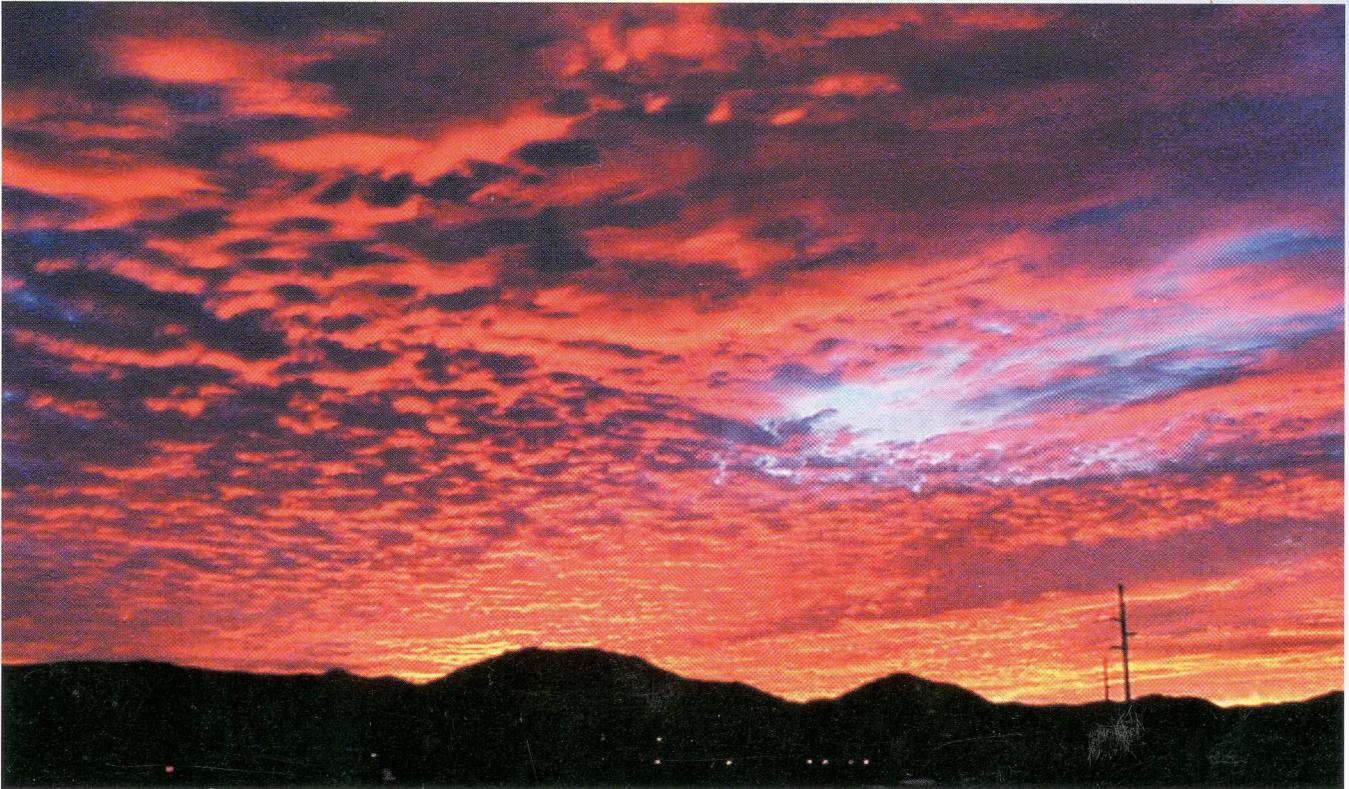


SANDIA REPORT  
SAND2002-2415  
Unlimited Release  
Printed September 2002

Calendar Year 2001  
*Annual Site Environmental Report*  
*Sandia National Laboratories, New Mexico*



Photograph of SNL/NM courtesy of Charles Fink

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Prepared by  
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**Calendar Year 2001  
Annual Site  
Environmental Report**  
Sandia National Laboratories, Albuquerque, New Mexico

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**ABSTRACT**

Sandia National Laboratories, New Mexico (SNL/NM) is a government-owned, contractor-operated facility overseen by the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) through the Albuquerque Operations Office (AL), Office of Kirtland Site Operations (OKSO). Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, operates SNL/NM. Work performed at SNL/NM is in support of the DOE and Sandia Corporation's mission to provide weapon component technology and hardware for the needs of the nation's security. Sandia Corporation also conducts fundamental research and development (R&D) to advance technology in energy research, computer science, waste management, microelectronics, materials science, and transportation safety for hazardous and nuclear components. In support of Sandia Corporation's mission, the Integrated Safety and Security (ISS) Center and the Environmental Restoration (ER) Project at SNL/NM have established extensive environmental programs to assist Sandia Corporation's line organizations in meeting all applicable local, state, and federal environmental regulations and DOE requirements. This annual report summarizes data and the compliance status of Sandia Corporation's environmental protection and monitoring programs through December 31, 2001. Major environmental programs include air quality, water quality, groundwater protection, terrestrial surveillance, waste management, pollution prevention (P2), environmental remediation, oil and chemical spill prevention, and the National Environmental Policy Act (NEPA). Environmental monitoring and surveillance programs are required by DOE Order 5400.1, *General Environmental Protection Program* (DOE 1990) and DOE Order 231.1, *Environment, Safety, and Health Reporting* (DOE 1996).

Calendar Year 2001 Annual Site Environmental Report  
Sandia National Laboratories, Albuquerque, New Mexico  
Final Approval date: September 2002

Work performed under Contract No. DE-ACO4-94AL85000

***Prepared for:***

U.S. Department of Energy, National Nuclear Security Administration,  
Albuquerque Operations Office, Office of Kirtland Site Operations

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## ACKNOWLEDGMENTS

We wish to thank the following individuals who contributed their time and expertise assisting in the production of this annual report.

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**ACRONYMS AND ABBREVIATIONS**

<b>A</b>	ABC/AQCB	Albuquerque-Bernalillo County/Air Quality Control Board
	ACRR	Annular Core Research Reactor
	ACE	Army Corps of Engineers
	AEA	Atomic Energy Act
	AEC	Atomic Energy Commission
	AIRFA	American Indian Religious Freedom Act
	AL	Albuquerque Operations Office
	ALARA	as low as reasonably achievable
	AMP	Analytical Management Program
	AMPL	Advanced Manufacturing Process Laboratory
	AOC	area of concern
	AQC	Air Quality Compliance
	AR	annual review
	ARCOG	Analysis Request and Chain-of-Custody
	ARPA	Archaeological Resources Protection Act
	ASER	Annual Site Environmental Report
	AST	above-ground storage tank
	AT&T	American Telephone and Telegraph Company
	AWN	Acid Waste Neutralization
<b>B</b>	BMP	Best Management Practice
	BWSA	bulk waste staging area
<b>C</b>	CAA	Clean Air Act
	CAAA	Clean Air Act Amendments
	CAMU	Corrective Action Management Unit
	CAN	Clean Air Network
	CAP88	Clean Air Act Assessment Package-1988
	CAS	Chemical Abstract Service
	CCCL	Cleaning and Contamination Control Laboratory
	CEARP	Comprehensive Environmental Assessment and Response Program
	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
	CFR	Code of Federal Regulations
	COD	chemical oxygen demand
	CPAP	Contractor Performance Assessment Program
	CPMS	Criteria Pollutant Monitoring Station
	CRADA	Cooperative Research and Development Agreements
	CSRL	Compound Semi-Conductor Research Laboratory
	CTF	Coyote Test Field
	CVAA	Cold Vapor Atomic Absorption
	CWA	Clean Water Act
	CWDR	Chemical Waste Disposal Request
CWL	Chemical Waste Landfill	
CY	Calendar Year	
<b>D</b>	D&D	decontamination and demolition
	DCG	derived concentration guide
	DoD	U.S. Department of Defense
	DOE	U.S. Department of Energy
	DOT	U.S. Department of Transportation
	DP	Discharge Plan
	DQO	data quality objective
	DR	disposal request

<b>E</b>	EA	Environmental Assessment
	ECF	Explosive Components Facility
	EDE	effective dose equivalent
	EDP	Experiment Development Plan
	EHS	extremely hazardous substance
	EID	Environmental Information Document
	EIS	Environmental Impact Statement
	EM	Environmental Management
	EMS	Environmental Management System
	EMSL	Environmental Monitoring Systems Laboratory
	EO	Executive Order
	EOD	Explosive Ordnance Disposal
	EPA	U.S. Environmental Protection Agency
	EPCRA	Emergency Planning and Community Right-to-Know Act
	EPP	Environmentally Preferable Purchasing
	ER	Environmental Restoration
	ERCL	Environmental Restoration Chemical Laboratory
	ERDA	Energy Research and Development Administration
	ER/WM	Environmental Restoration and Waste Management
ES&H	Environment, Safety, and Health	
ESA	Endangered Species Act	
<b>F</b>	FFCA	Federal Facilities Compliance Act
	FFCO	Federal Facility Compliance Order
	FGR	flue gas recirculation
	FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
	FMOC	Facilities Management & Operations Center
	FONSI	Finding of No Significant Impact
	FY	Fiscal Year
<b>G</b>	GEL	General Engineering Laboratories
	GIF	Gamma Irradiation Facility
	GPMPP	Groundwater Protection Management Program Plan
	GSA	General Services Administration
	GWPP	Groundwater Protection Program
<b>H</b>	HA	Hazard Analyses
	HAP	hazardous air pollutant
	HAZMAT	hazardous materials
	HBWSF	High-Bay Waste Storage Facility
	HCF	Hot Cell Facility
	HDRV	Historical Disposal Requests Validation
	HE	high explosives
	HERMES-III	High Energy Radiation Megavolt Electron Source-III
	HLW	high-level radioactive waste
	HQ	headquarters
	HSWA	Hazardous and Solid Waste Amendments
	HWMF	Hazardous Waste Management Facility
<b>I</b>	ICP	Inductively Coupled Plasma
	ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectrum
	ILMS	Integrated Laboratory Management System
	IRP	Installation Restoration Program
	ISMS	Integrated Safety Management System
	ISS	Integrated Safety & Security Center
	ISS	Interim Status Storage

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<b>J</b>	JCEL	Joint Computational Engineering Laboratory
	JIT	Just-In-Time
<b>K</b>	KAFB	Kirtland Air Force Base
	KTF	Kauai Test Facility
<b>L</b>	LANL	Los Alamos National Laboratory
	LCBS	Lurance Canyon Burn Site
	LECS	Liquid Effluent Control System
	LLW	low-level waste
	LMF	Large-scale Melt Facility
	LRRRI	Lovelace Respiratory Research Institute
	LTES	Long-Term Environmental Stewardship
	LTTD	Low-Temperature Thermal Desorption
LWDS	Liquid Waste Disposal System	
<b>M</b>	MAC	maximum allowable concentration
	MAPEP	Mixed Analyte Performance Evaluation Program
	MBTA	Migratory Bird Treaty Act
	MCL	maximum contaminant level
	MDA	minimum detectable activity
	MDL	minimum detection limit
	MDL	Microelectronics Development Laboratory
	MEI	maximally exposed individual
	MESA	Microsystems and Engineering Sciences Application
	MIPP	Medical Isotope Production Project
	MLLW	mixed low-level waste
	MOC	Management and Operating Contract
	MP	monitoring point
	MSB	Manzano storage bunkers
	MSDS	Material Safety Data Sheet
	MSL	Melting and Solidification Laboratory
	MVF	Model Validation Facility
MW	mixed waste	
MWL	Mixed Waste Landfill	
<b>N</b>	N/A	not available or not applicable
	NAAQS	National Ambient Air Quality Standards
	ND	not detected
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants
	NFA	No Further Action
	NGF	Neutron Generator Facility
	NHPA	National Historic Preservation Act
	NMAC	New Mexico Administrative Code
	NMAAQs	New Mexico Ambient Air Quality Standards
	NMED	New Mexico Environment Department
	NMHWa	New Mexico Hazardous Waste Act
	NMSBA	New Mexico Small Business Assistance Program
	NMWQCC	New Mexico Water Quality Control Commission
	NNSA	National Nuclear Security Administration
	NON	notification of noncompliance
	NOV	Notice of Violation
	NPDES	National Pollutant Discharge Elimination System
	NPL	National Priorities List
	NPN	nitrate plus nitrite
NRC	U.S. National Response Center	

	NRC	U.S. Nuclear Regulatory Commission
	NSPS	New Source Performance Standards
<b>O</b>	ODS	Ozone-depleting substance
	OKSO	Office of Kirtland Site Operations
	ORPS	Occurrence Reporting Processing System
<b>P</b>	P2	Pollution Prevention
	PAAA	Price-Anderson Amendments Act
	PA/SI	Preliminary Assessment/Site Inspection
	PBFA-II	Particle Beam Fusion Accelerator
	PBT	Persistent Bioaccumulative Toxics
	PCB	polychlorinated biphenyl
	PETL	Processing and Environmental Technology Laboratory
	PG	Program Document (Sandia Corporation program overview document)
	PHS	Primary Hazard Screen
	PM	particulate matter
	PM <sub>10</sub>	respirable particulate matter (diameter equal to or less than 10 microns)
	PM <sub>2.5</sub>	respirable particulate matter (diameter equal to or less than 2.5 microns)
	POTW	Publicly-owned Treatment Works
	PPE	personal protective equipment
	PQL	Practical quantitation limit
<b>Q</b>	QA	quality assurance
	QAP	Quality Assurance Program
	QAPjP	Quality Assurance Project Plan
	QC	quality control
<b>R</b>	RCRA	Resource Conservation and Recovery Act
	R&D	research and development
	RHEPP	Repetitive High Energy Pulsed Power (an accelerator facility)
	RMP	Risk Management Plan
	RMWMF	Radioactive and Mixed Waste Management Facility
	ROD	Record of Decision
	RQ	reportable quantity
<b>S</b>	SABRE	Sandia Accelerator and Beam Research Experiment
	SAP	Sampling and Analysis Plan
	SARA	Superfund Amendments and Reauthorization Act
	SATURN	(an accelerator facility)
	SD	sustainable design
	SDWA	Safe Drinking Water Act
	SHPO	State Historic Preservation Officer
	SIC	Standard Industrial Classification
	SMO	Sample Management Office
	SNL/CA	Sandia National Laboratories, California
	SNL/NM	Sandia National Laboratories, New Mexico
	SOW	statement of work
	SPCC	Spill Prevention Control and Countermeasures (plan)
	SPHINX	Short Pulse High Intensity Nanosecond X-Radiator (an accelerator facility)
	SPR	Sandia Pulsed Reactor
	SSL	soil screening level
	SSWM	Storm Drain, Sanitary Sewer, and Domestic Water System Modernization
	START	Sandia Tomography and Radionuclide Transport Laboratory
	STEL	short-term exposure limit
	STP	Site Treatment Plan
	SURF	Sandia Underground Reactor Facility

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	SUWCO	Sewer Use and Wastewater Control Ordinance
	SVOC	Semi Volatile Organic Compound
	SWEIS	Site-Wide Environmental Impact Statement
	SWISH	Small WInd SHield (facility)
	SWMU	Solid Waste Management Unit
	SWP3	Storm Water Pollution Prevention Plan
	SWTF	Solid Waste Transfer Facility
<b>T</b>	TA	Technical Area
	TAG	Tijeras Arroyo Groundwater
	TCE	trichloroethylene or trichloroethene
	TLD	thermoluminescent dosimeter
	TLV	threshold limit value
	TNMHC	total non-methane hydrocarbon
	TOC	total organic carbon
	TOX	total halogenated organics
	TPH	Total extractable petroleum hydrocarbons
	TQ	threshold quantity
	TRI	Toxic Release Inventory
	TRU	transuranic (radioactive waste)
	TSCA	Toxic Substances Control Act
	TSD	treatment, storage, and disposal
	TSS	total suspended solids
	TTF	Thermal Treatment Facility
	TTR	Tonopah Test Range
	TU	Temporary Unit
	TWA	time-weighted average
<b>U</b>	UNM	University of New Mexico
	USAF	U.S. Air Force
	USFS	U.S. Forest Service
	USGS	U.S. Geological Survey
	UST	underground storage tank
<b>V</b>	VCA	Voluntary Corrective Action
	VCM	Voluntary Corrective Measure
	VEP	Vapor Extraction Project
	VOC	volatile organic compound
<b>W</b>	WA	Weapons Assembly
	WIPP	Waste Isolation Pilot Plant
	WQG	Water Quality Group

**UNITS OF MEASURE**

°C	degree centigrade	m/s	miles per second
cm	centimeter	m <sup>3</sup>	cubic meter
°F	degrees fahrenheit	mg	milligram
ft	feet	mi	mile
ft <sup>3</sup>	cubic feet	mL	milliliter
gal	gallon	mph	miles per hour
hr	hour	ppb	parts per billion
in.	inch	ppbv	parts per billion by volume
g	kilogram	ppm	parts per million
km	kilometer	scf	standard cubic feet
Km <sup>3</sup>	cubic kilometer	sq ft	square feet
kW	kilowatt	sq km	square kilometer
L	liter	sq mi	square mile
lb	pound	tpy	tons per year
m	meter	yd <sup>3</sup>	cubic yard
		yr	year

**RADIOACTIVITY MEASUREMENTS**

rem	roentgen equivalent man	Sv	Sievert
mrem	millirem (unit of radiation dose)	Ci	curie
person-Sv	person-Sievert (unit of radiation dosage)	pCi	picocurie
person-rem	radiation dose to population (also man-rem)	µg	microgram
mSv	millisievert (unit of radiation dosage)	mR	milliroentgen

**CHEMICAL ABBREVIATIONS**

CO	carbon monoxide	O <sub>3</sub>	ozone
Eh	redox	pH	potential of hydrogen (acidity)
H <sup>3</sup>	tritium	SO <sub>2</sub>	sulfur dioxide
<sub>1</sub> H <sup>1</sup>	hydrogen	TCE	trichloroethylene or trichloroethene
HCl	hydrochloric acid	TCA	trichloroethane
NO <sub>2</sub>	nitrogen dioxide	U <sub>tot</sub>	total uranium
NO <sub>x</sub>	nitrogen oxides		
1,1,1,-TCA	1,1,1,-trichloroethane		

**APPROXIMATE CONVERSION FACTORS FOR SELECTED SI (METRIC) UNITS**

Multiply SI (Metric) Unit	By	To Obtain U.S. Customary Unit
Cubic meters (m <sup>3</sup> )	35.32	Cubic feet (ft <sup>3</sup> )
Centimeters (cm)	0.39	Inches (in.)
Meters (m)	3.28	Feet (ft)
Kilometers (km)	0.61	Miles (mi)
Square kilometers (km <sup>2</sup> )	0.39	Square miles (mi <sup>2</sup> )
Hectares (ha)	2.47	Acres
Liters (L)	0.26	Gallons (gal)
Grams (g)	0.035	Ounces (oz)
Kilograms (kg)	2.20	Pounds (lb)
Micrograms per gram (mg/g)	1	Parts per million (ppm)
Milligrams per liter (mg/L)	1	Parts per million (ppm)
Celsius (°C)	°F = 9/5 °C + 32	Fahrenheit (°F)
Sievert (Sv)	100	roentgen equivalent man (rem)

# Executive Summary

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Sandia Corporation, a wholly-owned subsidiary of the Lockheed Martin Corporation, manages operations at Sandia National Laboratories, New Mexico (SNL/NM). SNL/NM operations are overseen by the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) through its Office of Kirtland Site Operations (OKSO), which in turn reports to the Albuquerque Operations Office (AL). This Annual Site Environmental Report (ASER) was prepared in accordance with and as required by DOE Order 5400.1, *General Environmental Protection Program* (DOE 1990) and DOE Order 231.1, *Environment, Safety, and Health Reporting* (DOE 1996).

