Therefore, the city of Albuquerque has begun acquiring other water supply sources (see Section 6.4.4).

##### DoD Activities at KAFB

In general, the projected demands on infrastructure supporting DoD activities at KAFB would likely decrease over the next 10 years (Table 6.4-2). DoD's water consumption would potentially decrease from 910 M gal to an estimated 637 M gal per year. Annual electrical consumption would probably stay at 307,000 MWh. Consumption of natural gas, fuel oil, and propane would remain at recent historic levels. Small fluctuations in utility consumption rates would occur due to annual changes in weather.

The current infrastructure resources are capable of accommodating KAFB demands. No additional

infrastructure facilities would be built to support KAFB. Buildings, services, communications, maintenance programs, roads, material storage, and waste storage activities supporting these facilities would not change substantially from recent historic levels. Specific details on these systems are presented in the *Comprehensive Plan, Kirtland Air Force Base, New Mexico* (USAF 1998a).

##### Other Activities in the Albuquerque Area

The demands on water supply and wastewater infrastructure in the city of Albuquerque would likely decrease over the next 10 years through expected conservation efforts. Water consumption would potentially decrease from 35 B gal to 30 B gal per year. Estimated annual electrical consumption would increase to 79 TWh by 2008 (Sullivan 1998), as the city's population increases. Consumption of natural gas, fuel oil, and propane would likely increase as a function of population growth. Small fluctuations in utility consumption rates would occur due to annual changes in weather.

The city of Albuquerque's infrastructure resources are capable of accommodating current demands. The demand on the aquifer, with or without conservation, exceeds aquifer recharge; therefore, the city would need to acquire other water supply sources. Future water supply projects would include use of Rio Grande water and San Juan/Chama water to compensate for the reduced capability of the Albuquerque-Belen Basin aquifer (CABQ n.d.[a][c]). See Section 6.4.4 for additional information regarding the Albuquerque-Belen Basin aquifer.

Additional power production plants would be needed if demand continues to rise at the rate experienced during most of the 1990s. City services, communications, maintenance programs, roads, and waste disposal activities supporting residents would likely continue to increase as population increases.

##### SNL/NM Activities at KAFB

As discussed in Section 5.4.2, demands on the infrastructure supporting SNL/NM activities would increase over the next 10 years due to the Expanded Operations Alternative requirements (Table 6.4-2). SNL/NM's water consumption at KAFB would likely increase from 440 M gal to 495 M gal per year. Annual electrical consumption would likely increase to 198,000 MWh. Consumption of natural gas, fuel oil, and propane would remain at recent historic levels. Small

**Table 6.4–2. Utility Usage and Utility Capacity**

UTILITY	BASE YEAR <sup>a</sup> USAGE	PROJECTION	SYSTEM CAPACITY ANNUAL	PROJECTION AS PERCENT OF CAPACITY
<b>DoD ACTIVITIES AT KAFB</b>				
<i>Water</i>	910 M gal	637 M gal	2.0 B gal	32%
<i>Wastewater (Discharge)</i>	355 M gal	214 M gal	850 M gal	25%
<i>Electricity</i>	307,000 MWh	307,000 MWh	1.1 M MWh <sup>b</sup>	28%
<b>ALBUQUERQUE</b>				
<i>Water</i>	35 B gal	30 B gal <sup>c</sup>	72 B gal	42%
<i>Wastewater (Discharge)</i>	21.8 B gal	18.7 B gal <sup>d</sup>	27.7 B gal	68%
<i>Electricity</i>	70 TWh	79 TWh	95 TWh <sup>d</sup>	80%
<b>SNL/NM ACTIVITIES AT KAFB (EXPANDED OPERATIONS ALTERNATIVE)</b>				
<i>Water</i>	440 M gal	495 M gal <sup>d</sup>	2.0 B gal	22%
<i>Wastewater (Discharge)</i>	280 M gal	322 M gal <sup>d</sup>	850 M gal	33%
<i>Electricity</i>	197,000 MWh	198,000 MWh	1.1 M MWh <sup>b</sup>	18%
<b>ADDITIONAL DOE ACTIVITIES<sup>e</sup></b>				
<i>Water</i>	21.3 M gal	18.9 M gal	2.0 B gal	Less than 1%
<i>Wastewater (Discharge)</i>	2.78 M gal	2.58 M gal	850 M gal	Less than 1%
<i>Electricity</i>	12.5 MWh	10.7 MWh	1.1 M MWh <sup>b</sup>	Less than 1%

Sources: DOE 1997k, 1998a, 1998c; COA n.d.(a)(b)(c); Sullivan 1998  
 B: billion  
 DOE/AL: U.S. Department of Energy/Albuquerque Operations Office  
 ETC: Energy Training Complex  
 FM&T/NM: Federal Manufacturing & Technology/New Mexico  
 gal: gallon  
 NNSI: Nonproliferation and National Security Institute  
 TWh: terawatt-hour  
 TSD: Transportation Safeguards Division

M: million  
 MWh: megawatt-hour  
<sup>a</sup>Base year is 1996 or 1997, whichever is the most representative of usage.  
<sup>b</sup>Based on 125-MW rating  
<sup>c</sup>2006 projection  
<sup>d</sup>Estimation by 2008, based on 20 percent capacity currently available.  
<sup>e</sup>Includes utility estimations for DOE/AL complex, Ross Aviation, NNSI, TSD, Lovelace Respiratory Research Institute, and FM&T/NM. ETC utilities are supplied through the city of Albuquerque infrastructure and were not included in the table.

fluctuations in utility consumption rates would occur due to annual changes in weather.

The current infrastructure resources are capable of accommodating the facilities' demands. No additional infrastructure facilities would be built to support these facilities. Buildings, services, communications, maintenance programs, roads, material storage, and waste storage activities supporting these facilities would not change substantially from recent historic levels. Specific details on these systems are presented in the *SNL Sites Comprehensive Plan FY 1998-2007* (SNL 1997a).

#### Additional DOE Activities at KAFB

The demands on the infrastructure supporting the seven additional DOE activities would likely decrease over the next 10 years due to the intended conservation commitments (Table 6.4–2). DOE's water consumption at KAFB would likely decrease from 21.3 M gal to 18.9 M gal per year. Annual electrical consumption would likely decrease to 10.7 MWh. Consumption of natural gas, fuel oil, and propane would remain at recent historic levels. Small fluctuations in utility consumption rates would occur due to annual changes in weather.