This ASER summarizes environmental protection, restoration, and monitoring programs in place at SNL/NM through December 31, 2001. It also discusses Sandia Corporation's compliance with environmental statutes, regulations, DOE Orders, permit provisions, and highlights significant environmental program efforts and accomplishments. This ASER is a key component of the DOE's effort to keep the public informed about environmental conditions throughout the DOE/NNSA's Nuclear Weapons Complex.

## Site Characteristics

SNL/NM is located on Kirtland Air Force Base (KAFB), a 51,559-acre military installation including the 20,486 acres withdrawn from the U.S. Forest Service (USFS) on the east side of KAFB (DOE 1999). The topography within the land withdrawn area generally consists of mountains and canyons vegetated with juniper, piñon, cactus, and drought-tolerant shrubs and grasses. The highest elevation within the land withdrawn area is just under 8,000 ft. To the west, the area grades into rolling hills and alluvial fans cut by arroyos. Further west, the topography is mostly flat-lying, except for the significant channel cut by the Tijeras Arroyo, which is up to 108 ft deep and 4,264 ft wide. The arroyo flows approximately 8.7 miles from its western exit point at KAFB to its discharge point at the Rio Grande River.

## Sandia Corporation's Mission

Sandia Corporation conducts its operations within five technical areas (TAs) and several remote test areas. Total DOE/NNSA-owned property that is dedicated to SNL/NM facilities and operational areas is approximately 8,824 acres (DOE 1999). SNL/NM is one of the nation's premier national laboratories within the DOE/NNSA Nuclear Weapons Complex. Sandia Corporation's primary mission is to conduct research and development (R&D) for nuclear weapon system components and to ensure the integrity and reliability of the nation's nuclear defense systems. This mission has greatly expanded in recent years to include non-military applications for microelectronics, micro-machines, computer technology, accelerator and pulsed power energy research, robotics, and material sciences and in the past year for Homeland Security issues.

## Environmental Programs

Sandia Corporation's strategy for managing and implementing its Environment, Safety, and Health (ES&H) Program is described in the Integrated Safety Management System (ISMS). The ISMS program is structured around five safety management functions and provides the processes to assist line management in identifying and controlling hazards. A formal Environmental Management System (EMS) is in the process of being defined and implemented through the ISMS structure, incorporating existing processes when appropriate. It will serve as a framework to manage environmental compliance, controls, improvements, and pollution prevention (P2) goals. In 2001, Sandia Corporation developed gap analyses comparing the current ISMS with environmental standards. The gaps will be used to identify system improvements to an EMS. Full implementation of the EMS is directed by an executive order (EO) to be in place by the year 2005.

The primary environmental programs in place at SNL/NM are:

- Waste management and P2 programs
- Environmental Restoration (ER) Project

- Terrestrial Surveillance Program
- Water quality programs
- Groundwater Protection Program (GWPP)
- Air quality programs
- National Environmental Policy Act (NEPA) Program

All 2001 program activities are performed continuously, but reported in this ASER on a Calendar Year (CY) basis, unless otherwise noted.

### Waste Management and P2

Three primary waste handling facilities conduct waste management activities at SNL/NM: the Hazardous Waste Management Facility (HWMF), the Radioactive and Mixed Waste Management Facility (RMWMF), and the Solid Waste Transfer Facility (SWTF). In addition, representatives from SNL/NM's waste minimization and P2 programs confer with Sandia Corporation line organizations to implement waste minimization technologies and recycling, wherever feasible.

- **HWMF** – The HWMF operates under a Resource Conservation and Recovery Act (RCRA) Part B Operating Permit administered by the New Mexico Environment Department (NMED). All non-radioactive, non-explosive, chemical waste, including RCRA-hazardous waste, asbestos, polychlorinated biphenyls (PCBs), and biohazardous waste are handled at this facility. A total of 11,219 individual items were collected in 2001. The HWMF shipped out the following waste categories:

<u>Category</u>	<u>Weight</u>	
	<u>kg</u>	<u>lbs</u>
RCRA waste	44,341	97,755
Asbestos	59,827	131,896
PCBs (recycled & waste)	12,768	28,737
Biohazardous waste	338	745
Other recycled and chemical waste	1,292,248	2,848,918
Total	1,409,522	3,107,464

- **SWTF** – The SWTF accepts non-hazardous solid waste generated from SNL/NM consisting primarily of office and laboratory trash. The waste is inspected, compacted, baled, and stored for shipment for disposal at local area landfills. Recyclable material handling makes up a large portion of the facility's activities. The SWTF recycles paper and cardboard contributed from SNL/NM, KAFB, DOE/NNSA field offices, and Los Alamos National Laboratory (LANL). In 2001, a total of 2,249,271 lbs (1,020,252 kg) of

solid waste was handled at the facility and an additional 783,824 lbs (355,537 kg) of paper, cardboard, newsprint, and aluminum was recycled.

- **RMWMF** – The RMWMF currently administers low-level waste (LLW), mixed waste (MW), and transuranic (TRU) waste. In 2001, the RMWMF shipped the following quantities of radioactive waste:

<u>Category</u>	<u>Weight</u>	
	<u>kg</u>	<u>lbs</u>
LLW	310,149	683,761
Mixed Waste	53,108	117,082
TRU	0	0
Total	438,218	966,105

### ER Project

The assessment and remediation of past and potential release sites due to activities performed at Sandia Corporation continue to be addressed by the ER Project according to the Hazardous and Solid Waste Amendments (HSWA) Module 4 of the RCRA Part B Operating Permit. During 2001, eight ER sites were being remediated at SNL/NM, 11 sites were completed, and 30 sites were proposed for No Further Action (NFA). NFA approval was granted by NMED in November 2001. NFA status is granted by the NMED once a site has been cleaned up or it has been determined that contamination levels are below regulatory concern. Additionally, DOE approves the release of any site with radiological contamination issues once it has been determined that contamination levels are non-existent or negligible. These sites are then proposed for NFA and must be approved by NMED in order to be removed from the permit. At the end of 2001, there were 158 ER sites remaining to be addressed at SNL/NM.

Remediation activities continued at the Chemical Waste Landfill (CWL) and the Classified Waste Landfill in 2001. Remediation of all SNL/NM ER sites is expected to be complete by 2009.

### Terrestrial Surveillance

Sandia Corporation conducts annual terrestrial surveillance sampling at various sites near SNL/NM facilities or in areas where contaminants could be expected to accumulate as well as at sites from the surrounding community. Currently, soil, sediment, and vegetation are collected from on-site, perimeter, and off-site (community locations outside KAFB boundaries) locations. The terrestrial surveillance sampling objectives are to detect any potential releases or migration of contaminated

material to off-site locations. In 2001, results were consistent with past years' sampling results. There were some sites that showed statistically increasing trends for some analytes, but the results for all of these sites were below average community concentrations. Other sites in areas of known contamination (usually associated with an ER site) were above off-site values, but none of these sites showed an increasing trend.

### Water Quality

Water Quality at SNL/NM includes programs that address wastewater, surface discharge, and storm water runoff.

- **Wastewater** – Wastewater from SNL/NM is discharged from five on-site outfalls permitted by the City of Albuquerque. Four of these stations connect directly to the public sewer at the Tijeras Arroyo Intercept and one station monitors wastewater discharged from the Acid Waste Neutralization (AWN) System at the Microelectronics Development Laboratory (MDL). Wastewater monitoring is conducted to ensure that all discharges meet the standards set by the City of Albuquerque's publicly-owned treatment works (POTW). In 2001, one permit violation occurred after SNL/NM Environmental Restoration Chemical Laboratory (ERCL) personnel poured volatile organic compounds (VOCs) down a drain. There were no penalties assessed for this violation.
- **Surface Discharge** – All water to be discharged to the ground surface, either directly or to lined containments, must meet State of New Mexico surface discharge standards. There were 28 one-time requests made for individual discharges to the ground surface in 2001. Surface discharges are only made with the approval of the Surface Discharge Program within the Environmental Management (EM) Department. In 2001, all requests met NMED New Mexico Water Quality Control Commission (NMWQCC) standards and were approved. Additionally, routine surface discharges are made to two evaporation lagoons servicing the Pulsed Power Facility under an existing discharge permit. A renewal application was submitted to NMED in 1999 and was approved in 2001. All permit requirements for both lagoons were met in 2001.

In 2001, there were four surface releases reported as occurrences and reviewed by the Surface Discharge Program. A surface

discharge is defined as the spilling, leaking, pumping, pouring, emitting, or dumping into water or in a location and manner where there is a reasonable probability that the discharged substance will reach surface or subsurface water in such quantity as may with reasonable probability injure human health, animal or plant life, or degrade the environment. There was no discernable impact to the environment due to any of these surface discharges.

- **Storm Water Runoff** – In 2001, no analytical monitoring was required under the National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit for Stormwater discharges. The NPDES Permit requires quarterly analytical sampling to be conducted in the second and fourth year of the five-year permit, weather permitting. The permit was renewed in January 2001. The next required analytical sampling will occur in Fiscal Year (FY) 2002 beginning in October 2001. However, quarterly visual samples were collected at five monitoring points (MPs) and inspected as described under "wet weather inspections" in Section 6.3.3. No unusual characteristics were noted. The permit is due for renewal again in 2005. Six additional storm water monitoring stations were added in 2001.

### Groundwater Protection

Groundwater monitoring activities reported are those associated with Sandia Corporation's ER Project and the GWPP.

- **GWPP** – The GWPP conducts general surveillance of water quality from a network of wells not associated with the ER Project. During May and June 2001, 13 wells and one perennial spring were sampled during annual groundwater surveillance monitoring. An off-site laboratory using U.S. Environmental Protection Agency (EPA) guidelines analyzed samples. Groundwater concentration trends are shown in Appendix D. No metal analytes were detected above the maximum contaminant level (MCL) for drinking water. Uranium-234 activity for EOD Hill and TRE-1 exceeded the DOE drinking water guideline of 20 pCi/L. These wells are located east of the Tijeras fault zone where high levels of uranium-234 occur naturally in groundwater. The results are consistent with prior data and are considered to be within background values. Additional details are provided in section 7.2.1 and Appendix D.

- **ER** – The ER Project collects groundwater samples at five general project areas: the CWL, the MWL, Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG), and the Canyons Area. Water quality results reported by the ER Project were consistent with past years' results. In areas of known contamination, levels remained consistent except for the CWL, which has shown a decreasing trend in detected trichloroethylene (TCE) since completion of the Vapor Extraction Project (VEP). This project successfully removed up to 5,000 lb of VOCs from the vadose zone (unsaturated soil above the water table). TA-V wells have shown an increase in TCE levels up to 26 µg/L as compared to the MCL of 5 µg/L. Recent 2001 data indicate that TCE levels in TA-V wells are leveling off and are no longer increasing. There have been no contaminants detected in groundwater at the MWL with the exception of nickel (attributed to well screen corrosion). Nitrates are a contaminant of concern at TAG, TA-V, and the Canyons Area near the Lurance Canyon Burn Site (LCBS). Nitrate levels are highest in TAG wells. There is no indication that contaminants are migrating from any ER sites at SNL/NM.
- **National Emission Standards for Hazardous Air Pollutants (NESHAP) Compliance** – Subpart H of NESHAP regulates radionuclide air emissions from DOE/NNSA facilities with the exception of naturally-occurring radon. In 2001, there were 18 SNL/NM facilities reporting NESHAP-regulated emissions. Of these 18 sources, 16 were point sources and two were diffuse sources. In 2001, the primary radionuclides released were tritium and argon-41. The results of the dose assessment showed that the on-site maximally exposed individual (MEI) received an effective dose equivalent (EDE) of 0.0030 millirem per year (mrem/yr). The off-site MEI received an EDE of 0.0008 mrem/yr. Both doses are below the EPA standard of 10 mrem/yr. By comparison, the average person in the Albuquerque area receives 330 to 530 mrem/yr resulting primarily from radon emanating from earth materials, medical procedures, consumer products, and cosmic radiation (Brookins 1992).

#### NEPA Activities

During 2001, NEPA compliance activities at SNL/NM included support to DOE/NNSA/OKSO for the preparation of a Supplement Analysis to the Site-Wide Environmental Impact Statement (SWEIS) that analyzed and approved resumption of pulse-mode operations at the Annular Core Research Reactor (ACRR) in TA-V. The NEPA team also coordinated information and data collection to support the Final Environmental Assessment for the Sandia Underground Reactor Facility (SURF) prepared by DOE/NNSA/OKSO (DOE 2001c). In February 2001, the ISMS NEPA Module software, an electronic system for performing NEPA compliance reviews, was deployed for laboratory-wide use, while the software was revised and upgraded throughout the year. The *SWEIS Annual Review-FY 2000* (SNL 2001i) was compiled and published in September 2001; the SWEIS Annual Review provides a yearly summary of facilities and operational changes at SNL/NM in comparison with the environmental conditions used in the SWEIS analysis (finalized in 1999). In 2001, SNL/NM NEPA staff performed a total of 326 NEPA compliance reviews, sending 62 NEPA checklists to DOE/NNSA/OKSO for review and determination. Table 2-3 provides summary details of SNL/NM NEPA review activities.

#### Air Quality

- **Ambient Air Monitoring** – Sandia Corporation measures ambient air quality at five stations throughout SNL/NM and compares results with National Ambient Air Quality Standards (NAAQS) and local ambient air standards. The network monitors criteria pollutants and VOCs. There were no exceedences in ambient air quality standards at any of SNL/NM's stations in 2001.
- **Air Quality Compliance** – The City of Albuquerque has yet to issue DOE a Title V Operating Permit for SNL/NM as required under the Clean Air Act Amendments (CAAA) of 1990. Since 1997, source owners were able to submit an inventory of their actual emissions or fuel throughput for the year and pay an annual fee based on this amount. Effective July 1, 2001, a modification to the City of Albuquerque's 20 NMAC 11.02, "Permit Fees," eliminated this fee reduction provision. Annual fees are now based on an assessed value of a source's maximum allowable to emit regardless of actual emissions, thereby increasing SNL/NM's fees from \$2,290 for 2000 to potentially \$78,430 for 2001.

# Chapter 1

## Introduction

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### Chapter Summary

This Annual Site Environmental Report (ASER) describes environmental protection programs currently in place at Sandia National Laboratories, New Mexico (SNL/NM) and summarizes the compliance status with major environmental laws and regulations during Calendar Year (CY) 2001.

SNL/NM is situated on Kirtland Air Force Base (KAFB) in Albuquerque, New Mexico. The regional setting of SNL/NM provides a diverse range of geological, hydrological, climatic, and ecological settings. The Sandia, named for the watermelon color seen on the mountains at sunset, and Manzanita Mountains provide a beautiful setting at SNL/NM.

Sandia Corporation (a wholly-owned subsidiary of Lockheed Martin Corporation) continues to provide technological innovations since its inception in 1945. The mission of Sandia Corporation is to provide science and engineering support for the nuclear weapons stockpile and stewardship. Most of SNL/NM's activities are conducted within five technical areas (TAs) and several remote locations.

### Environmental Snapshot

- *Between the months of July and October, KAFB receives approximately 8.3 in. of precipitation. During the winter, the average precipitation is 1.6 in.*
- *KAFB is home to at least 267 plant species and 195 animal species.*

In support of Sandia Corporation's mission, Environment, Safety, and Health (ES&H) issues are addressed through environmental management programs. These programs include effluent monitoring, environmental surveillance, environmental restoration (ER), pollution prevention (P2), chemical inventory management, oil spill prevention, and quality assurance (QA).



Cottonwoods set against the Manzanita Mountains.

SNL/NM is one of the nation's premier multi-program security laboratories within the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). SNL/NM is managed by Sandia Corporation (a wholly-owned subsidiary of Lockheed Martin Corporation) and overseen by the DOE/NNSA through its Albuquerque Operations Office (AL), Office of Kirtland Site Operations (OKSO).

This ASER describes environmental protection programs currently in place at SNL/NM and summarizes the compliance status with major environmental laws and regulations during CY 2001. This report was prepared in accordance with the requirements set forth for all large DOE/NNSA facilities and represents a key component of DOE's effort to keep the public informed about environmental conditions at DOE/NNSA sites.

### General Site Location and Characteristics

SNL/NM is located on the east side of KAFB, a 51,559-acre military installation, including 20,486 acres withdrawn from the Cibola National Forest through agreement with the U.S. Forest Service (USFS) (Figure 1-1). The total area of DOE/NNSA-owned property that is dedicated to SNL/NM facilities and operations is approximately 8,784 acres. Of these, Sandia Corporation conducts its operations within 2,841 acres (five TAs and several remote test areas). An additional 8,397 acres in remote areas are provided to DOE through land-use agreements with the U.S. Air Force (USAF) and Isleta Pueblo. There are an additional 9,000 acres of buffer zone near the southwest boundary of KAFB. The buffer zone provides margins of safety and sound buffers for SNL/NM testing activities. The ownership of the land is divided between the Pueblo of Isleta and the State of New Mexico. During CY 2001, SNL/NM successfully negotiated a lease of the area administered by the State of New Mexico Land Office. Negotiations with the Pueblo of Isleta are ongoing. KAFB is host to over 150 tenant groups including the Air Force Research Laboratory (Phillips Laboratory), Air Force Operations Wing, Defense Nuclear Agency's Field Command, DOE/NNSA field offices, and SNL/NM.

KAFB is located at the foot of the Manzanita Mountains and encompasses parts of these ranges within the land withdrawn area. The topography within the land withdrawn area consists mostly of vegetation consisting of juniper, piñon, cactus, and drought-tolerant shrubs and grasses. The topography on the western section of KAFB is mostly flat lying except for the significant channel cut by the Tijeras Arroyo, which dissects KAFB

east to west. KAFB and SNL/NM are located adjacent to the City of Albuquerque, which surrounds KAFB on the north, northeast, west, and southwest boundaries. Isleta Pueblo borders KAFB on the south. Additional information on local geology, hydrology, and ecology is presented at the end of this chapter.

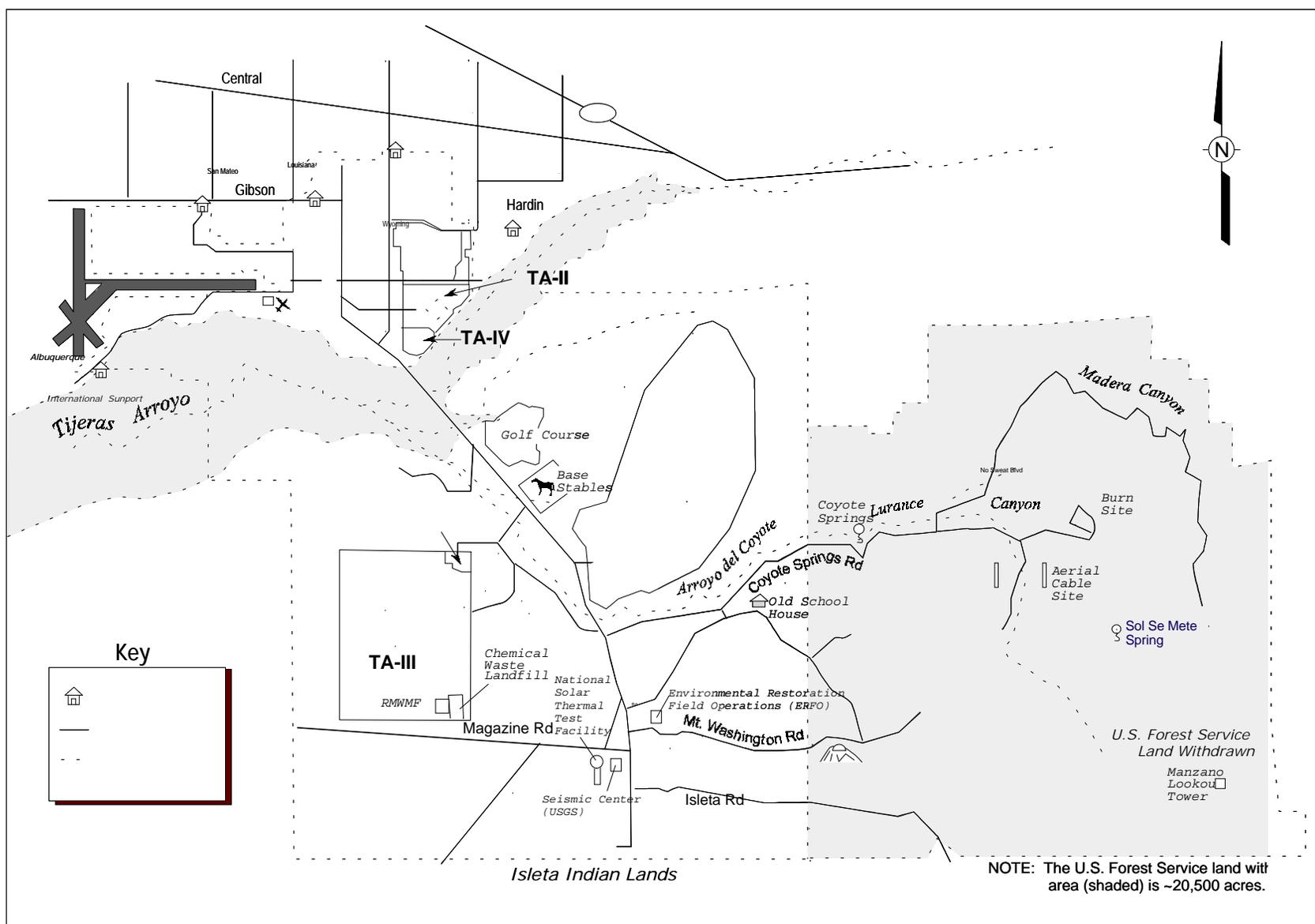
### ASER Scope

This chapter describes Sandia Corporation's history, mission, operational areas, and site characteristics of the surrounding region. Subsequent chapters in this ASER describe Sandia Corporation's specific environmental programs related to effluent monitoring, environmental surveillance, ER, waste management, P2, chemical inventory management, oil spill prevention, and QA. Ongoing and new activities, changes in program direction, corrective actions, and special awards and commendations are also discussed.

### Operations Contract

Sandia Corporation, like all regulated industries, complies with specific environmental regulations promulgated by local, state, and federal agencies. The Management and Operating Contract (MOC) between Sandia Corporation and DOE defines the primary contractual obligations for operating SNL/NM. This contract also drives Sandia Corporation's ES&H standards and requirements. Additionally, as stated in the MOC, Sandia Corporation must comply with DOE Orders and directives that establish specific requirements for environmental programs. There are six primary DOE directives on the contract baseline that pertain to the environment:

- DOE Order 5400.1, *General Environmental Protection Program* (DOE 1990);
- DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1993);
- DOE Order 231.1, *Environment, Safety, and Health Reporting*, Attachment 1, "Contractor Requirements Document" (DOE 1996);
- DOE Manual 231.1-1, *Environment, Safety, and Health Reporting Manual*, as amended by DOE Order 470.2A (DOE 2000a);
- DOE Order 435.1, *Radioactive Waste Management* (DOE 2001b); and
- DOE Order 5400.2A, *Environmental Compliance Issue Coordination* (DOE 1993a).



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**FIGURE 1-1.** Facilities Located on KAFB Showing SNL/NM Technical Areas and the U.S. Forest Service Land Withdrawn Area

## 1.1 SANDIA CORPORATION'S HISTORY AND MISSION

### History

SNL/NM got its start in 1945 as part of the Manhattan Project, which produced the first nuclear weapon. In 1949, President Harry Truman wrote American Telephone & Telegraph (AT&T) Corporation offering the company "an opportunity to render an exceptional service in the national interest" by managing Sandia Corporation. AT&T managed Sandia Corporation for 44 years. Today, Sandia Corporation is managed by Lockheed Martin Corporation for the DOE/NNSA.

### Mission

Sandia Corporation's enduring mission is to provide science and engineering support for the nuclear weapons stockpile. Today, the mission includes other aspects of national security, such as preventing the spread of nuclear, chemical, and biological weapons; developing technologies and strategies for responding to emerging threats such as terrorism; and preventing disruption of critical infrastructures such as energy supply and financial networks. Sandia Corporation collaborates with industry, universities, and other government agencies to commercialize new technologies. Recent technologies developed at SNL/NM can be found at the following website:

<http://www.sandia.gov/LabNews>

### Evolution of ES&H at SNL/NM

During the war era when the primary concern was to manufacture components for the nation's defense, very little consideration was given to environmental impacts resulting from weapons research and development (R&D). Even after World War II ended, cold war mission-driven tasks took priority over environmental concerns. Waste management practices and environmental management programs during that time were inadequate throughout the DOE. In 1984, DOE began assessing its sites of past releases nationwide, spurring major changes in improving the management of the environment around DOE sites. In 1987, the initial assessment of SNL/NM sites was completed. Significant environmental problems were identified at SNL/NM that included diesel fuel leaks, contaminated landfills, and various chemical discharge sites.

### Sandia Vision

*Helping our nation secure a peaceful and free world through technology.*

### Sandia Mission

*The primary mission of Sandia Corporation is to ensure the safety, security, and reliability of the nation's nuclear weapons.*

### Highest Goal

*Our highest goal is to become the laboratory that the U.S. turns to first for technology solutions to the most challenging problems that threaten peace and freedom for our nation and the globe.*

### Managing a Legacy of Contamination

In 1989, DOE established the Office of Environmental Restoration and Waste Management (ER/WM) to remediate areas of past contamination and establish sound waste management practices for the future. Innovative technologies continue to be developed to address ER sites throughout the DOE/NNSA Nuclear Weapons Complex. In a ranking of DOE sites, however, SNL/NM was one of the least contaminated facilities. The cleanup and remediation of all SNL/NM sites is expected to be complete by 2009. Some sites will require long-term monitoring to ensure that any remaining contamination does not migrate from the site. Detailed information about ER/WM cleanup efforts throughout DOE can be found at DOE's website:

<http://www.em.doe.gov/index4.html>

### DOE's Tiger Teams

In 1989, an initiative by the Secretary of Energy to conduct rigorous ES&H appraisals at DOE facilities formulated what became known as "Tiger Teams." The appraisal at SNL/NM was conducted from April 15, 1991 to May 24, 1991 and identified 382 findings in areas of worker safety, fire protection, emergency response, and material accountability. Sandia Corporation has since completed all corrective actions resulting from this appraisal and is subject to routine self-assessments and ongoing external audits.

### A History of Progress

Over the past eleven years, Sandia Corporation has made tremendous progress in building a comprehensive ES&H Program. The ES&H Manual (SNL 2002a), a dynamic online resource available to all personnel at SNL/NM, clearly describes ES&H requirements for all levels of work conducted at SNL/NM. Improved waste management practices have been implemented and state-of-the-art waste handling facilities have been constructed to handle and properly dispose of hazardous, radioactive, and solid waste. Recycling programs, P2, and other waste minimization practices have been very successful at SNL/NM. Audits conducted over recent years by the U.S. Environmental Protection Agency (EPA), various DOE/NNSA field offices, the City of Albuquerque, and the State of New Mexico have been testimony to Sandia Corporation's significant ES&H progress over the last 11 years.

Sandia Corporation's strategy for managing and implementing its ES&H Program is described in the Integrated Safety Management System (ISMS). The ISMS Program is structured around five safety management functions: (1) plan work, (2) analyze hazards, (3) control hazards, (4) perform work, and (5) feedback and improvement. ISMS provides the processes to assist line management in identifying and controlling hazards.

### Environmental Management System (EMS)

Sandia Corporation is working to define and implement an EMS as an improvement of the environmental elements of ISMS. In 2001, Sandia Corporation developed gap analyses comparing the current ISMS with environmental standards. The gap analyses will be used to determine system improvements to an EMS. It will serve as the basis to manage environmental compliance, controls, and improvements. Additionally, P2 goals will be incorporated into the EMS. This strategy ensures that ES&H considerations are incorporated into each element of all work processes being conducted at Sandia Corporation.

## 1.2 SNL/NM OPERATIONAL AREAS

### Technical Area I (TA-I)

TA-I is the focus of SNL/NM's operations housing the main administrative center and a close grouping of laboratories and offices. Although the majority of TA-I is located within the fenced area, several facilities and buildings are located just beyond the main compound. A majority of activities performed in TA-I are dedicated to the design, and R&D of

### Sandia Corporation ES&H Policy

*The policy of Sandia Corporation is to protect and preserve the environment, safety, and health of its personnel, contractors, visitors, and the public. Sandia Corporation shall make deliberate efforts to reduce hazardous exposures and releases to as low as reasonably achievable (ALARA) considering technical, economic, and social factors.*

*Concern and conduct in matters pertaining to ES&H are the responsibility of all Sandia Corporation employees, contractors, and visitors. **No job is more important than your health, your safety, and the protection of our environment.***

*Sandia Corporation's ES&H program mandates compliance with all applicable laws, regulations, and DOE directives (included in MOC) and adheres to the principles of line management responsibility for ES&H as described in Sandia Corporation's ISMS.*

weapon systems; limited production of weapon system components; and energy research programs. Facilities in TA-I include the main technical library, several assembly/manufacturing areas, the steam plant, the Advanced Manufacturing Process Laboratory (AMPL), the Microelectronics Development Laboratory (MDL), and the Neutron Generator Facility (NGF).

### Technical Area II (TA-II)

TA-II includes the diamond-shaped compound south of TA-I and several facilities south of Hardin Road. TA-II is primarily used to test explosive components. Research includes studies to develop techniques for measuring fractures in geologic strata. TA-II facilities within the main fenced area include the Explosive Components Facility (ECF) and the Classified Waste Landfill. Other TA-II facilities include the Facilities Command Center, the Solid Waste Transfer Facility (SWTF), and the Hazardous Waste Management Facility (HWMF).

### Technical Area III (TA-III)

TA-III is the largest and most remote area of all technical areas. It contains facilities mostly separated by large undeveloped areas. TA-III is used to accommodate large-scale engineering test activities, that require large safety and/or security area buffers, such as sled tracks used for collision testing, centrifuges, and a radiant heat facility. Facilities include the Radioactive and Mixed Waste

Management Facility (RMWMF), the Mixed Waste Landfill (MWL), the Chemical Waste Landfill (CWL), the Large-Scale Melt Facility (LMF), the Melting and Solidification Laboratory (MSL), and the Solar Tower Facility.

#### Technical Area IV (TA-IV)

TA-IV is a compound located just south of TA-I and TA-II. This area is used to conduct R&D activities in inertial-confinement fusion, pulsed power, and nuclear particle acceleration. The two primary facilities in TA-IV are the Z-Machine Accelerator and the High Energy Radiation Megavolt Electron Source-III (HERMES-III) including several small or nonactive accelerators such as the SATURN accelerator, the Sandia Accelerator Beam Research Experiment (SABRE), the Repetitive High Energy Pulsed Power (RHEPP-I and RHEPP-II) accelerators, the High Power Microwave Laboratory, and the Short Pulse High Intensity Nanosecond X-Radiator (SPHINX).

#### Technical Area V (TA-V)

TA-V is located adjacent to and on the northeast end of TA-III. Facilities in TA-V routinely handle radioactive materials used in experimental research for nuclear fuel. TA-V houses the Sandia Pulsed Reactor (SPR), the Gamma Irradiation Facility (GIF), the Annular Core Research Reactor (ACRR), and the Hot Cell Facility (HCF).

#### Remote Test Areas

Several remote test areas are located south of TA-III and within the canyons and foothills of the land withdrawal (e.g., Lurance Canyon and Coyote Canyon). These areas are used for explosive ordnance testing, rocket firing experiments, and open burn thermal tests.

#### Sandia Corporation's Science and Technology Capabilities

- *Advanced Manufacturing*
- *Biotechnology*
- *Computational and Information Sciences*
- *Electronics*
- *Engineering Sciences*
- *Materials and Process Sciences*
- *Microelectronics and Photonics*
- *Modeling and Simulation*
- *Nanotechnology*
- *Pulsed Power Sciences*
- *Surety Sciences*

### 1.3 SITE SETTING

#### Regional Topography and Layout

KAFB has widely varied topography from rugged mountains on the east to nearly flat plains on the west. As shown in Figure 1-1, the land withdrawn area backs up to and encompasses a portion of the Manzanita Mountains within the Cibola National Forest. The remainder of KAFB, with the exception of Manzano Base, is situated on gently west-sloping foothill terrain that grades to widespread flat areas where the majority of USAF and SNL/NM facilities are located.

#### The Mountains

The most prominent topographic feature in the Albuquerque area is the impressive west face of the Sandia Mountains. The Sandia Mountains form a 13-mi long escarpment distinguished by steep cliffs, pinnacles, and narrow canyons. Sandia Crest at 10,768 ft is the highest point in the region. Tijeras Canyon divides the Sandia Mountains to the north from the Manzanita and Manzano Mountains to the south. Sediments transported from the canyons and draws of these mountains have formed coalescing alluvial fans called bajadas. These broad alluvial plains slope west across KAFB and are dissected by the Tijeras Arroyo, smaller arroyos, and washes.

#### Tijeras Arroyo

Tijeras Arroyo is 4,265 ft wide and 108 ft deep forming a significant topographic feature across KAFB. The watershed drained by Tijeras Arroyo includes the southern Sandia Mountains, the Manzanita Mountains, and the north end of the Manzano Mountains. The arroyo is dry except during heavy downpours, which can cause significant flash floods. The arroyo originates out of Tijeras Canyon and runs coincident with the Tijeras fault for several miles before deviating to the southwest, where it discharges to the Rio Grande.

#### The Rio Grande

The Rio Grande (Great River) is 1,800 mi long and extends from Stony Pass in the San Juan Mountains of Colorado to the Gulf of Mexico. In North America, it is second only in length to the Mississippi/Missouri River system. It is flanked by a narrow riparian forest ecosystem (bosque). The middle Rio Grande bosque has the largest stands of cottonwoods in the world. The cottonwoods depend on the natural flood cycles of the river for seedling propagation. However, flooding of the river has since been managed and contained by the construction of the Cochiti Dam

and an extensive system of flood control ditches built by the U.S. Army Corps of Engineers. As a result, the cottonwoods have been declining. A Bosque Ecosystem Monitoring Program in conjunction with the University of New Mexico (UNM) is studying the problem and working to preserve the bosque.

Today, water from the Rio Grande is primarily used for agricultural irrigation; however, plans are underway to build a water treatment plant by 2005 that will use water from the river to supplement Albuquerque's drinking water supply.

### Regional Elevations

Elevations in the Albuquerque metropolitan area range from 4,898 ft at the Rio Grande, near the intersection of Interstate-40 and Interstate-25, to approximately 5,797 ft at the base of the Sandia Mountains. Albuquerque's average elevation of 5,312 ft makes it the highest large metropolitan city in America (AED 2002). The KAFB military reservation has a mean elevation of 5,384 ft. The maximum elevation at KAFB is 7,986 ft within the land withdrawn area.

### Counties and Population

New Mexico is the fifth largest state in the U.S. with 121,666 sq mi in area and a total population of approximately 1.5 million. A recent count of the population within an 80-km (50-mi) radius of SNL/NM was 695,406 residents (DOC 2002). The Albuquerque metropolitan area alone has approximately 678,820 residents (DOC 2002). There are nine counties contained in all or part of this radius (Table 1-1 and Figure 1-2).