The current infrastructure resources are capable of accommodating the facilities' demands. No additional infrastructure facilities would be built to support these facilities. Buildings, services, communications, maintenance programs, roads, material storage, and waste storage activities supporting these facilities would not change substantially from recent historic levels. Specific details on these systems are presented in the *U.S. Department of Energy "Other" DOE Facilities* (DOE 1998f).

#### Summary of Infrastructure Cumulative Impacts

As shown in Table 6.4–2, current and planned utility usage for water, wastewater, and electricity for KAFB, including SNL/NM, is within the capacities of existing systems. No additional infrastructure facilities would be built to support KAFB. Buildings, services, communications, maintenance programs, roads, material storage, and waste storage activities supporting these facilities would not change substantially from recent historic levels. Specific details on these systems are presented in the *Comprehensive Plan, Kirtland Air Force Base, New Mexico* (USAF 1998a), and the *SNL Sites Comprehensive Plan FY 1998-2007* (SNL 1997a).

As shown in Table 6.4–2, the expected water use of 1.15 B gal (SNL/NM's [Expanded Operations Alternative] 495 M gal plus DoD's 637 M gal plus DOE's 18.9 M gal) for the entire KAFB represents approximately 3 percent of the expected water use (30 B gal) by the city of Albuquerque. Similarly, by 2008, the 539 M gal projected amount of wastewater at KAFB (includes SNL/NM) would represent 3 percent of the expected wastewater processed (18.7 B gal) by the city of Albuquerque. If water conservation goals are met by SNL/NM and DoD/KAFB, these estimates of water use and wastewater discharge would be expected to decline.

Additionally, the Albuquerque area would consume 79 TWh per year of electricity. The entire KAFB consumption of 505,000 MWh per year by 2008 represents less than 1 percent of the ROI.

Because sufficient capacities exist, actual effect to infrastructure would not contribute significantly to any impacts that result from any other identified past, present, or reasonably foreseeable actions that may be taken by public and private entities in the ROI. Additionally, the city of Albuquerque is the largest user and consumer of infrastructure resources in the ROI.

#### 6.4.3 Soils

There are limited, if any, cumulative impacts related to soils. Areas of soil contamination resulting from SNL/NM

activities are distinct from other onsite entities, such as USAF facilities or IRP sites. No combined effects to human health or the environment would be expected at these areas.

#### 6.4.4 Water Resources and Hydrology

Locations of known or suspected groundwater contamination are presented in Section 4.6. All locations, with the possible exception of Sandia North (beneath TAs-I and -II), are discrete areas of concern with no cumulative effect issues. Definitive attribution of contaminants at Sandia North has not been made. It is unclear whether contamination is a result of one source or many sources, and whether the source is the result of activities by SNL/NM, the USAF, the city of Albuquerque, or another entity. An environmental monitoring program (SNL 1997d) is in place to detect and track any migration of groundwater contamination so it does not become a public health concern.

The USAF operates 14 production wells on KAFB. A presentation of infrastructure capacity is given in Section 6.4.2. These wells supply water to the USAF, SNL/NM, and other DoD, DOE, and associate-occupied facilities at KAFB. These wells draw water from the Santa Fe Group aquifer system in the Albuquerque-Belen Basin aquifer, the same aquifer system that is the exclusive source of potable water for cities and towns north and south of SNL/NM, including Albuquerque and Rio Rancho. As explained in Section 4.6.3, an excess of withdrawal over recharge results in a continuing decline in groundwater levels in this aquifer. In the vicinity of KAFB, the water levels have been declining as much as 3 ft per year over the past 12 years (Section 5.3.4).

The majority of water withdrawn from the aquifer is by the city of Albuquerque, accounting for 78 percent of basin-wide groundwater withdrawals for the years 1985 through 1996 (Table 6.4–3). The total KAFB withdrawal over this period was 3 percent of basin-wide withdrawals. For the year 1996, SNL/NM water use was 58.9 M ft<sup>3</sup>, 0.88 percent of the basin-wide withdrawal for the year (SNL/NM 1997a). The presence of a small incremental effect to the groundwater resources resulting from SNL/NM, would potentially contribute to impacts resulting from other identified past, present, or reasonably foreseeable actions taken by public and private entities in the ROI.

The impact analysis performed for this SWEIS determined that SNL/NM would account for 11 percent of projected groundwater withdrawal in the immediate vicinity of KAFB over the period 1998 to 2008 (Section 5.3.4.2 and Appendix B.2). The analysis described in Section 5.3.4.2 examines all local groundwater withdrawals, thereby

**Table 6.4–3. 1985 through 1996 Groundwater Withdrawal in the Albuquerque-Belen Basin**

YEAR	BASIN-WIDE		KAFB
	CITY OF ALBUQUERQUE WELLS (M ft <sup>3</sup> )	PRIVATE AND OTHER MUNICIPAL WELLS (M ft <sup>3</sup> )	KIRTLAND WITHDRAWAL (INCLUDES SNL/NM) (M ft <sup>3</sup> )
1985	4,343	1,172	232.3
1986	4,538	1,186	237.4
1987	4,813	1,170	210.1
1988	4,796	1,222	199
1989	5,513	1,498	258.1
1990	5,095	1,401	208
1991	5,057	1,443	219.7
1992	5,026	1,456	235.7
1993	5,349	1,959	201.2
1994	5,376	1,665	166.7
1995	5,396	1,506	151.7
1996	5,209	1,489	155.5
<b>TOTAL</b>	<b>60,510</b>	<b>17,170</b>	<b>2,475</b>

Sources: USAF 1998b, USGS 1995  
ft<sup>3</sup>: cubic feet  
KAFB: Kirtland Air Force Base

M: million  
SNL/NM: Sandia National Laboratories/New Mexico

accounting for some level of cumulative impacts. It was possible to estimate SNL/NM withdrawal as a percentage of basin-wide withdrawal for each alternative. Assuming a 1.5-percent per year compounded population growth factor (COA n.d.[b]) and a 30-percent city of Albuquerque water conservation goal to be achieved by 2004 (COA n.d.[a]), projected SNL/NM usage would be approximately 1 percent of basin-wide withdrawal (Appendix B.2).