## 1.4 GEOLOGY

### 1.4.1 Regional Setting

The regional geologic setting in which SNL/NM and KAFB are situated is an area that has been subjected to relatively recent episodes of basaltic volcanism and ongoing intercontinental rifting (crustal extension). The Rio Grande rift has formed a series of connected down-dropped basins in which vast amounts of sediments have been deposited. The Rio Grande rift extends for about 450 mi from Leadville, Colorado to southern New Mexico and is one of the greatest troughs on earth.

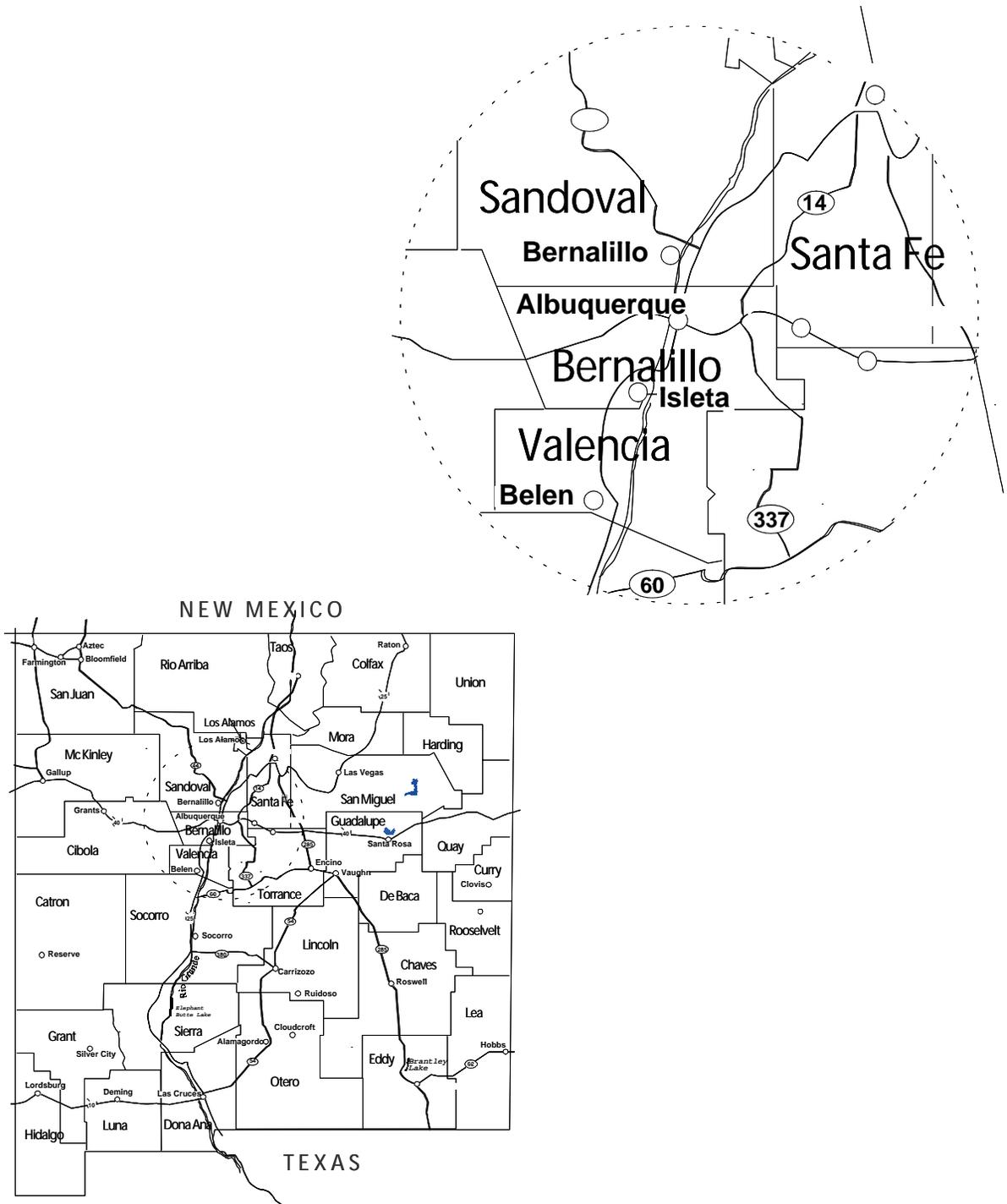
### 1.4.2 Albuquerque Basin

The Albuquerque Basin is one of several north-south trending sediment-filled basins formed by the Rio Grande rift. This major structural feature is approximately 30 mi wide and 100 mi long and 3,000 sq mi in area (Grant 1982) (Figure 1-3). On the east, uplifted fault blocks, reflected by the Sandia, Manzanita, and Manzano Mountains are bound by the basin. The western side of the basin is bound by the Lucero uplift to the south, the Rio Puerco fault belt, and the Nacimiento uplift at the northern end. There is relatively little topographic relief along the Rio Puerco fault belt on the northwestern side of the basin. Two south-flowing rivers drain the basin: the Rio Puerco to the west and the Rio Grande to the east.

During the Miocene and Pliocene epochs, the basin filled with as much as 14,961 ft of sediments derived from the erosion of the surrounding highlands and material transported into the basin by the ancestral Rio Grande. This sequence of unconsolidated sediments (primarily the Santa Fe Group) thins toward the edge of the basin and is

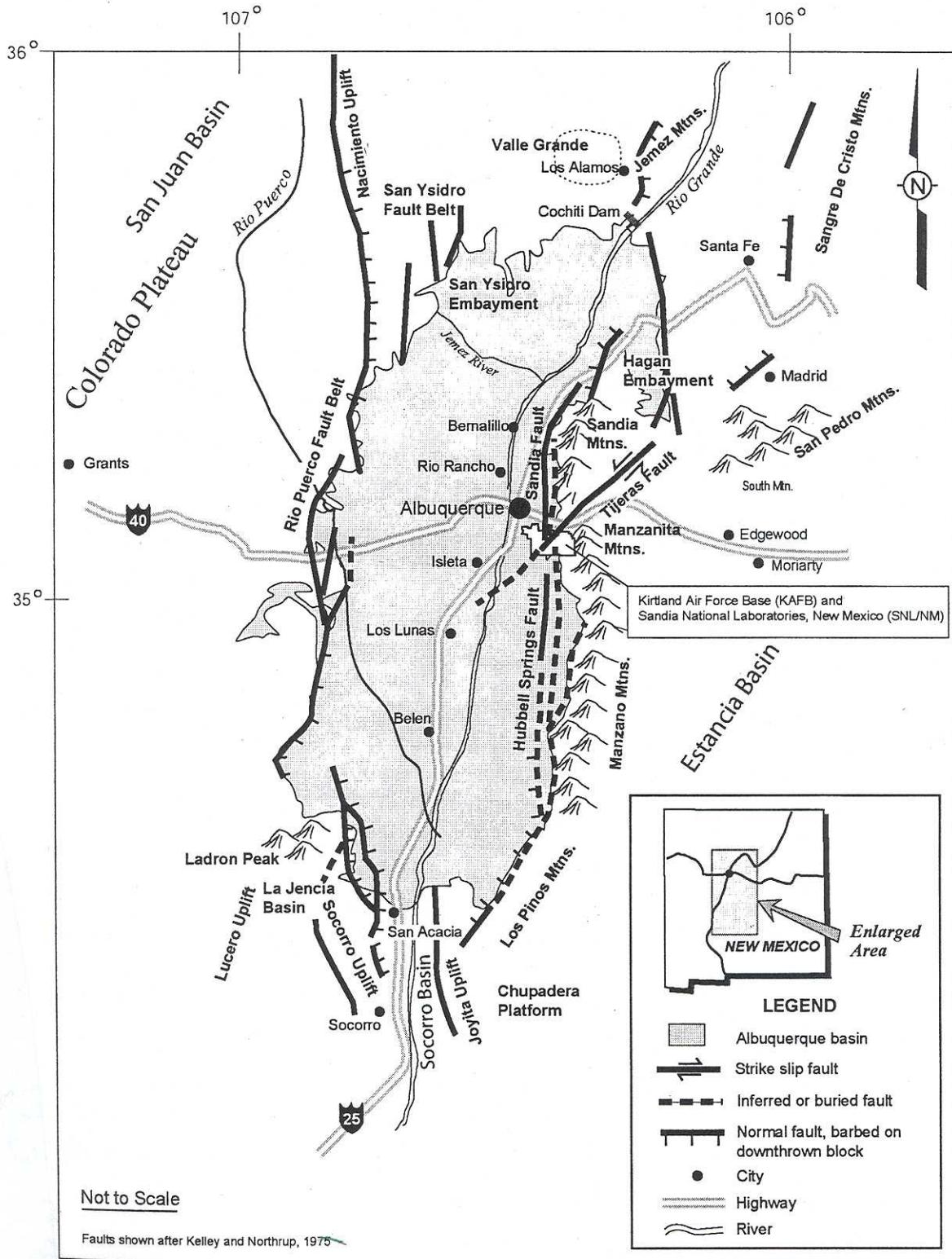
**TABLE 1-1.** Counties Within a 50-mi Radius of SNL/NM

County	Primary Population Centers
Bernalillo	Albuquerque, KAFB, and east mountain residents (Sandia, Manzanita, and Manzano Mountains)
Sandoval	Corrales, Rio Rancho, Bernalillo, and several Indian Pueblos
Valencia	Bosque Farms, Los Lunas, and Belen
Santa Fe	Edgewood and suburbs of Santa Fe
Torrance	Moriarty and small villages east of the Manzano Mountains
McKinley	Sparsely populated northwest edge of the county
San Miguel	Sparsely populated southwest edge of the county
Cibola	Laguna Pueblo
Socorro	Several small villages on the north edge of the county



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**FIGURE 1-2.** State of New Mexico Map  
*The overlay shows major roads, cities, county lines, and the 50-mi radius from SNL/NM facilities (dashed circle).*



**FIGURE 1-3.** The Albuquerque Basin, North Central New Mexico, Showing Bounding Faults and Uplifts

truncated by normal faults at the bounding uplifts. The Santa Fe Group is overlain in places by Pliocene Ortiz gravel and Rio Grande fluvial deposits, which are interbedded with Tertiary and Quaternary basaltic and pyroclastic materials. The Santa Fe Group consists of channels, debris flow, floodplain deposits, and includes eolian and playa deposits toward the center of the basin (in the lower units). Most of the bedding is thought to be lenticular with limited lateral extent, although buried channels or debris flows can extend for miles. These subsurface features are of major importance in controlling the movement of groundwater within the basin.

### Regional Fault Systems

As shown in Figure 1-4, several major faults are located on KAFB. The Tijeras fault, which has been traced as far north as Madrid, New Mexico, trends southwesterly through Tijeras Canyon and across KAFB. The Tijeras Canyon was formed by preferential erosion along the fault. The Tijeras fault is a strike-slip fault of Paleozoic (and younger) age expressed by southwesterly movement of the northern block (left lateral). The system of faults connecting with the Tijeras fault on KAFB is collectively referred to as the Tijeras fault complex. The Tijeras fault complex marks a distinct geologic boundary between the uplifted blocks on the east and the sediment-filled basin to the west. This geologic boundary also forms a boundary between the two groundwater regimes at KAFB.

The Sandia fault is thought to be the primary boundary between the Sandia Mountains and the Albuquerque Basin and shows evidence of Quaternary motion (Kelley 1977). The Sandia fault converges with the Tijeras fault and the Hubble Springs fault. The Hubble Springs fault has created the Hubbell Bench (at the south end of KAFB) with offsets of 15 to 100 ft and is one of the most clearly visible fault scarps on the edge of the basin (Machette et al. 1982). Both the Sandia fault and Hubble Springs fault are north-south trending, down-to-the-west, en-echelon normal faults, which are Tertiary in age (Lozinsky et al. 1991; Woodward 1982; Kelley and Northrup 1975).

### 1.5 HYDROLOGICAL SETTING

Because of the structurally complex terrain, the groundwater hydrology at KAFB is difficult to understand. In general, hydrogeological characterization is divided into two areas separated by the Tijeras fault complex, which marks a distinct geological boundary. To the east of the Tijeras

fault complex, the geology is characterized by fractured and faulted bedrock covered by a thin layer of alluvium and shallow groundwater 49 to 98 ft deep. On the west side of the Tijeras fault complex within the basin, groundwater levels occur from 295 to 492 ft below the surface.

### Natural Springs

There are two perennial springs present on KAFB: Coyote Springs and Sol Se Mete Spring. Additionally, there is one perennial spring (Hubbell Spring) located immediately south of the KAFB boundary on Isleta Pueblo.

### Groundwater Yields

The primary regional aquifer in the basin is within the upper unit and, to a lesser degree, the middle unit of the Santa Fe Group. Most of the City of Albuquerque's water supply wells are located on the east side of the Rio Grande. The highest yield wells are screened in the sediments associated with the ancestral river channel. Prior to extensive urban development in the Albuquerque area beginning in the 1950s, the direction of regional groundwater flow was primarily to the southwest. As a result of groundwater withdrawal, the water table has dropped by as much as 141 ft (Thorn et al. 1993). Groundwater withdrawal from KAFB and City of Albuquerque wells at the north end of KAFB has created a trough-like depression in the water table causing flow to be diverted northeast in the direction of the well fields.

## 1.6 REGIONAL CLIMATE

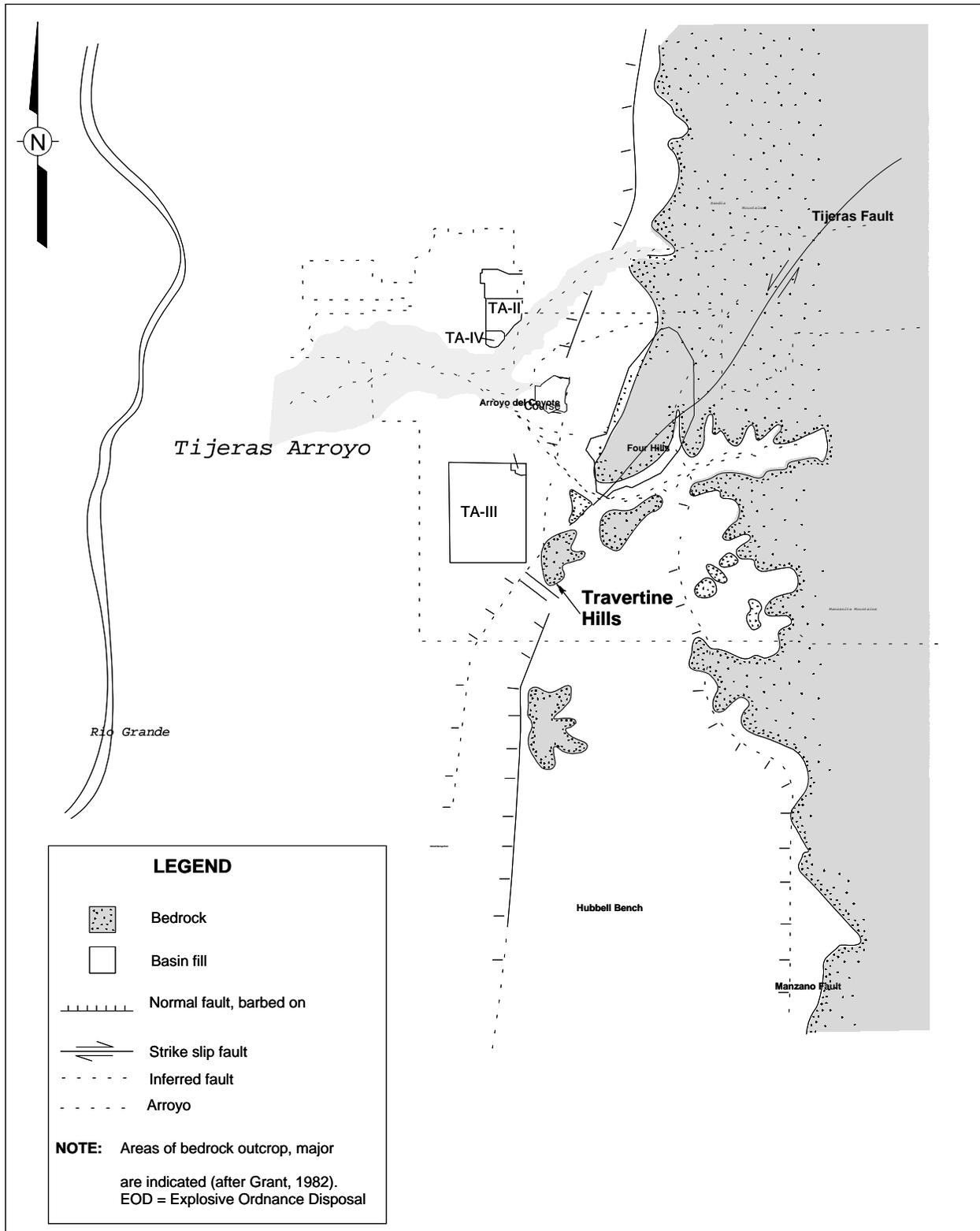
Wide diurnal temperature extremes, monsoons, and frequent drying winds are characteristic of the Albuquerque Basin climate.

Air temperatures are characteristic of high-altitude and dry continental climates. Temperature averages are as follows:

Season	Daytime High (avg.)	Nighttime Low (avg.)
Summer	32.7 °C 90.8 °F	16.6 °C 61.8 °F
Winter	9.6 °C 49.2 °F	-4.6 °C 23.7 °F

Source: NOAA 2002

The monthly average relative humidity varies from a low of 30 percent in early summer to 56 percent in early winter.



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FIGURE 1-4. Generalized Geology in the Vicinity of SNL/NM and KAFB

Annual precipitation, most of which occurs between July and October, averages approximately 8.3 in. on KAFB. In the higher elevations of the Sandia and Manzano Mountains, annual precipitation is between 12 to 35 in. The winter season is typically dry with less than 1.6 in. of precipitation recorded.