This analysis may underestimate basin-wide usage as private and other municipal users have not necessarily committed to water reduction goals. Likewise, SNL/NM's water conservation commitment of a 30-percent reduction in water use (SNL/NM 1998b) is not included in the calculation of SNL/NM quantities. This analysis would, therefore, tend to overestimate the SNL/NM contribution to basin-wide withdrawal. Nonetheless, the 1998 to 2008 SNL/NM usage would remain about 1 percent of basin-wide withdrawal for any alternative, and absolute water usage for any alternative would not exceed the 1996 base year (58.9 M ft<sup>3</sup>).

The San Juan/Chama Project (COA n.d.[a]) is scheduled to come on-line in 2004. This project would allow the city of Albuquerque to meet its normal water demands from Rio Grande water. Groundwater withdrawals would be used only to supplement these normal demands. If this project is completed as scheduled, SNL/NM water use, as a percentage of basin-wide groundwater withdrawal, would increase substantially.

Therefore, the small incremental effect to groundwater would not contribute significantly to any impacts resulting from any other identified past, present, or reasonably foreseeable actions that may be taken by public and private entities in the ROI.

Storm water runoff from SNL/NM facilities or ER Project sites and USAF facilities or IRP sites could potentially combine in arroyos during storm events. The presence of contamination in surface soils, on paved surfaces, or from any discharges, could result in cumulative impacts to the surface water resource.

However, analyses of surface water samples, discussed in Section 5.3.4, have repeatedly shown no surface water contamination near the downstream exit point of surface water from KAFB. No activities analyzed under the alternatives in the SWEIS are projected to increase the quantity of contaminants available for transport by surface water.

#### 6.4.5 Biological and Ecological Resources

Because of the restricted access and limited planned development at KAFB, there has been a beneficial impact on biological and ecological resources. The presence of populations of the grama grass cacti on KAFB may, in fact, be due to the restriction on grazing. There is no indication that there has been a decline in wildlife or plant biodiversity as a result of activities conducted by SNL/NM. Potential effects to animals and plants due to soil contaminants have been found to be minimal.

Man-made activities, roads, fences and other infrastructure have fragmented wildlife habitat in portions of KAFB. This disruption in natural habitat patterns will continue because of the presence and activities of the DoD, USFS, DOE, and the surrounding population of the city of Albuquerque. KAFB is adjacent to Federal lands that are managed, in part, for wildlife and forest health. Management activities include wildlife habitat improvement, wildlife management plans, biomonitoring, and prescribed burning to improve forest health and decrease the threat of a wildfire.

Therefore, there is no incremental effect on biological and ecological resources resulting from continuing SNL/NM operations that would contribute significantly to any other identified impacts that result from past, present, or reasonably foreseeable actions that may be taken by public and private entities in the ROI.

#### 6.4.6 Cultural Resources

Actions taken by the DOE, SNL/NM, the USAF, and the USFS in the ROI, such as construction, testing activities, military exercises, infrastructure maintenance, decontamination and decommissioning (D&D), fire suppression, and any other ground-disturbing activities would be accomplished in accordance with Federal laws and regulations. Compliance with these laws and regulations, which involves consultation with the agency cultural resource managers and the New Mexico State

Historic Preservation Officer, would preclude adverse impacts to cultural resources. The DOE has adopted department-wide orders and guidelines (DOE 1988a; DOE 1993d,e,f) that address the management of cultural resources and would remove the potential for appreciable incremental adverse effects resulting from past, present, or reasonably foreseeable future activities under the Expanded Operations Alternative in the ROI.

#### 6.4.7 Air Quality

##### Nonradiological Air Quality

The analysis of cumulative air quality impacts involves examination of the DOE's proposed action at SNL/NM (defined as the next 10 years of foreseeable activities, 1998 to 2008) and reasonably foreseeable activities within the ROI. The *New Mexico Air Pollution Control Bureau Dispersion Modeling Guidelines* defines the ROI for air quality as the maximum extent of a source's "significant" impact (NMAPCB 1996). The maximum extent of impact of the primary major stationary source at SNL/NM (the steam plant) is approximately 15 mi. A 15-mi radius about the SNL/NM steam plant falls largely within Bernalillo county, with a small portion extending into northern Valencia county to the south.

The air quality cumulative effects address the criteria pollutants: carbon monoxide, lead, particulate matter less than 10 microns in diameter (PM<sub>10</sub>), sulfur dioxide, ozone, and nitrogen dioxide. The criteria pollutant emissions represent the major sources of pollutants from SNL/NM, as well as from emission sources from within the ROI.

This analysis of air quality cumulative effects from criteria pollutants is very similar to that in Chapter 5, because the ROI in both analyses is the same and there is no reasonable way to completely isolate the contributions of various sources when using monitoring data. The analysis in Chapter 5, however, provides more of a focus on effects from SNL/NM by using the following sources of data:

- modeled concentrations at the National Atomic Museum from SNL/NM 1996 actual emissions, and
- modeled concentrations at the National Atomic Museum from new sources that are planned for SNL/NM in the future.

Background concentrations added to this data set include

- concentrations consisting of carbon monoxide, nitrogen dioxide, and sulfur dioxide from monitoring stations located in the Albuquerque area,

but subject to lesser influences from SNL/NM sources;

- background PM<sub>10</sub> concentrations provided in the New Mexico state modeling guideline; and
- criteria pollutant concentrations resulting from operation of the Cobisa Power Station.

The discussion in this chapter provides the best available view of cumulative air quality effects in the vicinity of SNL/NM by selecting the following sources of data:

- the Criteria Pollutant Monitoring Station (CPMS) located in TA-I, for 1996, representing pollutant concentrations from SNL/NM and KAFB sources;
- modeled concentrations of criteria pollutants at the CPMS resulting from additional sources at SNL/NM added between 1996 and 2008; and
- the pollutant concentrations resulting from operation of the Cobisa Power Station.

The discussion in this chapter also provides more information on sources other than SNL/NM.

The Cobisa Power Station, to be located at Rio Bravo and Broadway SW in the southern part of Albuquerque, is expected to be in service by the summer of 2000. The plant will be a single gas-fired turbine peaking unit to be used primarily during peak demand periods with a permitted carbon monoxide emission rate of 23.3 tons per day. In addition to burning natural gas as a fuel, the plant will have the capability to burn No. 2 fuel oil.

Prevention of Significant Deterioration (PSD) incremental concentrations were calculated for Class II areas for each of the two fuels consumed. A Class II area may be considered any area outside of the facility boundary, excluding Class I areas. The No. 2 fuel oil produces the highest incremental concentrations of nitrogen dioxide, sulfur dioxide, and PM<sub>10</sub>. The incremental concentrations for No. 2 fuel oil for these criteria pollutants were included in Table 6.4–4 as additional background concentrations contributing to cumulative criteria pollutant concentrations.

As for future concentrations of the remaining criteria pollutants, lead and ozone, it is uncertain as to whether or not the concentrations will increase, decrease, or remain the same within the ROI.

Major sources of nitrogen dioxide in the ROI include major energy utilities and construction materials industries. Major sources of PM<sub>10</sub> in the ROI include construction materials industries and wood-burning

fireplaces and stoves during the winter months. KAFB is a major source with respect to criteria pollutant emissions. A major source is one that has allowable emissions in excess of 100 tons per year of any regulated pollutant. KAFB's allowable emissions of nitrogen oxides, carbon monoxide, PM<sub>10</sub>, and volatile organic compounds are greater than 100 tons per year. The majority of these sources are noncontinuous and spatially distributed over a large area. Many of these are portable generators for servicing and starting aircraft.

No changes in future emissions were reported for the seven other DOE facilities (DOE 1998f). The cumulative effects from their contributions, compared to other sources on KAFB, would remain small considering the nature and scope of operations at these seven facilities.

The total air pollutant concentrations in Table 6.4–4 consist of background criteria pollutant concentrations (which include concentrations generated by KAFB, the DOE, and SNL/NM) in the vicinity of SNL/NM, the additions from the new Cobisa Power Plant scheduled to begin operation in 2000, and the incremental concentrations from modeling new sources added at SNL/NM through 2008. The 1996 criteria pollutant concentrations were assumed to represent an estimate of the background concentrations for the year 2008. The criteria pollutant monitoring station (CPMS) located in TA-I was selected to represent the background criteria pollutant concentrations in the vicinity of SNL/NM. This monitoring station is the closest station to SNL/NM emission sources and is, therefore, representative of the air quality in the vicinity of the maximum effects from the alternatives. The pollutant concentrations measured by the CPMS also include contributions from sources at SNL/NM. All criteria pollutants for each of the respective averaging periods are below the National Ambient Air Quality Standards or New Mexico Ambient Air Quality Standards.

The incremental contribution to carbon monoxide emissions under the Expanded Operations Alternative for SNL/NM commuter traffic is estimated to be 5.1 percent of the carbon monoxide emissions from highway sources within Bernalillo county in 2005. The concurrent contribution to carbon monoxide emissions from KAFB commuter traffic is estimated at 6,128 tons per year, or 8.2 percent of the carbon monoxide emissions from highway sources within Bernalillo county (SNL 1996c). The cumulative contribution of carbon monoxide emissions in 2005 for SNL/NM and KAFB commuter traffic is estimated at 13.3 percent of the total

**Table 6.4–4. Cumulative Criteria Pollutant Concentrations from Incremental SNL/NM Stationary Sources, Background Monitoring Data, and Cobisa Power Station with Applicable National and New Mexico Ambient Air Quality Standards**

POLLUTANT	AVERAGING TIME	NAAQS (ppm [ $\mu\text{g}/\text{m}^3$ ])	NMAAQs (ppm [ $\mu\text{g}/\text{m}^3$ ])	CUMULATIVE CONCENTRATION (ppm [ $\mu\text{g}/\text{m}^3$ ])	PERCENT OF STANDARD
<b>Carbon Monoxide</b>	1 hour	35[33,305]	13.1[12,466]	8.5[8,130]	65
	8 hours	9[8,564]	8.7[8,279]	2.9[2,787]	34
	Annual	-	-	0.8[743]	NA
<b>Lead</b>	30 Days	-	-	0.0021 <sup>a</sup>	NA
	Quarterly	1.5 <sup>a</sup>	-	0.001 <sup>a,b</sup>	0.07
<b>Nitrogen Dioxide</b>	Annual	0.053[83]	0.05[78]	0.014[21.5]	28
	24 hours	-	0.10[156]	0.044[69.2]	44
<b>TSP</b>	Annual	-	60 <sup>a</sup>	15.01 <sup>a</sup>	25
	30 days	-	90 <sup>a</sup>	NA	NA
	7 days	-	110 <sup>a</sup>	NA	NA
	24 hours	-	150 <sup>a</sup>	53.5 <sup>a</sup>	36
<b>PM<sub>10</sub></b>	Annual	50 <sup>a</sup>	-	15.01 <sup>a,d</sup>	30
	24 hours	150 <sup>a</sup>	-	53.5 <sup>a,d</sup>	36
<b>Sulfur Dioxide</b>	Annual	0.03[65]	0.02[44]	0.0005[1.17]	3
	24 hours	0.14[305]	0.10[218]	0.006[13.8]	6
	3 hours	0.50[1,088]	-	0.029[62.1]	6
<b>Ozone</b>	Annual	-	-	0.033[54]	NA
	1 hour	0.12[196]	-	0.103[168] <sup>c</sup>	85.8
<b>Hydrogen Sulfide</b>	1 hour	-	0.01[12]	NA	NA
<b>Total Reduced Sulfur</b>	0.5 hour	-	0.03[33]	NA	NA

Sources: 20 NMAC 2.3, 40 CFR Part 50, SNL/NM 1997c

- indicates no standard for listed averaging time

°R: degree Rankin

CPMS: criteria pollutants monitoring station

ft: feet

kw: kilowatt

NA: not available

NAAQS: National Ambient Air Quality Standards

NMAAQs: New Mexico Ambient Air Quality Standards

PM<sub>10</sub>: particulate matter less than 10 microns in diameter

ppm: parts per million

TSP: total suspended particulates

$\mu\text{g}/\text{m}^3$ : micrograms per cubic meter

<sup>a</sup> $\mu\text{g}/\text{m}^3$

<sup>b</sup> Highest quarterly lead monitoring data measured at the CPMS site in 1996

<sup>c</sup> Highest one-hour ozone monitoring data measured at the CPMS in 1996

<sup>d</sup> PM<sub>10</sub> is assumed equal to TSP

Notes: 1) Some of the pollutants are stated in ppm. These values were converted to  $\mu\text{g}/\text{m}^3$  with appropriate corrections for temperature (530°R) and pressure (elevation 5,400 ft) following New Mexico Dispersion Modeling Guidelines (NMAPCB 1996).