While the regional climate is described by the atmospheric state variables of temperature and humidity, site-specific meteorology at SNL/NM is influenced by the proximity to topographic features such as mountains, canyons, and arroyos. These features influence local wind patterns across the site; canyons and arroyos tend to channel or funnel wind, whereas mountains create upslope-downslope diurnal/nocturnal (day/night) wind flows. Diurnal winds tend to blow toward the mountains during the day and nocturnal winds tend to blow down the mountain towards the Rio Grande Valley. These topographically induced wind flows can be enhanced or negated by weather systems that move across the southwest part of the U.S. The strongest winds occur in the spring when monthly wind speeds average 10.3 mph. Wind gusts can commonly reach up to 50 mph.

## 1.7 REGIONAL ECOLOGY

The regional area within an 50-mi radius of SNL/NM facilities is situated at the junction of four major physiographic provinces:

- **Great Plains Grassland Prairie** (east of the Rocky Mountains);
- **Great Basin Desert** (west of the Rocky Mountains);
- **Chihuahuan Desert** (south of Albuquerque); and
- **Rocky Mountains** (the Sandia and Manzano Mountains form the southern extension of the Rockies).

Each province has an influence on the typical landforms, flora, and fauna predominant within the region. The Albuquerque area is perhaps most influenced by the Great Basin Desert ecosystem. With the topography at KAFB ranging from mountainous to flat grasslands, and much of the

### Prairie Dog Towns Enhance Local Ecology

*KAFB is home to a vast array of prairie dog colonies. The Gunnison's prairie dog (Cynomys gunnisoni) is a social animal that provides ecological nourishment to the grasslands on KAFB. The prairie dog does a remarkable job of aerating soil, maintaining grassland vegetation, and providing shelter for other wildlife. Prairie dog burrows are often used by other rodents, reptiles, and birds. The Western burrowing owl (Athena cunicularia hypugaea) uses the prairie dog burrows during nesting season and is currently protected under the Migratory Bird Treaty Act (MBTA). KAFB, in cooperation with Hawks Aloft, Inc., conducts research on reproductive success and nest usage of the Western burrowing owl.*

reservation remaining undeveloped, there is much diversity in plant and animal communities living on KAFB. At least 267 plant species and 195 animal species occur on KAFB (DOE 1999). Table 1-2 lists some of the birds, mammals, reptiles, and amphibians that have been identified on-site. Table 1-3 lists some of the plants identified on-site.

#### 1.7.1 Regional Life Zones

**The Canadian Life Zone** occurs from 8,000 to 11,500 ft; the highest elevations in the Sandia and Manzano Mountains are just over 10,000 ft.

**The Ponderosa Pine or Transition Zone** occurs in the higher elevations of the land withdrawn area on KAFB. In the Albuquerque region, ponderosas generally occur between 7,000 and 8,000 ft.

**The Piñon Juniper Zone** generally occurs from 6,000 to 7,000 ft within canyons, foothills, and mesas. This zone makes up much of the rolling terrain located on the KAFB land withdrawn area.

**The Upper Sonoran Life Zone** occurs below 6,000 ft and supports scrubby semi-desert vegetation.

**The Rio Grande and Bosque** in the Albuquerque area occurs below 6,000 ft. The river is approximately seven miles from the western boundary of KAFB.

TABLE 1-2. A Partial List of Animals Identified at KAFB

BIRDS			
American robin	<i>Turdus migratorius</i>	Gray vireo	<i>Vireo vicinior</i>
American kestrel	<i>Falco sparverius</i>	Golden eagle	<i>Aquila chrysaetos</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	Great horned owl	<i>Bubo virginianus</i>
Canyon towhee	<i>Pipilo fuscus</i>	Great-tailed grackle	<i>Quiscalus mexicanus</i>
Barn owl	<i>Tyto alba</i>	Grace's warbler	<i>Dendroica graciae</i>
Bushtit	<i>Psaltirparus minimus</i>	Gambel's quail	<i>Callipepla gambelii</i>
Black-chinned hummingbird	<i>Archilochus alexandris</i>	Hairy woodpecker	<i>Picoides villosus</i>
Black-throated sparrow	<i>Ampohispiza bilineata</i>	Horned lark	<i>Eremophila alpestris</i>
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	Dark-eyed junco	<i>Junco hyemalis</i>
Brown-headed cowbird	<i>Molothrus ater</i>	Killdeer	<i>Charadrius vociferus</i>
Broad-tailed hummingbird	<i>Selasphorus platycercus</i>	Lark bunting	<i>Caramopiza melanocorys</i>
Bank swallow	<i>Riparia riparia</i>	Loggerhead shrike	<i>Lanius ludovicianus</i>
Barn swallow	<i>Hirundo rustica</i>	Mountain bluebird	<i>Sialia currucoides</i>
Black-throated gray warbler	<i>Dendroica nigrescens</i>	Northern flicker	<i>Colaptes auratus</i>
Bewick's wren	<i>Thryomanes bewickii</i>	Piñon jay	<i>Gymnorhinus cyanocephalus</i>
Cooper's hawk	<i>Accipter cooperi</i>	Red-tailed hawk	<i>Buteo jamaicensis</i>
Common raven	<i>Corvus corax</i>	Rufous-sided towhee	<i>Pipiloerythro melanocephalus</i>
Chirping sparrow	<i>Spizella passerina</i>	Scrub jay	<i>Aphelocoma coerulescens</i>
Cassin's kingbird	<i>Tyrannus vociferans</i>	Turkey vulture	<i>Cathartes aura</i>
Crissal thrasher	<i>Toxostoma dorsale</i>	Western burrowing owl	<i>Athena cucularia hypugaea</i>
Dark-eyed junco	<i>Junco hyemalis</i>	Western meadowlark	<i>Sturnella neglecta</i>
European starling	<i>Sturnus vulgaris</i>		
Greater roadrunner	<i>Geococcyx californianus</i>		
MAMMALS			
Black bear	<i>Ursus americanus</i>	Desert cottontail	<i>Sylvilagus audubonii</i>
Bobcat	<i>Felis rufus</i>	Deer mouse	<i>Peromyscus maniculatus</i>
Big brown bat	<i>Eptesicus fuscus</i>	Gunnison's prairie dog	<i>Cynomys gunnisoni</i>
Banner-tailed kangaroo rat	<i>Dipodomys spectabilis</i>	Gray fox	<i>Urocyon cinereoargenteus</i>
Brush mouse	<i>Peromyscus boylii</i>	Mountain lion	<i>Felis concolor</i>
Black-tailed jackrabbit	<i>Lepus californicus</i>	Mule deer	<i>Odocoileus hemionus</i>
Common porcupine	<i>Erethizon dorsatum</i>	Rock squirrel	<i>Spermophilus variegatus</i>
Common raccoon	<i>Procyon lotor</i>	Striped skunk	<i>Mephitis mephitis</i>
Coyote	<i>Canis latrans</i>		
REPTILES AND AMPHIBIANS			
Collared lizard	<i>Crotaphytus collaris</i>	Leopard lizard	<i>Gambelia wislizenii</i>
Chihuahuan spotted whiptail	<i>Cnemidophorus exsanguis</i>	Tiger salamander	<i>Ambystoma tigrinum</i>
Desert horned lizard	<i>Phrynosoma platyrhinos</i>	Western diamondback rattlesnake	<i>Crotalus atrox</i>
Eastern fence lizard	<i>Sceloporus undulatus</i>	Side-blotched lizard	<i>Uta stansburiana</i>
Gopher snake	<i>Pituophis melanoleucus</i>	Striped whip snake	<i>Masticophis taeniatus</i>
Great plains skink	<i>Eumeces obsoletus</i>	Short-horned lizard	<i>Phrynosoma douglassi</i>
Great plains toad	<i>Bufo cognatus</i>		

TABLE 1-3. A Partial List of Plants Identified at KAFB

PLANTS			
Apache plume	<i>Fallugia paradoxa</i>	Goathead	<i>Tribulus terrestris</i>
One-seed juniper	<i>Juniperus monosperma</i>	India ricegrass	<i>Oryzopsis hymenoides</i>
New Mexico porcupine grass	<i>Stipa neomexicana</i>	Ring muhly	<i>Muhlenbergia torreyi</i>
Purple three-awn	<i>Aristida purpurea</i>	Bush muhly	<i>Muhlenbergia porteri</i>
Shrub live oak	<i>Quercus turbinella</i>	Soapweed yucca	<i>Yucca glauca</i>
Spectacle pod	<i>Ditheryrea wislizenii</i>	Blue locoweed	<i>Astragalus lentiginosus</i>
Annual goldenweed	<i>Machaeranthera gracilis</i>	Globemallow	<i>Sphaeralcea incana</i>
Western blue flax	<i>Linum lewisii</i>	Beakpod milkvetch	<i>Astragalus lentigenosus</i>
Four-wing saltbush	<i>Atriplex canescens</i>	Paperdaisy	<i>Psilostrophe tagetina</i>
Colorado piñon	<i>Pinus edulis</i>	Prickly pear cactus	<i>Opuntia polyacantha</i>
Desert marigold	<i>Baileya multiradiata</i>		

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# Chapter 2 Compliance Summary

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## Chapter Summary

Sandia Corporation conducts operations based on environmental regulations, statutes, and U.S. Department of Energy (DOE) Orders. A variety of programs at Sandia National Laboratories, New Mexico (SNL/NM) work together to strive for 100 percent compliance with applicable regulations. As a part of these federal, state, and locally mandated regulations, SNL/NM must adhere to strict reporting and permitting requirements.

External audits and appraisals are conducted at SNL/NM to identify any issues that may arise from operations. SNL/NM also conducts internal audits and appraisals as a part of quality assurance (QA). In 2001, four external audits and five inspections or sampling activities were conducted.

Six environmental occurrences (i.e., problems, concerns, failures, malfunctions or deficiency in a process, procedure, or program) were reported in 2001. Occurrences are categorized based on the severity of the event. All reportable occurrences are tracked through the Occurrence Reporting Processing System (ORPS).

### Environmental Snapshot

- The "National Nuclear Security Administration FY 2001 Multi-Program Laboratory Appraisal of Sandia National Laboratories" report indicated that "Overall performance in Operations and Administration Support was Outstanding" (NNSA 2001).
- Sandia Corporation reviewed a total of 326 activities related to the National Environmental Policy Act (NEPA) in 2001, and submitted 62 NEPA checklists to the DOE for review.

SNL/NM tracks environmental progress through environmental performance measures that help to track trends in compliance status. Performance measures were included in ten areas of Environment, Safety, and Health (ES&H) and Environmental Restoration/Waste Management (ER/WM) in 2001.



Gunnison's prairie dog (*Cynomys gunnisoni*) looking out at the Manzanita foothills.

This chapter summarizes Sandia Corporation's compliance status with major environmental regulations, statutes, and DOE Orders applicable to operations conducted at SNL/NM (see shaded box on page 2-3). Environmental compliance specifically falls under the guidance of six primary DOE Orders as described under section 2.1.16. Specific environmental programs responsible for meeting compliance with these regulations are discussed in subsequent chapters of this Annual Site Environmental Report (ASER).

Current permits held by Sandia Corporation and DOE, National Nuclear Security Administration (NNSA), Office of Kirtland Site Operations (OKSO) for air, water, and waste are listed in Appendix B. Ongoing compliance issues and corrective actions, environmental occurrences, and environmental audits and appraisals are also discussed in this chapter.

## 2.1 COMPLIANCE STATUS WITH FEDERAL REGULATIONS

This section summarizes DOE and Sandia Corporation's compliance status with major environmental regulations, statutes, executive orders (EOs), and DOE Orders that pertain to the environment.

### 2.1.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

CERCLA, commonly known as "Superfund," provides cleanup funds and/or assessment requirements for inactive waste sites at all federal facilities. CERCLA requirements are implemented under 40 CFR 302, "Designation, Reportable Quantities, and Notification." CERCLA was amended by SARA in 1986 to address significant hazardous waste sites.

A Preliminary Assessment/Site Inspection (PA/SI), as required by CERCLA Section 120 (DOE 1995), was performed at SNL/NM in 1988. This inspection confirmed that Sandia Corporation does not own any sites that would qualify for listing on the National Priorities List (NPL). The NPL lists the nation's high priority cleanup sites or "Superfund sites." Therefore, with respect to inactive hazardous waste sites, Sandia Corporation has no CERCLA reporting requirements. Other CERCLA reporting requirements are invoked in the case of a reportable quantity (RQ) release. CERCLA

requires that any release to the environment (in any 24-hour period) of any pollutant or hazardous substance in a quantity greater than or equal to the RQ, must be reported immediately to the U.S. National Response Center (NRC). There were no RQ releases in 2001. If the release is "federally permitted" under CERCLA Section 101(10)H, it is exempted from CERCLA reporting. This reporting exemption also applies to any "federally permitted" release under SARA Title III. Sandia Corporation was in full compliance with CERCLA and SARA in 2001. NRC information can be found at the following website:

[www.nrc.uscg.mil](http://www.nrc.uscg.mil)

Additional CERCLA reporting requirements defined under SARA Title III are discussed in the following section.

### 2.1.2 Emergency Planning and Community Right-to-Know Act (EPCRA)

EPCRA, also known as SARA Title III, establishes emergency planning requirements for federal, state, and local governments and industry. EPCRA, passed in 1986, is implemented by:

- 40 CFR 355, "Emergency Planning and Notification" (EPCRA, Section 302-304);
- 40 CFR 370, "Hazardous Chemical Reporting: Community Right-to-Know" (EPCRA, Section 311-312); and
- 40 CFR 372, "Toxic Chemical Release Reporting: Community Right-to-Know" (EPCRA, Section 313).

EPCRA applies to all facilities in which there is a presence of a threshold quantity (TQ) of an extremely hazardous substance (EHS) equal to or greater than the threshold planning quantities or in specifically designated amounts as determined by the local community. EO 13148, Greening the Government Through Leadership in Environmental Management, strengthens and reiterates the goals of pollution prevention (P2) and reporting under EPCRA.

EPCRA requires that the community be informed of potential hazards, such as the type and location of large quantities of toxic chemicals used and stored by facilities in the community. EPCRA specifically mandates that chemical information be made

## Major Environmental Regulations &amp; Statutes Applicable to SNL/NM

## Atomic Energy Act (AEA)

Directs U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) in the management of nuclear materials and radioactive waste

## Clean Air Act (CAA) and CAA Amendments (CAAA )

Provides standards to protect the nation's air quality

## Clean Water Act (CWA)

Provides general water quality standards to protect the nation's water sources and byways

## Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

Provides federal funding for cleanup of inactive waste sites on the National Priorities List (NPL) and mandates requirements for reportable releases of hazardous substances

## Cultural resources acts

Includes various acts that protect archeological, historical, religious sites, and resources

## Endangered Species Act (ESA)

Provides special protection status for federally-listed endangered or threatened species

## Executive Orders (EOs)

Several EOs provide specific protection for wetlands, floodplains, environmental justice in minority and low-income populations, and greening the government through leadership in environmental management

## Federal Facility Compliance Act (FFCA)

Directs federal agencies regarding environmental compliance

## Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Controls the distribution and use of various pesticides

## Migratory Bird Treaty Act (MBTA) of 1918

Prevents the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts, and nests

## National Emission Standards for Hazardous Air Pollutants (NESHAP)

Specifies standards for radionuclide air emissions and other hazardous air releases

## National Environmental Policy Act (NEPA)

Ensures that federal agencies review all proposed activities and include environmental consideration in agency decision-making

## Resource Conservation and Recovery Act (RCRA)

Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks (USTs)

## Safe Drinking Water Act (SDWA)

Provides specific standards used for drinking water sources

## Superfund Amendments and Reauthorization Act (SARA) SARA, Title III, also known as the

Emergency Planning and Community-Right-to-Know Act (EPCRA), mandates communication standards for hazardous materials over a threshold amount that are stored or used in a community

## Toxic Substance Control Act (TSCA)

Specifies rules for the manufacture, distribution, and disposal of specific toxic materials such as asbestos and polychlorinated biphenyls (PCBs)

available to local emergency response organizations, such as fire departments and hospitals. Any inadvertent release must be reported to appropriate state and local authorities and all subsequent reports must be made accessible to the public. The four major reporting requirements designated by specific sections of SARA Title III (or EPCRA) are shown in Table 2-1.

On October 29, 1999, the U.S. Environmental Protection Agency (EPA) published a final rule under section 313 of the EPCRA, which lowers the Toxic Release Inventory (TRI) reporting thresholds for persistent bioaccumulative toxic (PBT) chemicals and adds certain other PBT chemicals to the TRI. Other rulings related to PBTs have since been finalized. Relatively small releases of PBT chemicals can pose human and environmental health threats. PBT chemicals, such as lead and lead compounds are of concern not only because they are toxic, but because they remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue.

There were no reportable releases at SNL/NM under EPCRA or CERCLA in 2001. Information on EPCRA can be found at the following EPA website:

<http://www.epa.gov/swercapp/cr tk.html>

#### TRI Reporting

EPCRA regulations (40 CFR 372) require that facilities with activities described in the Standard Industrial Classification (SIC) Code 20 through 39 that use toxic chemicals listed in SARA Title III over a threshold value must submit a TRI report. A TRI report is also required by EO 13148. The threshold value for listed chemicals for which a TRI report is required is 10,000 lb/yr, unless otherwise specified.

Sandia Corporation began submitting TRI reports to the EPA and the DOE in 1991. In 1995, chemical use at SNL/NM fell below the reporting threshold. However, Sandia Corporation continues to document its toxic chemical use in the Chemical Purchase Inventory Report, Calendar Year 2001 (SNL/URS Corporation 2002), which lists all purchases of chemicals (even though the quantities are below the threshold quantities).

#### Hazardous Chemical Inventory

Sandia Corporation conducts an annual hazardous chemical purchase inventory from both purchase data and Material Safety Data Sheets (MSDSs). The assumption is that chemicals purchased are equivalent to chemicals used; therefore, the actual chemical inventory at any given time may be different from the purchase inventory.

This purchase inventory supports compliance with SARA Title III as well as Title V of the Clean Air Act Amendments (CAAA) of 1990. Table 2-2 lists chemicals over 1,000 lb purchased in 2001 that are on the SARA Title III toxic chemical list and compares them to 1999 and 2000 purchases.

#### 2.1.3 Resource Conservation and Recovery Act (RCRA)

RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous chemical wastes, non-hazardous solid wastes, and hazardous or petroleum products stored in underground storage tanks (USTs).