2) Cumulative concentrations consist of 1996 CPMS concentrations, modeled concentrations from an "insignificant" boiler and emergency generator in Building 701 and a 600-kw-capacity generator in Building 870b, and Prevention of Significant Deterioration (PSD) Class II incremental concentrations from Cobisa Power Station.

carbon monoxide emissions from highway mobile sources within Bernalillo county.

Projections of carbon monoxide emissions from vehicles in Bernalillo county, based on *The Maintenance Plan for*

*Carbon Monoxide-Albuquerque/Bernalillo County, New Mexico (A/BC AQCB 1998)*, show a downward trend from 1996 through the year 2000, with a constant rate through the year 2005. This is a worst-case scenario, assuming that none of the action scenarios to further

reduce carbon monoxide emissions in the county would be performed. The reduction in carbon monoxide emissions during this period reflects better emission controls on future vehicles and maintenance and inspection programs to ensure peak emission control performance.

### Radiological Air Quality

Two facilities (not operated by SNL/NM) with potential radiological air emissions were identified. The dose effects from each are combined with the calculated maximum dose under the Expanded Operations Alternative. These facilities are the Lovelace Respiratory Research Institute, located on KAFB east, and KAFB's 377<sup>th</sup> Air Base Wing IRP sites (RW-10, RW-68).

The Lovelace Respiratory Research Institute evaluated and presented the dose to the maximally exposed individual (MEI), located at a distance of 5.7 mi west-northwest, as a part of the NESHAP compliance for the calendar year 1996 (DOE 1997g). The collective dose to population was not evaluated. To be consistent with the dose evaluations performed for the Expanded Operations Alternative for the SWEIS, the *CAP88-PC* model (DOE 1997e) was used to calculate the dose to the MEI and the total population within 50 mi, assuming Lovelace Respiratory Research Institute's total radiological air emissions centered at TA-V. The calculated MEI dose of  $6.1 \times 10^{-6}$  mrem/yr is lower than the Lovelace Respiratory Research Institute's reported value of  $3.7 \times 10^{-5}$  mrem/yr, due to different meteorological data and receptor location. However, the

collective dose to the population was calculated to evaluate the potential cumulative effects on a consistent basis. Table 6.4–5 presents these doses for cumulative effects. For the year 1994, KAFB evaluated and presented the dose to the MEI at a distance of 2.2 mi in all directions, using EPA's screening computer model *COMPLY*. The reported dose to the MEI was 4.9 mrem/yr (USAF 1995b). Because the dose to the MEI was calculated based on using a screening type of model, it is claimed that the actual dose to the MEI from all sources combined is most likely to be many orders of magnitude smaller than this reported value (USAF 1995b). No collective dose to the population was evaluated for these sites. Therefore, in order to be consistent with the dose evaluations performed for the Expanded Operations Alternative for the SWEIS, the *CAP88-PC* model was used to calculate the dose to the MEI and to the total population within 50 mi, assuming KAFB's IRP total radiological air emissions are centered at TA-V.

The calculated MEI dose of 0.26 mrem/yr is lower than the KAFB-reported value of 4.9 mrem/yr; however, it is considered reasonable, based on the statement that the actual dose value could be many orders of magnitude lower compared to the reported value of 4.9 mrem/yr (USAF 1995b). Table 6.4–5 presents these doses for cumulative effects. The calculated total cumulative dose to the MEI of 0.77 mrem/yr is much lower than the regulatory limit of 10 mrem/yr. Even with the NESHAP reported doses to the MEI for the Lovelace Respiratory Research Institute and KAFB facilities, the total cumulative MEI dose of 5.4 mrem/yr is also lower than the regulatory limit of 10 mrem/yr. These doses are also

**Table 6.4–5. Summary of Annual Cumulative Radiological Dose Estimates to the Public from All Sources on KAFB**

FACILITY/SOURCE	ANNUAL MEI DOSE (EDE) (mrem)	ANNUAL POPULATION DOSE (person-rem)
<i>SNL/NM Expanded Operations Alternative</i>	0.51	15.8
<i>Lovelace Respiratory Research Institute</i>	$6.1 \times 10^{-6}$ <sup>a</sup> $3.7 \times 10^{-5}$ <sup>b</sup>	$1.3 \times 10^{-4}$ <sup>a</sup>
<i>Kirtland Air Force Base</i>	0.26 <sup>a</sup> 4.9 <sup>b</sup>	5 <sup>a</sup>
<b>TOTAL FROM ALL SOURCES</b>	0.77 5.4 <sup>c</sup>	20.8 <sup>d</sup>

Sources: DOE 1997g, USAF 1995b

EDE: effective dose equivalent

MEI: maximally exposed individual

mrem: millirem

NESHAP: National Emissions Standards for Hazardous Air Pollutants

<sup>a</sup> *CAP88-PC* modeled values (DOE 1997e)

<sup>b</sup> Reflects the NESHAP reported values

<sup>c</sup> Based on NESHAP reported values

<sup>d</sup> Based on *CAP88-PC* modeled values

small compared to an individual background radiation dose of 360 mrem/yr. In summary, a small incremental effect to radiological air quality resulting from DOE, SNL/NM, and KAFB operations would not significantly contribute to impacts resulting from past, present, or reasonably foreseeable future actions taken by public and private entities in the ROI.

### 6.4.8 Human Health and Worker Safety

SNL/NM's location, adjacent to the city of Albuquerque and co-located with KAFB, other DOE facilities, and private industry, makes it possible that cumulative environmental effects exist. The potential for SNL/NM to contribute significantly to the cumulative effects from all present, past, and reasonably foreseeable future activities within the ROI was examined qualitatively and quantitatively in the area of human health and worker safety. Specifically, consequence analyses, presented in Chapter 5, identify human health and worker safety effects and were used to select other similar impact sources within the ROI for this cumulative effects assessment.