Under the authority of the New Mexico Hazardous Waste Act (NMHWA), the New Mexico Environment Department (NMED) administers regulatory programs in place of the EPA. Hazardous waste management activities at SNL/NM are conducted under NMED regulations. Some additional RCRA requirements and regulations of the EPA also apply. Applicable regulations are listed in Appendix C.

The hazardous component of mixed hazardous/radioactive waste is regulated as hazardous waste and is subject to the requirements of state and federal regulations. The radioactive component of mixed waste is regulated under the Atomic Energy Act (AEA) of 1946.

Sandia Corporation generates hazardous and mixed waste through normal operations. Sandia Corporation also generates hazardous and mixed waste through the ongoing environmental restoration (ER) project involving cleanup of sites that were formerly used for operations such as testing and disposal. Sandia Corporation has an active and successful program to minimize hazardous and mixed waste through product substitutions, process changes, material re-use, and recycling.

**TABLE 2-1.** 2001 SARA Title III (or EPCRA) Reporting Requirements Applicable to SNL/NM

Section	SARA Title III Section Title	Requires Reporting?		Description
		Yes	No	
302 - 303	Notification/ Plans	✓		Sandia Corporation submits an annual report listing chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 Appendix B, location of the chemicals and emergency contacts. The report is prepared for the DOE/NNSA/OKSO, which distributes it to the required entities.
304	Emergency Notification		✓	No RQ releases of an EHS, or as defined under CERCLA, occurred in 2001.
311-312	MSDSs/ Chemical Purchase Inventory Report	✓		There are two "Community Right-to-Know" reporting requirements: (a) SNL/NM completes the EPA Tier II forms for all hazardous chemicals present at the facility at any one time in amounts equal to or greater than 10,000 lbs and for all EHSs present at the facility in an amount greater than or equal to 500 lbs or the Threshold Planning Quantity, whichever is lower; (b) SNL/NM provides MSDSs for each chemical entry on a Tier II form unless it decides to comply with the EPA's alternative MSDS reporting, which is detailed in 40 CFR Part 370.21.
313	Toxic Chemical Release Forms		✓	Sandia Corporation is below the reporting threshold in 2001 for submitting a TRI Report for SNL/NM operations. SNL/NM has been below the reporting threshold for a TRI report since 1995.

**NOTE:** MSDS = Material Safety Data Sheets (gives relevant chemical information)  
 RQ = reportable quantity  
 EHS = extremely hazardous substance  
 TRI = Toxic Release Inventory  
 DOE = U.S. Department of Energy  
 OKSO = Office of Kirtland Site Operations  
 EPA = U.S. Environmental Protection Agency  
 NNSA = National Nuclear Security Administration  
 SNL/NM = Sandia National Laboratories, New Mexico

**TABLE 2-2.** 2001 Summary of SARA Title III (or EPCRA) Toxic Chemical Purchases at SNL/NM

Chemical Name	CAS Number	1999 Usage (lb/yr)	2000 Usage (lb/yr)	2001 Usage (lb/yr)
Acetone	67-64-1	7,021	8,533	6,068
Isopropyl alcohol (manufacturing - strong process, no supplier notification)	67-63-0	3,439	3,080	2,837
Methanol	67-56-1	2,028	1,732	1,912
Nitric acid	7697-37-2	4,186	2,907	1,317
Sulfuric acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size)	7664-93-9	52	30	3,131
<b>TOTAL</b>		16,726	16,282	15,265

**NOTE:** CAS = Chemical Abstract Service  
 lb/yr = pound per year

The following summarizes Sandia Corporation's hazardous waste management activities during 2001:

- **Hazardous Waste** - Much of the hazardous waste generated at SNL/NM is managed at the Hazardous Waste Management Facility (HWMF). The HWMF operates under a 10-year RCRA Part B Operating Permit issued by the EPA in August 1993 (active permits are listed in Appendix B). In 2001, the HWMF shipped a total of 97,755 lbs (44,341 kg) of RCRA-regulated hazardous wastes, including recycled hazardous materials. Details related to the HWMF operations are contained in Chapter 3.
- **Explosive Waste** - Explosive waste generated at SNL/NM is usually managed at the point of generation until it can be shipped to a treatment facility. In 2001, 864 lbs (392 kg) were sent to the Explosive Ordnance Disposal (EOD) and four large rocket motors totalling 29,844 lbs (13,537 kg) were sent to Hill Air Force Base for treatment.

Sandia Corporation also has a permitted Thermal Treatment Facility (TTF) for treating certain explosive waste. The TTF operates under a 10-year Part B Operating Permit issued by the EPA in November 1994 (as listed in Appendix B). During 2001, Sandia Corporation did not use the TTF for waste treatment.

- **Mixed Waste** - Much of the mixed waste (MW) generated at SNL/NM is managed at the High-Bay Waste Storage Facility (HBWSF), the Manzano Storage Bunkers (MSB), and the Radioactive and Mixed Waste Management Facility (RMWMF). All three units are currently operating under interim status and have not yet received final operating permits. Sandia Corporation and DOE applied for a Part B Operating Permit most recently in 1996. In 2001, SNL/NM shipped 117,082 lbs (53,108 kg) of MW to off-site facilities. An additional 1,166 lbs (529 kg) of MW was treated at the RMWMF and rendered non-hazardous. Due to the significant weight of some containers, MW is reported in volume instead of weight. Details related to these facilities are contained in Chapter 3.
- **ER Project** - Sandia Corporation and DOE continued ER activities in 2001, assessing and remediating sites according to the Hazardous and Solid Waste Amendments (HSWA)

Module 4 of the Part B Operating Permit, issued by EPA in September 1993. At the end of 2001, 158 sites and areas of concern (AOC) remained to be addressed at SNL/NM. During 2001, Sandia Corporation and DOE completed 11 ER sites and removed 30 from the permit. The ER project generated 311,888 lbs (141,470 kg) of RCRA-regulated waste in 2001.

The Corrective Action Management Unit (CAMU), designed to process, store, treat, and contain waste (primarily contaminated soil) generated from ER Project site closures, operates under a 5-year authorization that expires in September 2002. Most of the waste in the CAMU is soil excavated from the Chemical Waste Landfill (CWL).

Two treatment processes will be used as needed to treat soils before they are placed in the containment cell. The first is stabilization at the CAMU Temporary Unit (TU). Cement and other additives will be mixed with soil containing metals in the TU to stabilize the metals and moisture in the soil. In June 1998, the EPA issued authorization to operate the TU for a 12-month period that begins when Sandia Corporation and DOE certifies that the TU is ready for operation. Sandia Corporation and DOE did not use the TU in 2001, but expect to use it in 2002.

The second CAMU treatment system is Low-Temperature Thermal Desorption (LTTD) Unit. It will be set up to remove certain organic compounds from some of the soils before they are placed in the containment cell. In August 1998, NMED issued a temporary authorization to operate the LTTD that will expire six months after the start of operation. Sandia Corporation and DOE did not use the LTTD in 2001, but expect to use it in 2002.

- **USTs** - USTs are regulated under the New Mexico Administrative Code (NMAC) as indicated in Appendix B. Sandia Corporation currently has three registered USTs at SNL/NM and complied with all regulatory requirements in 2001.
- **Solid Waste** - Non-hazardous solid waste is regulated under New Mexico Solid Waste Management Regulations administered by the NMED. Personnel at the Solid Waste Transfer Facility (SWTF) screen, bale, and ship non-hazardous solid waste generated from SNL/NM.

The SWIF also serves as SNL/NM's central recycling center. In 2001, the SWIF handled 2,249,271 lbs (4,958,794 kg) of solid waste and 783,824 lbs (1,728,036 kg) of cardboard, paper, newsprint, aluminum, and plastic for recycling. Additionally, 52,580 lbs (115,919 kg) of computers and electronic equipment were shredded and recycled. The SWIF processed 566,280 lbs (1,248,434 kg) of solid waste and 652,022 lbs (1,437,462 kg) of cardboard, paper, newsprint, aluminum, and plastic from cooperating agencies, including Kirtland Air Force Base (KAFB), Los Alamos National Laboratory (LANL), DOE/NNSA field offices, and Lovelace Respiratory Research Institute (LRRI).

- **Permits** - During 2001, Sandia Corporation held Part B (final) Operating Permits or authorization for five units used for hazardous waste management. Sandia Corporation operated three additional units under interim status while awaiting final permits. Two of the Part B Operating Permits will expire in 2002. In order to continue operations, Sandia Corporation and DOE are required to submit a request for renewing the permit for the HWMF on or before February 6, 2002. Sandia Corporation, DOE, and the NMED determined that the best approach was to combine the existing permits into a single comprehensive permit. During 2001, Sandia Corporation began to prepare a comprehensive Part B Operating Permit request that includes nine units used for management of RCRA-regulated hazardous and mixed waste. Eight of these units are discussed above: the HWMF, the TTF, the RMWMF, the HBWSF, the MSB, the CAMU, the TU, and the LTID at the CAMU.

The ninth unit that will be included in the comprehensive Part B Operating Permit request is the Auxiliary Hot Cell Facility (AHCF). The AHCF was built by refurbishing an existing facility. Sandia Corporation plans to use it to process waste that does not meet the waste acceptance criteria for the RMWMF or HBWSF. Sandia Corporation and DOE will request permission from NMED to use the AHCF under interim status before the final Part B Operating Permit is issued.

- **Closures** - During 2001, Sandia Corporation continued closure activities for hazardous waste management units that were operated under interim status and are no longer used as follows:

CWL - The CWL was used for hazardous waste disposal under interim status until 1985. Sandia Corporation and DOE are closing the landfill under the terms of a plan approved by NMED. During 2001, Sandia Corporation and DOE continued to excavate waste and waste constituents from the CWL and underlying soil as part of a voluntary corrective measure (VCM). Much of the excavated soil will be placed in the CAMU containment cell.

Interim Status Storage (ISS) unit - The ISS unit was used for container storage. In 2001, Sandia Corporation completed cleanup and sampling and will submit a report to NMED in early 2002.

#### 2.1.4 Federal Facility Compliance Act (FFCA)

In October 1992, Congress passed the FFCA, establishing that federal facilities are required to comply with all federal, state, and local requirements for hazardous and solid waste. Because of the limited options for treatment and disposal of MW, Sandia Corporation had stored MW on-site longer than the one-year period allowed under the state and federal hazardous waste regulations. On October 4, 1995, the NMED, the DOE, and Sandia Corporation entered into a Federal Facility Compliance Order (FFCO) for management of MW at SNL/NM. Sandia Corporation developed an inventory of MW in storage. Sandia Corporation also developed a general Site Treatment Plan (SIP), and a schedule for processing the waste.

In 2001, Sandia Corporation continued to characterize and treat MW, and to package them for shipment to permitted off-site treatment, storage, and disposal (TSD) facilities. Sandia Corporation met all milestones in the SIP.

#### 2.1.5 Atomic Energy Act (AEA)

In 1946, the AEA was passed to encourage the development and use of nuclear energy for general welfare, common defense, and security. The purpose of the AEA is to assure the proper management of nuclear materials and radioactive waste. The AEA, as amended, delegates the control of nuclear energy and nuclear materials primarily to the DOE, the NRC, and the EPA. Although federal regulations control radioactive emissions and the transport of nuclear materials, there are no federal regulations controlling radioactive waste. At SNL/NM, this authority is retained by the DOE

and is governed by DOE Orders. In 1999, DOE Order 435.1, Radioactive Waste Management, Change 1 (DOE 2001b) replaced DOE Order 5820.2A.

#### 2.1.6 Clean Air Act (CAA) and Clean Air Act Amendments (CAAA) of 1990

The objectives of the CAA and the CAAA are to protect and enhance the quality of the nation's air. The EPA is responsible for describing and regulating air pollutants from stationary and mobile sources and for setting ambient air quality standards. The City of Albuquerque locally administers these standards as well as specific air emission permits and registrations as shown in Appendix B, Table B-1.

#### Ambient Air Quality

The City of Albuquerque announces air quality alerts requesting voluntary or mandatory compliance. Yellow alerts request voluntary cooperation to limit driving and open burning. Red alerts are mandatory no-burn days and request a voluntary non-driving day. Sandia Corporation honors these notices by not performing any open burns or detonations during yellow or red alerts. In 2001, Sandia Corporation was 100 percent compliant with CAA and CAAA as determined by monitoring records at its six ambient air quality surveillance stations.

#### National Emission Standards for Hazardous Air Pollutants (NESHAP)

NESHAP regulates releases of hazardous air pollutants to the air. Subpart H of 40 CFR 61 specifically regulates radionuclide emissions, other than radon, from DOE facilities. As required by the regulation, Sandia Corporation calculates an annual dose to potentially exposed members of the public. The regulation requires that Sandia Corporation determine the maximum possible dose that could be delivered to an individual residing at a nearby location 24 hours per day. The result is the effective dose equivalent (EDE) to the maximally exposed individual (MEI). The dose is compared to the EPA standard of 10 millirem per year (mrem/yr) allowed from radioactive air emissions from a DOE facility.

In 2001, the MEI was located at a KAFB facility just north of Technical Area V (TA-V). The dose at this location was 0.003 mrem/yr. The off-site MEI was located at Tijeras Arroyo (West). The dose at this location was 0.0012 mrem/yr. Both doses are below the EPA standard. Sandia Corporation met all NESHAP compliance requirements in 2001.

#### 2.1.7 Clean Water Act (CWA)

The CWA sets forth goals to protect "Waters of the U.S." by controlling the discharge of pollutants. At SNL/NM, the CWA applies to sanitary and septic system wastewater effluents, storm water runoff, and surface water discharges. The CWA is implemented through local, state, and federal water quality standards as follows: (1) the City of Albuquerque administers sanitary sewer discharges based on federal pretreatment standards; (2) the NMED administers regulations concerning surface discharges; and (3) the EPA retains oversight over storm water discharges and mandates requirements for oil storage and secondary containment.

#### New Mexico Stream Standards

New Mexico has not been delegated authority to regulate discharges under the National Pollutant Discharge Elimination System (NPDES). However, New Mexico has enacted 20 NMAC 6.4 "Standards for Interstate and Intrastate Surface Waters" to protect the quality of surface waters in the State. Due to the hydrologic conditions at SNL/NM, Sandia Corporation does not specifically monitor for compliance with these standards. In order to determine compliance, SNL/NM compares analytical results from NPDES sampling with the stream standards. Some constituents of concern in New Mexico's Stream Standards that are not on the NPDES analyte list have been added to SNL/NM's analyte list to confirm compliance.

#### City of Albuquerque Sewer Discharge Regulations

There are five wastewater monitoring stations, or outfalls, at SNL/NM permitted by the City of Albuquerque. Four of these stations discharge directly to the City of Albuquerque public sewer and one is a categorical pretreatment station that is located upstream of the general outfalls.

There was one exceedence of permit limits in 2001. Details related to this exceedence is discussed in Section 2.4.

#### National Pollutant Discharge Elimination System (NPDES)

NPDES implements the requirements that are specific to all discharges made to "Waters of the U.S." as defined in the CWA. At SNL/NM, this is applicable to storm water runoff from any point that can drain to the Tijeras Arroyo. In 1999, five storm water samples were collected from two permitted stations. Storm water sampling was not required in 2000 or 2001. Analysis results indicated that several metals were over the benchmark values listed in the general permit.

However, results do not indicate SNL/NM operations are contributing to this condition. The small number of data points collected over the last several years (one storm water event in both 1997 and 1998) as well as the contribution of naturally-occurring metals in the sediment (total sample) indicate this result is not significant. The igneous and metamorphic rocks comprising the mountains to the east of KAFB are made up of minerals that are naturally high in metals such as magnesium, iron, zinc, and aluminum. As additional data becomes available, meaningful results will become more apparent. Section 6.3 discusses Sandia Corporation's 1999 storm water results. As stated in SNL/NM's storm water discharge permit, the next analytical samples will be collected in Fiscal Year (FY) 2002.

The EPA conducted an inspection of the Storm Water Monitoring Program at SNL/NM on June 4, 2001. The recommendations generated from this inspection are also discussed in Section 6.3.

#### Surface Water Discharge

Surface discharges made to the ground or to containment areas must be first evaluated for compliance with regulations implemented through the New Mexico Water Quality Control Commission (NMWQCC). Sandia Corporation issued 28 one-time surface discharge permits in 2001. Additionally, two evaporation lagoons in TA-IV are permitted by the NMED due to the routine nature of the discharges. The lagoons are used to contain and evaporate accumulated storm water pumped from the secondary containment areas around seven oil tanks, which support the pulsed power accelerators. All permit conditions for the two lagoons were met in 2001.

In 2001, there were four reportable surface releases that were reported as occurrences and reviewed by the Surface Discharge Program (Section 2.4).

#### 2.1.8 Safe Drinking Water Act (SDWA)

The SDWA, passed in 1974 and amended several times since, sets national drinking water standards, surface water sources, and includes a few provisions for groundwater. SDWA standards are designed to protect human health by regulating the allowable amount of chemicals, metals, radionuclides, bacteria, and other potential pollutants in potable water sources. Discharges from residential, municipal, and industrial sources are closely monitored and regulated to prevent contamination of drinking water sources. All drinking water systems in the U.S. must be

routinely tested to ensure that the water meets the EPA's National Drinking Water Standards.

The SDWA addresses the following areas:

- Threshold contaminant levels,
- Treatment techniques to remove certain contaminants, and
- Monitoring and reporting requirements.

#### Drinking Water Supply at SNL/NM

Potable water for most facilities on KAFB (including SNL/NM) is provided by the KAFB Water System. The system derives its water from deep groundwater wells (discussed in Chapter 7). KAFB's water utility operates under EPA identification number NM3567701 and serves approximately 30,000 people who live and work on KAFB. KAFB routinely samples its water for trihalomethanes, coliforms, volatile organic compounds (VOCs), gross alpha and gross beta radioactivity, and various inorganic chemicals.

Information on the KAFB Water System is located at EPA's SDWA website, which details the compliance status for all drinking water systems in the U.S.:

<http://www.epa.gov/safewater>

NOTE: Although it is KAFB's responsibility to meet regulatory monitoring and reporting requirements for potable water, SNL/NM's Industrial Hygiene Program routinely collects potable water samples in response to potable water concerns.

#### 2.1.9 Toxic Substances Control Act (TSCA)

TSCA addresses the import, export, use, and disposal of specifically listed toxic chemicals. At SNL/NM, compliance with TSCA primarily involves the handling and disposal of polychlorinated biphenyls (PCBs) and asbestos. Sandia Corporation was in full compliance with the TSCA in 2001.