#### Occupational

The occupational health and safety of workers at SNL/NM is site-specific and would not be affected by other activities occurring within the ROI. Cumulative effects to workers would be the same as the effects presented in the consequence analyses for worker health and safety in Chapter 5 under each of the operational alternatives.

#### Air Quality – Criteria Pollutants

Air quality within the ROI is affected by numerous sources. The levels of criteria pollutants—carbon monoxide, lead, PM<sub>10</sub>, sulfur dioxide, ozone, and nitrogen dioxide—are regulated regionally. SNL/NM's

contribution and potential for air quality effects to affect the attainment of air quality standards are presented in Section 6.4.6. SNL/NM has a very small contribution to the overall attainment of regulated levels of these criteria pollutants within the ROI. Therefore, SNL/NM would not be a major source for human health effects from criteria air pollutants within the ROI.

#### Air Quality - Chemicals

Chemical air pollutants released by SNL/NM could have a cumulative effect with releases from other sources within the ROI. However, SNL/NM's chemical air releases show no potential for adverse health effects and similar analyses are not available for other sources. Therefore, to present an assessment of all potential sources of chemical air pollutants in the SNL/NM vicinity, a health-risk assessment was done using ambient air sampling data collected by chemical air monitoring stations at SNL/NM for volatile organic compounds (VOCs). The chemical air concentrations were assumed to be representative of local air quality, including other sources besides SNL/NM. A possible cumulative health risk was calculated from this information using maximum chemical concentrations (Table 6.4–6). Minimal health effects would be expected from these risk levels.

#### Air Quality – Radiological

Two facilities, not associated with but in proximity to SNL/NM, have potential radiological air emissions. These facilities are the Lovelace Respiratory Research Institute, located on KAFB east, and the KAFB 377<sup>th</sup> Air Base Wing IRP sites (RW-10, RW-68). The human health effects associated with maximum emissions from these sources were combined with calculated maximum health impacts from the SNL/NM Expanded Operations Alternative. The radiological doses calculated or reported to the MEI and to the population within 50 mi are discussed in Section 6.4.6.2. Based on the

**Table 6.4–6. Cumulative Human Health Impacts Based on 1996 SNL/NM Onsite Ambient Volatile Organic Compound Air Monitoring**

VOC CHEMICAL AIR MONITORING DATA	RECEPTOR	TOTAL HAZARD INDEX RME/AEI	TOTAL EXCESS LIFETIME CANCER RISK RME/AEI
<i>Onsite VOC Monitoring Stations (Maximum Concentrations)</i>	Adult	0.04/<0.01	9.36x10 <sup>-5</sup> /3.79x10 <sup>-6</sup>
	Child	0.07/<0.01	3.42x10 <sup>-5</sup> /3.28x10 <sup>-6</sup>

Source: SmartRISK 1996  
 <: less than  
 AEI: Average Exposed Individual

RME: Reasonable Maximum Exposed  
 VOC: volatile organic compound

radiological risk estimator of 500 fatal cancers per 1 M person-rem to the public (ICRP 1991), the lifetime risk of fatal cancer from a 1-year dose to the MEI and the number of excess fatal cancers in the population within 50 mi of SNL/NM were calculated and are presented in Table 6.4–7. With regard to cumulative impacts, these results identify no additional fatal cancers in the population and a very low increased lifetime risk of cancer to individuals.

### Environmental Restoration

Releases of hazardous and radiological materials from SNL/NM operations into surface soils, surface water, and groundwater have existed from historic operations. No additional releases are anticipated by future routine operations, but should they occur as a result of accidents under any of the alternatives, mitigation of impacts would take place. Cleanup of the historic contamination in these environmental media at SNL/NM is scheduled for completion by 2004 under the ER Project.

The SNL/NM ER Project consists of more than 180 individual ER sites, within approximately 157 solid waste management units. Many of these sites (more than 50), after sampling or further investigation, have been identified as requiring NFA (DOE 1996c). A site would qualify for an NFA status if SNL/NM could demonstrate that the site poses no threat to human health or the environment. The DOE determined that the proposed environmental restoration actions would not significantly affect the quality of the human environment, and a Finding of No Significant Impact was signed on March 25, 1996 (DOE 1996c).

Environmental restoration site-specific risk assessments completed to date by SNL/NM show human health impacts from cleanup of historically contaminated sites would result in less than 10 mrem additional radiation dose per year to the population, a chemical exposures Hazard Index of less than 1, and an excess lifetime cancer risk of less than  $10^{-6}$ . These impacts would only slightly increase if added to SNL/NM health impacts under the Expanded Operations Alternative. The overall health risk remains below levels considered by regulators to be protective of human health.

### Other DOE Facilities

Cumulative human health impacts potentially exist from normal operations at the seven additional DOE facilities and other operations within KAFB. For example, the TSD is responsible for the maintenance and operation of weapons transportation equipment. TSD operations use hazardous chemicals and involve both air and ground transportation of hazardous materials. The NNSI, located in Coyote Canyon, has possible environmental soil contamination from deposits of lead at the firing range. Although none of the impacts from these facilities appear to be substantial incremental contributors of human health impacts within the ROI, any increases in future operational levels could increase the potential for cumulative impacts.

When considered in combination with impacts identified for the SNL/NM SWEIS operational alternatives and given the available data, it appears that these potential cumulative effects would relate to very low risk levels. Other nonrelated activities in the ROI may

**Table 6.4–7. Summary of Annual Cumulative Health Impacts from all Radiological Emission Sources at KAFB**

FACILITY SOURCE	ANNUAL EXCESS RISK OF FATAL CANCER MEI	ANNUAL EXCESS NUMBER OF FATAL CANCERS POPULATION
<i>SNL/NM-Expanded Operations Alternative</i>	$2.6 \times 10^{-7}$	$7.9 \times 10^{-3}$
<i>Lovelace Respiratory Research Institute</i>	$3.1 \times 10^{-12}$ <sup>a</sup> $1.9 \times 10^{-11}$ <sup>b</sup>	$6.5 \times 10^{-8}$ <sup>a</sup>
<i>KAFB</i>	$1.3 \times 10^{-7}$ <sup>a</sup> $2.5 \times 10^{-6}$ <sup>b</sup>	$2.5 \times 10^{-3}$ <sup>a</sup>
<b>TOTAL FROM ALL SOURCES</b>	<b><math>3.9 \times 10^{-7}</math> <sup>a</sup></b> <b><math>2.8 \times 10^{-6}</math> <sup>b</sup></b>	<b><math>1.04 \times 10^{-2}</math></b>

Sources: DOE 1997e, g; USAF 1995b

MEI: maximally exposed individual

NESHAP: National Emissions Standards for Hazardous Air Pollutants

<sup>a</sup>Based on CAP88-PC modeled values

<sup>b</sup>NESHAP-reported values

affect human health. However, they were not presented here because impacts were not similar or additive in nature and are not distinguishable within the ROI.

In summary, the presence of a small incremental effect to human health and worker safety resulting from SNL/NM operations would not significantly contribute to impacts resulting from any other identified past, present, or reasonably foreseeable actions taken by public and private entities in the ROI.

#### **6.4.9 Transportation**

Albuquerque's two major interstate highways, Interstate-25 and Interstate-40, handle large volumes of local traffic as well as regional commerce. As the city has grown, the overall impact of SNL/NM activities has decreased as a percentage of vehicle volume. This trend is projected to continue due to population growth and several new planned communities. Major arteries into KAFB are being improved based upon projected community needs and traffic flow patterns. Short-term and construction work will continue to disrupt transportation for a limited time. KAFB gate counts presented in Chapter 5 represent a total of all personnel living or working on KAFB.

Airport ground traffic has grown steadily as the airport has expanded to meet the needs of the region, which overshadows SNL/NM traffic effects. Although air traffic will continue to expand, sufficient capacity exists to meet the projected needs of the combined commercial and military operations.

Currently, the ER Project is in the process of remediating past disposal sites, thus generating a large volume of waste over a relatively short period of time. This has the short-term impact of increasing transportation and waste management requirements to the region. More detailed information is presented in Chapters 4 and 5.

In summary, a small incremental effect to transportation resulting from SNL/NM operations would not significantly contribute to impacts resulting from any other identified past, present, or reasonably foreseeable actions taken by public and private entities in the ROI.

#### **6.4.10 Waste Generation**

Multiple users of KAFB have a cumulative impact on the waste generated and transported from various facilities. In general, with the implementation of waste minimization programs, the DOE and DoD programs have, to the extent possible, minimized their impact on

local and regional waste management facilities. Based on the available data, the capacity to handle the anticipated waste streams being generated by all facilities is considered to be sufficient for the foreseeable future. Projected waste generation from the planned research park or the materials center is within the capacities for the local region. The current trend at SNL/NM is to maintain all hazardous materials in quantities sufficient for identifiable programmatic needs. As a result, materials are moved more frequently but in smaller quantities. This reduces the generation of legacy-type wastes and minimizes consequences in the event of an accident. In addition, the potential exists for offsite shipments of solid waste to the local landfill to increase if KAFB closes its onsite landfill.

None of the seven DOE facilities manage hazardous waste under a RCRA hazardous waste permit. While some of the DOE facilities manage other types of wastes, including radioactive; historically, the wastes are generated infrequently and in small quantities. Municipal solid waste is managed through existing infrastructure provided by KAFB, SNL/NM, and the city of Albuquerque. No changes in waste generation rates were estimated for the seven DOE facilities (DOE 1998f).

In summary, a small incremental increase in waste generation resulting from SNL/NM operations would not significantly contribute to impacts resulting from any other identified past, present, or reasonably foreseeable actions taken by public and private entities in the ROI.

#### **6.4.11 Noise and Vibration**

While the ROI associated with noise and vibration at SNL/NM includes the Albuquerque basin, the primary area of interest is the area surrounding SNL/NM. Potential sources contributing to noise and vibration include increases in Albuquerque International Sunport air traffic and potential offsite construction activities. Any increase in the number of receptors (people) exposed to noise and vibration could result in increased cumulative effects.

Activities under the Expanded Operations Alternative would result in increased levels of noise/vibration due to increased vehicular traffic, testing activities, and construction. For this alternative, there would be an estimated 10 percent increase in commuter traffic to SNL/NM in 2008. Projections of the number of impulse noise tests for this alternative indicate a threefold increase

in tests over those of the 1996 base year. These test activities would originate from facilities located in TA-III and the Coyote Test Field and would be remote relative to SNL/NM TAs and offsite receptors. Vehicular traffic and testing activities would likely result in a greater frequency of noise and vibration at current levels of intensity, similar to those presently experienced, whereas construction would be expected to increase peak noise levels. Construction activities would add to the ambient background noise levels at SNL/NM.

As is the case for SNL/NM vehicular traffic, increases in regional air and vehicular traffic would result in longer duration peak levels, with these levels remaining within current dB(A) ranges. Air traffic at Albuquerque International Sunport consists of a mix of commercial and military aircraft. Military fighter jets produce the highest single event noise level of any aircraft using the airport. The noise levels generated by the commercial jet aircraft vary significantly for each type of aircraft. The older low-bypass-ratio engines (Stage II) generate significantly higher noise levels than the newer generation high-bypass-ratio engines (Stage III). The average sound exposure level for Stage II aircraft is 10 to 15 dB(A) higher than for Stage III aircraft. It is expected that the older Stage II aircraft will be phased out of the fleet mix by the year 2000 and replaced with Stage III aircraft (KAFB 1998). Military fighter jet use of the Albuquerque International Sunport was assumed to remain similar to that observed during a 1997 noise survey. Therefore, the cumulative ambient background noise level in the vicinity of SNL/NM would be similar to or lower than current levels due to the phaseout of older Stage II aircraft. Construction in general, and at the Mesa del Sol project in particular, would also contribute to ambient background noise levels. The Mesa del Sol project, when completed, would also increase the number of receptors adjacent to SNL/NM, thereby further contributing to cumulative noise and vibration effects.