Asbestos - In 2001, the HWMF shipped 131,896 lbs (59,827 kg) of asbestos waste for disposal. Asbestos waste increased in 2001 due to facility renovation projects.

PCB - In 2001, the HWMF shipped 21,290 lbs (9,657 kg) of PCB waste for disposal and 7,447 lbs (3,378 kg) of PCB waste for recycling.

### 2.1.10 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA regulates the use of pesticides and is enforced under the New Mexico State Pesticide Control Act. Sandia Corporation's Biological Control Activity includes compiling information on pesticide use at SNL/NM, including the use of herbicides for weed control, rodenticides for control of mice and other rodents, and insecticides for control of insect pests. Copies of product labels and MSDSs are maintained for all pesticide products applied at SNL/NM. Sandia Corporation contracts with commercial certified pest control agencies when applying EPA-registered pesticides. SNL/NM maintains copies of certified pest control agency credentials. Sandia Corporation was in full compliance with FIFRA in 2001.

### 2.1.11 National Environmental Policy Act (NEPA)

NEPA requires federal agencies and private entities that perform federally-sponsored projects, including DOE, to analyze potential impacts to the environment during the early planning of proposed actions. If the proposed action is determined to be environmentally "significant," the agency must prepare an environmental assessment (EA) or an environmental impact statement (EIS) before an irrevocable commitment of resources or funding occurs. Although a major objective of NEPA is to preserve the environment for future generations, the law does require an agency to select the proposed action alternative with the least environmental impacts. One of the major intents of the law is to ensure that federal agencies are aware of the potential environmental impacts associated with their operations and are able to make informed decisions based on this information. NEPA also mandates that the decision process be open for public review.

#### 2001 NEPA Documentation

During 2001, Sandia Corporation performed a total of 326 NEPA reviews, including the preparation and submission of 62 NEPA checklists for DOE/NNSA/OKSO review and determination. A total of 124 citations were made against the SNL/NM Site-Wide Environmental Impact Statement (SWEIS) (DOE 1999). Table 2-3 provides a summary of SNL/NM NEPA reviews performed in 2001. SNL/NM NEPA staff also supported DOE in the preparation of the Final Environmental Assessment for the proposed "Sandia Underground Reactor Facility (SURF) in TA-V," issued in November 2001 (DOE 2001c).

#### SWEIS Maintenance

The SWEIS analyzed SNL/NM's operations, processes, site characteristics, and potential operational impacts for 1996 and 1997 baseline conditions and for projected expanded operations of selected facilities. In 2001, the SWEIS Annual Review (AR) - FY 2000 (SNL 2001i) provided an updated summary of SNL/NM operational activities compared to the environmental analysis in the SWEIS. Preparation of the SWEIS AR will support both ongoing NEPA compliance at SNL/NM and preparation of an expected supplement analysis by DOE in 2004. Preparation of a supplement analysis is a process used to determine whether the SWEIS continues to represent the environmental impacts of SNL/NM operations, or whether a supplemental or new SWEIS should be prepared.

NEPA staff also supported preparation of 24 U.S. Air Force (USAF) Environmental Checklists (AF-813 forms) submitted for land-use permits and SNL/NM projects on KAFB property.

### 2.1.12 Endangered Species Act (ESA)

ESA applies to both the activities of private individuals and federal agencies (Section 7 of the ESA specifically applies to federal agencies). At SNL/NM, ESA compliance is coordinated with NEPA compliance reviews. The law ensures that any action authorized, funded, or carried out by a federal agency will not jeopardize the continued existence of a "threatened or endangered species," or result in adverse modifications to its habitat.

#### Wildlife

There are several state- and federally-listed threatened and endangered species that could potentially occur in Bernalillo County as shown in Table 2-4. Two state-listed, threatened species have the potential to occur on KAFB. These include the spotted bat (*Euderma maculatum*) and the gray vireo (*Vireo vicinior*). The gray vireo has been sighted in the Cibola National Forest land withdrawn area. Two state-listed species that could be transients through KAFB include the bell's vireo (*Vireo bellii*) and baird's sparrow (*Ammodramus bairdi*). There are no plant species known to occur on KAFB that are currently listed as endangered by the New Mexico Forestry and Resource Conservation Division of the New Mexico Energy, Minerals and Natural Resources Department.

**TABLE 2-3.** Summary Data for SNL/NM NEPA Reviews Performed in Calendar Year 2001

NEPA Reviews		Types	Quantity
<b>DOE NEPA</b>		DOE Checklist Submittals	62
<b>SNL/NM NEPA</b>	<b>NEPA Module Reviews</b>	SNL/NM SWEIS Citations	124
		SNL/NM 'Other' Citations <sup>1</sup>	41
		SNL/NM citing Categorical Exclusions	6
		Additional Reviews <sup>2</sup>	28
	<b>ER Project NEPA</b> <sup>3</sup>	ER Project Reviews (Total)	11
	<b>EDP</b> <sup>4</sup>	SNL/NM SWEIS Citations	18
		EA-1195 Citations	11
		Under review	1
<b>SNL/NM Reviews (Total)</b>			302
<b>Air Force (AF) NEPA</b> <sup>5</sup>		Land Use Permit Renewals	12
		Land Use Permit Terminations	1
		Other Projects	11
<b>AF-813 Submittals (Total)</b>			24
<b>GRAND TOTAL</b>	<b>(SNL/NM Reviews plus AF-813 Submittals)</b>		326

**NOTE:** <sup>1</sup>Includes citations to several existing environmental assessments (EAs) and several comprehensive National Environmental Policy Act (NEPA) checklists.

<sup>2</sup>Includes other U.S. Department of Energy (DOE) determinations such as new Site-Wide Environmental Impact Statement (SWEIS) supplement analyses, and other DOE determinations, including categorical exclusions.

<sup>3</sup>All Environmental Restoration (ER) reviews cite the ER Project EA. Projects that did not fit within the scope of the EA required preparation of a NEPA checklist. ER activity checklists were captured in the "DOE Checklist Submittals" count and in the Air Force "Other Projects" count.

<sup>4</sup>Experiment Development Plan (EDP): An electronic system used by the Full-Scale Experimental Complex to record Project information, including NEPA reviews. All EDP reviews are subsequently reviewed by the NEPA Team.

<sup>5</sup>All Air Force NEPA documents are prepared by the NEPA Team in cooperation with the project originator. SNL/NM = Sandia National Laboratories, New Mexico

**TABLE 2-4.** Threatened and Endangered Species Potentially Occurring in Bernalillo County, New Mexico

Species	Federal Status	State Status	
<b>MAMMALS</b>			
Spotted bat	<i>Euderma maculatum</i>	--	Threatened
New Mexican jumping mouse	<i>Zapus hudsonius luteus</i>	--	Threatened
<b>FISH</b>			
Rio Grande silvery minnow	<i>Hybognathus amarus</i>	Endangered	Endangered
<b>PLANTS</b>			
None listed			
<b>BIRDS</b>			
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened
Common black-hawk	<i>Buteogallus anthracinus anthracinus</i>	--	Threatened
American peregrine falcon	<i>Falco peregrinus anatum</i>	--	Threatened
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened	--
White-eared hummingbird	<i>Hylocharis leucotis borealis</i>	--	Threatened
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	Endangered
Whooping crane	<i>Grus americana</i>	Endangered	Endangered
Bell's vireo	<i>Vireo bellii</i>	--	Threatened
Gray vireo	<i>Vireo vicinior</i>	--	Threatened
Baird's sparrow	<i>Ammodramus bairdii</i>	--	Threatened
Neotropic cormorant	<i>Phalacrocorax brasilianus</i>	--	Threatened

**NOTE:** There are no listed endangered or threatened plant, reptile, or amphibian species in Bernalillo County.

The SNL/NM Environmental Information Document (EID) (SNL 1999b), a resource document for the SWEIS (DOE 1999), includes a section on biological resources. The management of sensitive species and habitat is also discussed in the SNL/NM ES&H Manual, Section 10B, "NEPA, Sensitive Species, and Historic Properties" (SNL 2002k).

#### 2.1.13 Migratory Bird Treaty Act (MBTA)

The MBTA of 1918, as amended, was established by Canada, Japan, Russia, Mexico, and the United States. The MBTA prevents the taking, possession, killing, transportation, and importation of migratory birds, their eggs, parts, and nests. Federal institutions are not exempt from the MBTA. Guidance is being developed by the U.S. Fish and Wildlife Service to assist federal institutions in interpreting the MBTA. At SNL/NM, MBTA is coordinated with NEPA compliance reviews and through Telecom work orders. In 2001, no migratory birds were relocated.

#### 2.1.14 Cultural Resources Acts

The three primary cultural resources acts applicable at SNL/NM are as follows:

- National Historic Preservation Act (NHPA)
- Archaeological Resources Protection Act (ARPA)
- American Indian Religious Freedom Act (AIRFA)

At SNL/NM, cultural resources compliance is coordinated through the NEPA Program. Actions that could adversely affect cultural resources are initially analyzed in a NEPA checklist.

Historical properties, as defined by NHPA and implementing regulations, include archaeological sites, historic buildings, and structures. Historic buildings and structures may include those over 50 years old that are historically significant, or younger structures of exceptional significance.

There are no known archaeological sites located on DOE/NNSA-owned property, although cultural and historic sites do exist in proximity to DOE/NNSA-leased property and ER sites. These areas are located both on USAF property and on portions of the Cibola National Forest land withdrawn area. Sandia Corporation's activities are usually planned to avoid potential impacts to

such archaeological sites. It is DOE's responsibility to ensure that cultural resources are not adversely impacted by DOE activities.

The EID provides information on cultural resources at KAFB (SNL 1999b). Cultural resources compliance is discussed in the SNL/NM ES&H Manual, Section 10B, "NEPA, Sensitive Species, and Historic Properties" (SNL 2002k).

#### Historical Building Assessment

In 2000, information was prepared to assist DOE in determining whether buildings in TA-I are eligible for the National Register of Historic Places as required under NHPA. There are 81 buildings in TA-I of greater than 1,000 ft<sup>2</sup> that were built or acquired before 1990. These buildings have been documented on State of New Mexico Historic Building Inventory forms. DOE will determine the eligibility of TA-I buildings to be included in the National Register in consultation with the New Mexico State Historic Preservation Officer (SHPO). To date, this consultation has not yet been completed.

#### 2.1.15 Environmental Compliance Executive Orders (EOs)

There are four EOs related to environmental compliance:

- Floodplain Management (EO 11988), as amended - This EO has minimal impact for SNL/NM, since all active SNL/NM facilities are located outside the 500-year floodplain as described by the U.S. Army Corps of Engineers (ACE) (USACE 1979). This applies to both major on-site drainages: Tijeras Arroyo and Arroyo del Coyote.
- Protection of Wetlands (EO 11990), as amended - Wetlands are areas inundated by surface or groundwater with a frequency sufficient to support a prevalence of aquatic plant and/or animal life. Wetlands generally include swamps, bogs, potholes, ponds, mudflats, and areas around natural springs. There are several natural springs on KAFB with a limited wetland setting. These springs, located on USAF property and the land withdrawn area, are managed by the USAF and the U.S. Forest Service (USFS). The springs provide an important source of drinking water for wildlife and create a unique biological niche in an otherwise arid habitat.

- Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898), as amended – To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the Report on the National Performance Review (Gore 1993), each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the U.S. and its territories and possessions. SNL/NM must include in the assessment of its operations any disproportionate impacts on minority or low-income populations within the area of influence of SNL/NM operations.
- Greening the Government Through Leadership in Environmental Management (EO 13148) – EO 13148 requires federal agencies to ensure that “all necessary actions are taken to integrate environmental accountability into agency day-to-day decision-making and long-term planning processes, across all agency missions, activities, and functions.” Among the primary agency goals is support to the development and implementation of environmental management systems, and the establishment of environmental compliance audit programs and policies “that emphasize pollution prevention as a means to both achieve and maintain environmental compliance.” Sandia Corporation is working under guidance from DOE/NNSA/OKSO towards compliance with this law.

#### 2.1.16 DOE Orders

There are six primary DOE Orders that pertain to environmental protection and management:

- DOE Order 5400.1, General Environmental Protection Program (DOE 1990);
- DOE Order 5400.5, Radiation Protection of the Public and the Environment (DOE 1993);
- DOE Order 231.1, Environment, Safety, and Health Reporting, Attachment 1, “Contractor Requirements Document” (DOE 1996);
- DOE M 231.1-1, Environment, Safety, and Health Reporting Manual, as amended by DOE Order 470.2A (DOE 2000a);
- DOE Order 435.1, Radioactive Waste Management (DOE 2001b); and
- DOE/AL Order 5400.2A, Environmental Compliance Issue Coordination (DOE 1993a).

In 2001, Sandia Corporation met all requirements stated in these DOE Orders.

#### 2.1.17 Summary of Radiological Releases

A summary of radiological releases and public dose resulting from Sandia Corporation operations is provided in Table 2-5. More detailed information is found in Chapters 5 and 6 of this report.

## 2.2 CURRENT COMPLIANCE ISSUES AND ACTIONS

Environmental issues and actions current in 2001 relating to noncompliance or corrective actions at SNL/NM are discussed below.

- MW Management – Although Sandia Corporation is in compliance with the FFCO, MW is stored at SNL/NM for more than one year in violation of the hazardous waste land disposal restrictions specified in state and federal regulations. The FFCO acknowledges the lack of permitted treatment and disposal capacity for MW and allows such wastes to be stored for more than one year. During 2001, Sandia Corporation continued to process MW in compliance with the schedule and plan developed under the FFCO. However, it will be several years before Sandia Corporation is able to process all of the wastes stored on-site. Table B-3 in Appendix B details the history of Sandia Corporation’s MW compliance.
- Ozone (Smog) Issue – On October 1999, a 1-hour ozone standard was proposed to ensure that the public receives continued health protection from ground-level ozone. On July 5, 2000, the EPA officially reinstated its 1-hour ozone standard in nearly 3,000 counties across the U.S. Ambient ozone at SNL/NM has been continuously monitored since 1995.
- Particulate Matter (PM) (Soot) Issue – A new standard was developed for PM in 1998 to include particulates with a diameter less than or equal to 2.5  $\mu\text{m}$  ( $\text{PM}_{2.5}$ ). A proposed annual  $\text{PM}_{2.5}$  standard of 15  $\mu\text{g}/\text{m}^3$  and a 24-hour standard of 65  $\mu\text{g}/\text{m}^3$  were established. SNL/NM plans to monitor for  $\text{PM}_{2.5}$  during 2002.

**TABLE 2-5. SNL/NM Radiological Dose Reporting for Calendar Year 2001**

Pathway	Dose to MEI		% of DOE 100 mrem/yr Limit	Estimated Population Dose (80 km radius)		Population within 80 km radius of site	Estimated Background Radiation Population Dose	
	mrem	mSv		Person-rem	Person-Sv		Person-rem	Person-Sv
Air	3E-3	3E-5	0.03%	3.7E-1	3.7E-3	698,691	-	-
Water	0	0	0	0	0	0	-	-
Other Pathways	0	0	0	0	0	0	-	-
All Pathways	3E-3	3E-5	0.03%	3.7E-1	3.7E-3	698,691	2.5E5	2.5E3

Radiological Atmospheric Releases for 2001 (in Curies)											
Tritium	Kr <sup>85</sup>	Noble Gases (t <sub>1/2</sub> <40 days)	Fission and Activation Products (t <sub>1/2</sub> <3 hr)	Fission & Activation Products (t <sub>1/2</sub> >3 hr)	Total Radio-iodine	Total Radio-strontium	Total U	Pu	Other Actinides	Other	
4.5	0	16.2	7.6E-4	3.9E-7	0	3.8E-7	1.1E-6	1E-13	9.7E-6	1.1E-4	

Liquid Effluent Releases of Radioactive Material for 2001						
Tritium	Fission and Activation Products (t <sub>1/2</sub> <3 hr)	Fission & Activation Products (t <sub>1/2</sub> >3 hr)	Total Radio-iodine	Total Radio-strontium	Total U	Pu
0	0	0	0	0	0	0

**NOTE:** mrem = millirem  
mSv = millisievert  
DOE = U.S. Department of Energy  
MEI = maximally exposed individual

- U.S. Supreme Court Rules in Ozone and PM Case – The U.S. Supreme Court on February 27, 2001, unanimously upheld the constitutionality of the CAA as EPA had interpreted it in setting health-protective air quality standards for ground-level ozone and particles. The EPA set those standards in 1997 to better protect the public from the wide variety of health problems that air pollution can cause. The Supreme Court also reaffirmed EPA's long-standing interpretation that it must set these standards based solely on public health considerations without consideration of costs.

### 2.3 2001 AUDITS AND APPRAISALS

Operations at SNL/NM are routinely subjected to audits by external regulatory agencies including the DOE. Sandia Corporation also conducts its own self-assessments and appraisals. Audits identify issues that may be positive or negative in nature. Addressing negative issues resulting from audits and appraisals is the responsibility of each program area. The ES&H Manual provides requirements for addressing and tracking corrective actions (SNL 2002). Audits and appraisals

conducted by external agencies in 2001 are listed in Table 2-6.

### 2.4 2001 RELEASES AND ENVIRONMENTAL OCCURRENCES

An occurrence is defined as a problem, concern, failure, malfunction, or a deficiency in equipment, process, procedure, or program. It is also any condition or event that adversely affects, or may adversely affect, DOE or contractor personnel, the public, property, the environment, or the DOE's mission, security, or operations. Environmental occurrences that occurred in 2001 are described in Section 2.4.2.

#### 2.4.1 Occurrence Tracking

Occurrence reporting is tracked by the ES&H Safety and Security Reporting, Feedback, and Information Management Department. All occurrences at SNL/NM are entered into the CRPS database, which tracks corrective actions and closeouts. Final responsibility for completing corrective actions rests with each affected organization. Table 2-7 presents a five-year history of occurrence reporting status for SNL/NM.