In summary, noise and vibration would remain within current dB(A) ranges, but increase in duration or frequency. Population increases would result in a greater number of receptors subject to noise and vibration effects. The small incremental effect resulting from SNL/NM operations would not significantly contribute to impacts resulting from any other identified past, present, or reasonably foreseeable actions taken by public and private entities in the ROI.

#### 6.4.12 Socioeconomics

The recent growth in central New Mexico, which has resulted in regional economic and population changes, would be expected to continue as a result of growth in the private sector. Even with a 10 percent increase in SNL/NM expenditures and employment, as analyzed under the Expanded Operations Alternative, growth would not be expected to increase significantly from SNL/NM contributions.

No noticeable impact on existing demographic characteristics is anticipated. Overall expenditures and employment at SNL/NM are expected to expand gradually at a steady rate over the 10-year study period, which would, in turn, tend to maintain demographic characteristics within the ROI.

The steady rate was assumed because, historically, any increases or decreases in operational levels of activities at SNL/NM have been gradual and/or have fluctuated approximately one or two percent per year (SNL/NM 1997a).

According to the University of New Mexico, Bureau of Business and Economic Research, the population of the ROI will increase from 683,676 in 1996 to 856,927 in 2010 (UNM 1997b). Assuming a straight-line increase over time, approximately 12,375 people are added to the ROI each year. By 2008, the population of the ROI will be approximately 832,176.

In 1996, the number of people employed in the ROI was reported as 331,800. This represents 48.5 percent of the entire ROI (331,800/683,676). Assuming the same ratio in 2008, approximately 403,605 people would be employed.

Under the Expanded Operations Alternative, SNL/NM employment would increase by an estimated 765 employees, from 7,652 to 8,417. The 765 additional employees at SNL/NM would induce or indirectly add an estimated 2,646 employees to the ROI by 2008 for a total of 3,411 new jobs.

By 2008, the number of employed in the ROI would increase from 331,800 to 403,605, or 71,805 people. Excluding the SNL/NM direct and indirect contribution to the increase (3,411), the ROI employment increase would be 68,394.

By 2008, SNL/NM would represent 8,417 employees of 403,605 total employees in the ROI. This represents 2 percent of the ROI. The projected increase in jobs associated with SNL/NM (3,411), represents 5 percent of the projected job growth in the ROI.

Table 6.4–8 presents an estimate of the cumulative effects on the ROI economy from a 10-percent increase in operational levels of activity and associated increases in expenditures, income, and employment, both direct and indirect, at SNL/NM. Operational activities associated with selected facilities are included in the totals. If operations at SNL/NM were to increase by 10 percent over current levels, overall economic activity within the ROI would be expected to increase by about 0.8 percent, with slightly smaller increases in income and employment at about 0.7 percent. As presented in Table 6.4–8, a 10-percent increase in operational levels of activity at SNL/NM over the 10-year study would generate a total of \$400 M in additional economic activity (\$42.8 B minus \$42.4 B) (an average increase of \$40 M per year), a total of \$100 M in additional income (an average increase of \$10 M per year), and a total of 2,646 additional jobs (an

average increase of 265 jobs per year) in the ROI. During the 10-year study period, contributory effects from other industrial and economic sectors within the ROI would reduce or mask some of SNL/NM's effects on the ROI economy.

No measurable cumulative effects on existing housing and community services within the ROI are anticipated (Section 4.14.3). Overall expenditures and employment at SNL/NM are expected to expand at a steady rate over the 10-year study period, which would, in turn, tend to maintain housing availability, value, and levels of service.

In summary, a small incremental effect to socioeconomics resulting from SNL/NM operations would not significantly contribute to impacts resulting from any other identified past, present, or reasonably foreseeable actions taken by public and private entities in the ROI.

**Table 6.4–8. Impact on Central New Mexico's Economy if SNL/NM Operations Increased by 10 Percent**

ECONOMIC MEASURE	FY 1996 <sup>a</sup>			ASSUMING A 10% INCREASE IN OPERATIONS			
	SNL/NM	TOTAL ROI	PERCENT OF ROI	SNL/NM	TOTAL ROI	PERCENT OF ROI	PERCENT CHANGE
<b>ECONOMIC ACTIVITY (\$ BILLIONS)</b>							
<i>Direct Expenditures</i>	1.43			1.57			
<i>Indirect &amp; Induced</i>	<u>2.50</u>	42.4	9.3	<u>2.75</u>	42.80	10.1	0.8
<i>Total Economic Activity</i>	3.93			4.32			
<i>Economic Activity Multiplier: 2.75<sup>b</sup></i>							
<b>INCOME (\$ BILLIONS)</b>							
<i>Net Wages &amp; Salaries</i>	0.48			0.53			
<i>Indirect &amp; Induced</i>	<u>0.58</u>	13.4	8	<u>0.64</u>	13.51	8.7	0.7
<i>Total Income</i>	1.06			1.17			
<i>Income Multiplier: 2.21<sup>b</sup></i>							
<b>EMPLOYMENT (NUMBER OF EMPLOYEES)</b>							
<i>SNL/NM Employment</i>	7,652			8,417			
<i>Indirect &amp; Induced</i>	<u>18,826</u>	331,800	8	<u>20,706</u>	334,446	8.7	0.7
<i>Total Employment</i>	26,478			29,123			
<i>Employment Multiplier: 3.46<sup>b</sup></i>							

Source: DOE 1997j

FY: fiscal year

ROI: region of influence

SNL/NM: Sandia National Laboratories/New Mexico

<sup>a</sup> Modeled results from SNL/NM 1997g

<sup>b</sup> The use of multipliers in calculating economic effects in the ROI is explained in Section 4.14.3.

### **6.4.13 Environmental Justice**

The estimated effects presented in Chapter 6 and in Chapter 5 under the Expanded Operations Alternative would be expected to bound environmental justice impacts. Under the Expanded Operations Alternative, effects were considered on groundwater quality and groundwater quantity (Section 5.4.4), cultural resources (Section 5.4.6), air quality (Section 5.4.7), noise

emissions (Section 5.4.11), transportation (Section 5.4.9), human health during normal operations and facility accidents (Section 5.4.8), and socioeconomics (Section 5.4.12). The cumulative impacts presented would have no known disproportionately high or adverse health or environmental impacts on low-income or minority populations within the ROI.

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