**TABLE 2-6.** Environmental Program Audits and Appraisals Conducted in 2001

Appraising Agency	Title	Date	Summary
<b>External Audits, Appraisals, and Assessments</b>			
EPA/NMED	Multi-Media audit	June - August 2001	Multi-media environmental assessment focused on waste, air, water, and PCBs
DOE/NNSA/OKSO	Contractor Performance Assessment Program	September 2001	Appraisals of ISMS, worker safety, cross-cutting functions, environmental/public protection, nuclear explosives safety. There were 8 Findings, 10 Noteworthy Practices, and 11 Observations.
Lockheed Martin Corporation (LMC)	SNL/NM Nuclear Safety Programs	September 2001	LMC personnel reviewed programs associated with nuclear safety including QA, Nuclear Operations, Radiation Protection, Internal Audits, PAAA, and RMWMF
URS Corporation	Meteorological Towers	November 2001	An independent assessment of the meteorological towers operated by the Environmental Management Department in support of the air quality and emergency management programs.
<b>Inspections and Observations</b>			
City of Albuquerque	Follow-up to First Annual Air Quality Inspection and EPA Method 9 Visual Determination of Opacity	February 2001	Inspected Standby Power Plant Building 862 and its four standby diesel generators.
<b>Sampling and Inspections</b>			
City of Albuquerque	Wastewater sampling	March 2000	Collected routine samples at five permitted wastewater discharge points
City of Albuquerque	Routine Wastewater Inspection	April 2001	Routine inspection of wastewater discharge subject to permit 2069 G
City of Albuquerque	Routine Wastewater Inspection	May 2001	Routine inspection of wastewater discharge subject to permit 2069 K
City of Albuquerque/ NMED	Routine Wastewater Inspection	June 2001	Routine inspection of wastewater discharge subject to permit 2069 A, 2069 F, 2069 G, 2069 I, 2069 K. NMED also obtained samples for radiological analysis at 2069 K.

**NOTE:** DOE = U.S. Department of Energy  
 OKSO = Office of Kirtland Site Operations  
 ISMS = Integrated Safety Management System  
 PAAA = Price-Anderson Amendments Act  
 RMWMF = Radioactive and Mixed Waste Management Facility

NNSA = National Nuclear Security Administration  
 EPA = U.S. Environmental Protection Agency  
 NMED = New Mexico Environment Department  
 PCB = polychlorinated biphenyl  
 QA = quality assurance

**TABLE 2-7.** Summary of Environmental Occurrences at SNL/NM in the Past Five Years

Year	Waste Management	Surface Discharge or Water Quality	Air Quality	Other	Total Reportable Releases to the Environment
2001	1	4	0	1	6
2000	0	10 (9)	0	1	11 (10)
1999	2	4	1	1	8
1998	4	0	0	0	4
1997	7 (6)	5 (3)	1	0	13 (10)

**NOTE:** The numbers in parentheses for 1997 and 2000 represent the incidences for which an occurrence report was prepared.

Information on the CRPS can also be found at the following website:

<http://tis.eh.doe.gov/ceaf/crps.html>

DOE Order 232.1A, Occurrence Reporting and Processing of Operations Information (DOE 1997), establishes a DOE system for identification, categorization, notification, analysis, reporting, follow-up, and closeout of occurrences. The DOE notifies appropriate agencies based on the nature of each occurrence.

#### Occurrence Categories

There are three types of environmental occurrences that are determined by the severity of the event as described on page 2-17. All significant releases in the first two categories are reportable to outside state and federal agencies and the DOE immediately upon occurrence categorization. An occurrence can also be incurred as the result of an audit finding or other break in permit compliance and/or official agreement.

#### ES&H Occurrence Reporting Guidance

An internal guidance agreement from DOE/NNSA/OKSO for categorizing occurrence reporting (in addition to environmental categories) was recently updated to include: (1) electrical shocks, (2) suspicious packages, (3) near-miss occurrences, (4) unauthorized firearm discharge, and (5) sealed source accountability limits. The ES&H Manual, Chapter 18, "Reporting, Investigating and Correcting ES&H Events," was updated in May 2000 to improve guidance for determining what constitutes an occurrence and the proper reporting procedures (SNL 2000a).

#### Emergency Preparedness at SNL/NM

Sandia Corporation's notification and communication procedures are given in the SNL/NM Emergency Plan (SNL 2002j). The plan also describes SNL/NM's major facilities, hazards, and potential chemical releases. In addition to Sandia Corporation and the DOE, the plan is distributed to the City of Albuquerque emergency response officials, the State of New Mexico Department of Public Safety, the KAFB Fire Department, and other KAFB officials. DOE Order 151.1A, Comprehensive Emergency Management System (DOE 2000), provides the requirements for the SNL/NM Emergency Plan (SNL 2002j).

#### 2.4.2 2001 Occurrences

There were six reportable environmental occurrences at SNL/NM in 2001:

- (1) Cooling tower sludge discharged to storm drain - On March 3, 2001, SNL/NM maintenance personnel were cleaning a cooling tower sump, and were pumping sludge and water from the sump into a truck mounted holding tank. The holding tank overflowed, discharging sludge and water to the concrete drive in the area of the loading dock. Most of the discharged material pooled on the concrete drive, but a small quantity (approximately ten gallons) entered a storm drain inlet located at the edge of the concrete drive. On March 5, SNL/NM personnel cleaned up the dried material on the drive, and DOE verbally reported the release to NMED. DOE also provided 7-day and 15-day reports to NMED as required in 20 NMAC 6.2.

#### Emergency Preparedness at SNL/NM

Emergency planning notification, as required by EPCRA, facilitates emergency response and preparedness capabilities through better coordination and planning with state and local authorities.

Sandia Corporation conducts routine emergency drills and an annual full-scale exercise to simulate events such as a release or event with off-site impacts. These events are conducted through the Emergency Operations Center (EOC) and may involve full participation from the KAFB Fire Department, hazardous materials teams, and local hospitals.

Emergency exercises test Sandia Corporation's ability to quickly coordinate a response and function efficiently with other emergency response agencies. Of key importance is the ability to quickly characterize the level of emergency and to make proper notifications to DOE, city, state, and Indian Pueblo authorities in a timely manner. The ability to disseminate accurate and timely news reports to local media are handled by the Joint Information Center.

<b>Environmental Occurrence Categories</b>	<b>Category Description</b>
<b>Emergency Occurrence</b>	An "Emergency Occurrence" describes any actual or potential release of material that would put communities or the environment in great harm. There are three levels of emergency occurrences—Alert, Site Area, and General Emergency. A General Emergency is a release that goes beyond DOE/NNSA/OKSO-owned property or is a very significant on-site event. All state and federal agencies would be immediately contacted after the occurrence was categorized. There has never been an "Emergency Occurrence" of any level at SNL/NM.
<b>Unusual Occurrence</b>	An "Unusual Occurrence" includes CERCLA RQ releases and other more significant events based on quantities released or damage incurred. All releases in this category are reported to outside state or federal agencies and DOE. DOE must be notified as soon as practical, but within two hours of occurrence categorization.
<b>Off-Normal Occurrence</b>	An "Off-Normal Occurrence" is an unplanned release that adversely affects the environment. An occurrence in this category does not exceed federal limits, involve personal injury, or result from the violation of safety and operational rules. Almost all historical occurrences at SNL/NM fall into this category.

**NOTE:** RQ = reportable quantity  
 DOE = U.S. Department of Energy  
 NNSA = National Nuclear Security Administration  
 OKSO = Office of Kirtland Site Operations  
 SNL/NM = Sandia National Laboratories, New Mexico  
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

- (2) VOCs poured down drain - On March 21, 2001, personnel at the SNL/NM Environmental Restoration Chemical Laboratory (ERCL) discovered that two people had been disposing of excess solutions containing VOCs by pouring them down the drain. Such disposal is prohibited by SNL/NM internal policy and by the conditions of SNL/NM wastewater discharge permit 2069K-3. DOE notified the City of Albuquerque on March 23, 2001. ERCL personnel have reviewed the appropriate chemical waste disposal requirements and use of waste receptacles per SNL/NM requirements.
- (3) 12" Water Line Break at Wyoming and H Avenue - On May 17, 2001, a large volume of water was observed flowing south on Wyoming Boulevard. An estimated 13,000 gallons per minute flowed for about 30 minutes for a total discharge of approximately 400,000 gallons. Reporting was delayed due to uncertainty concerning ownership of the utilities in the area. The discharge was reported to NMED.
- (4) Road Grading of Closed Road - On September 6, 2001, a portion of the road at the end of No Sweat Boulevard that had been closed for restoration was graded by SNL/NM Facilities Management & Operations Center (FMOC) Structural and Grounds Services Department at the request of the Coyote Test Field (CTF) Management to allow personnel expedited access to the Cable Site Anchor location. The following interim corrective actions have been put in place until the root cause analysis and formal corrective actions are complete: The FMOC has highlighted a map of roads that are graded on a routine maintenance schedule. This map has been provided to DOE/NNSA/OKSO for concurrence. The FMOC will not grade any roads unless they are identified on that map. Any request for grading on other roads will be reviewed through the standard FMOC process.

- (5) Transfer Case Hose - On September 20, 2001, SNL/NM personnel were working on the transfer case on a tractor when a mouse hopped out of the engine housing and surprised them. They stopped work, notified the pest control team, and awaited arrival of pest control. When the team did not arrive by the end of the workday, the mechanics left work without checking to see if hoses were secure. After hours, a hose fitting came loose, a hose dropped to the pavement, and diesel fuel leaked out due to gravity siphon. Three to five gallons of diesel fuel oil dripped slowly out onto the pavement. The fuel was contained that night. A small amount possibly entered the storm drain inlet.
- (6) Loss of Hazardous Waste Container - On November 21, 2001, SNL/NM manifested a shipment of hazardous waste to ENSCO, a hazardous waste treatment facility located in El Dorado, Arkansas. Rinchem Company Inc., the transporter of the waste, took this shipment to its Albuquerque facility for temporary storage. The shipment consisted of 33 containers of hazardous waste exhibiting the characteristics of ignitability, reactivity and/or corrosivity. On November 27, 2001, when the SNL/NM shipment was being loaded for transport, Rinchem Company Inc. discovered that one container was missing. The container in question was determined to be a five gallon plastic pail that contained an absorbent and a piece of coal weighing less than 0.1 lbs potentially contaminated with copper, aluminum, carbon, and plastic.

## 2.5 SUMMARY OF REPORTING REQUIREMENTS

External reporting requirements (other than to the DOE) are necessary for both non-routine and routine releases of pollutants or hazardous substances. Release information may be used to evaluate facility operation compliance, waste handling activities, and emergency response programs. Table 2-8 summarizes the three primary reporting requirements for releases applicable to SNL/NM.

## 2.6 SUMMARY OF ENVIRONMENTAL PERMITS

Table B-1 in Appendix B lists all environmental permits and registrations that were in effect in 2001. This includes permit applications that are pending and are under review by various agencies. There were no permit standard exceedences or violations in 2001.

## 2.7 ENVIRONMENTAL PERFORMANCE MEASURES

Environmental progress at SNL/NM is tracked through performance measures and indicators, including annual summaries, such as this report.

Environmental performance is also tracked through the National Nuclear Security Administration FY01 Multi-Program Laboratory Appraisal of Sandia National Laboratories (NNSA 2001) and FY01 DOE/SNL Annual Appraisal Agreement (DOE/SNL 2001). Through this process, performance measures are developed and tracked on a quarterly and annual basis. As part of laboratory operations support, performance measures were included for the following areas of ES&H and ER/WM:

- Integrated Safety Management System (ISMS)
- Comparison of Injury and Illness Rates and Lost Workday Case Rates
- Radiation Exposures and Radiological Operations
- Environmental Compliance
- Price Anderson Amendments Act
- Occurrence Reporting
- ER Site Closure
- Treatment and Disposal of Legacy Waste
- Treatment and Disposal of Newly Generated Waste
- Preventing Pollution and Conserving Resources

The FY 2001 DOE/NNSA Multi-Program Laboratory Appraisal report indicated that, "Overall performance in operations and administration support was outstanding" (NNSA 2001).

In addition, Sandia Corporation continued exploring the enhancement of the ISMS to incorporate Environmental Management Systems (EMSs) in FY 2001.

**TABLE 2-8.** Summary of Sandia Corporation's Reporting Requirements to Outside Agencies (Other than the DOE) for Releases of Pollutants or Hazardous Substances

Report Title	Description	Agency
Annual NESHAP Dose Assessment Report	A dose assessment of the calculated effective dose equivalent (EDE) to the maximally exposed individual (MEI) is based on the assumption that an exposed individual resides 24 hours per day at an area of highest incident radiation. Dose assessment is discussed in Section 5.4 of this report.	EPA 40 CFR 61, Subpart H
Reportable Quantity (RQ) Accidental Release Reporting	RQ release reporting is required by CERCLA and SARA Title III, or EPCRA NRC. CERCLA and EPCRA are discussed in Section 2.1.1 and 2.1.2 of this report. There were no RQ releases at SNL/NM in 2000.	NRC 40 CFR 302
Toxic Release Inventory (TRI) Report	EPCRA, Section 313, requires a TRI report to be filed by facilities conducting specifically listed industrial activities and using listed toxic chemicals. As discussed in Section 2.1.2, Sandia Corporation is not currently required to submit a TRI report because its chemical use is below the reporting threshold.	EPA 40 CFR 372, Subpart B
Notification of Discharge	NMED requires reporting of oil or other water contaminate, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or use of the property shall make oral notification as soon as possible after learning of such a discharge, but in no event more than 24 hours thereafter to the Chief of the Ground Water Protection and Remediation Bureau. Within one week, the owner and/or operator shall send written notification to the Chief of the Bureau verifying the prior oral notification. Within 15 days, the owner and/or operator shall send written notification to the Chief of the Bureau describing any corrective actions taken and/or to be taken relative to the discharge.	NMED 20 NMAC 6.2.1203
Accidental Slug Discharge Notification	The City of Albuquerque requires immediate notification to the Wastewater Utility Division of any accidental/slug discharge that may cause potential problems for the POTW. Within five days following such occurrence, the user is required to provide the Industrial Waste Engineer with a detailed written report describing the cause of the dangerous discharge and measures to be taken to prevent similar future occurrences.	City of Albuquerque Ordinance § 6-3-5

**NOTE:** NESHAP = National Emission Standards for Hazardous Air Pollutants  
NRC = U.S. National Response Center  
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act  
SARA = Superfund Amendments and Reauthorization Act  
EPCRA = Emergency Planning and Community Right-to-Know Act  
EPA = U.S. Environmental Protection Agency  
CFR = Code of Federal Regulations  
POTW = Publicly-Owned Treatment Works

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Chapter 3

# Environmental Programs Information

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## Chapter Summary

Sandia National Laboratories, New Mexico (SNL/NM) began environmental monitoring in 1959. Since then, SNL/NM established programs in Environmental Restoration (ER), Waste Management, Biological Control, Pollution Prevention (P2), Oil Storage and Spill Control, the National Environmental Policy Act (NEPA), and Environmental Education Outreach. There are also a variety of surveillance and effluent monitoring programs that are discussed in subsequent chapters of this report.

Sandia Corporation continued forward with many environmental initiatives and accomplishments. The ER Program, with recycling initiatives in place, actively remediated eight sites in 2001. In anticipation of the closure of the ER Program in 2009, Sandia Corporation and the U.S. Department of Energy (DOE) completed a Long-Term Environmental Stewardship (LTES) Plan to address future environmental responsibilities.

The NEPA Program streamlined the review process with the introduction of the Integrated Safety Management System (ISMS) Software.

### Environmental Snapshot



- *The Environmental Education Outreach Program participated in 11 events in 2001.*
- *Fleet Services eliminated the use of hazardous solvents by utilizing citrus cleaners.*
- *SNL/NM was a primary partner in KOB-TV's "Waste to Warmth" Project.*

Waste Management handled 11,219 individual items, many of which were recycled, at the Hazardous Waste Management Facility (HWMF). Sandia Corporation has been recognized for various P2 awards including the EPA "2001 Waste-Wise Federal Partner Award."



SNL/NM personnel participate in Environmental Education Outreach Program activities.

Environmental programs at SNL/NM are in place to protect the environment, safety, and health (ES&H) of its employees and the community. Sandia Corporation has established and implemented environmental management programs to meet or exceed the requirements of federal, state, and local environmental regulations. DOE Orders and executive orders (EOs) also serve to guide program criteria.

Environmental program areas covered in this chapter include:

- ER Project
- Hazardous and Chemical Waste Management
- Radioactive and Mixed Low-level Waste (MLLW) Management
- Solid Waste Management
- Biological Control Activity
- P2 Program
- Oil Storage and Spill Control
- NEPA Program
- Environmental Education Outreach

Effluent and surveillance monitoring activities are discussed in Chapters 4, 5, 6, and 7.

### **Commitment to Health and the Environment**

It is the DOE, National Nuclear Security Administration (NNSA), Office of Kirtland Site Operations (OKSO) and Sandia Corporation's policy to minimize risks to the public and the environment to "as low as reasonably achievable" (ALARA) levels. For example, Sandia Corporation often exceeds regulatory requirements through Best Management Practices (BMPs) and P2 measures implemented on a corporate-wide basis.

### **Environmental Monitoring History at SNL/NM**

Environmental monitoring began at SNL/NM in 1959, at which time the principal objective was to monitor radioactive effluents and determine any associated environmental impacts. Since then, environmental programs, along with other ES&H activities, have greatly expanded at SNL/NM.

## **3.1 ER PROJECT**

Sandia Corporation's ER Project was created under the DOE/NNSA Office of Environmental Restoration and Waste Management (ER/WM) to identify, assess, and remediate sites potentially

contaminated by past spill, release, and disposal activities.

The DOE/NNSA/OKSO has oversight of Sandia Corporation's ER Project, which is administered under four departments within the Geoscience and Environment Center:

- ER Project Office,
- ER for Tech Areas and Miscellaneous Sites,
- ER for Landfills and Test Areas, and
- Site Closures.

### **3.1.1 Regulations**

The remediation and cleanup of areas of past contamination at SNL/NM are regulated by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984. HSWA requirements apply to ER sites, or Solid Waste Management Units (SWMUs) at SNL/NM. A SWMU is any unit "from which hazardous constituents might migrate, irrespective of whether the units were intended for the management of solid and or hazardous waste" (EPA 1985). Specific requirements for SWMUs are described in Module 4 of Sandia Corporation's RCRA Part B Operating Permit. SWMUs that must be addressed are listed in the RCRA Part B Operating Permit.

There are some additional sites at SNL/NM not regulated as SWMUs (primarily closed-out septic systems) that are also under ER investigation. These sites were not identified at the time of issuance of Module 4 of the RCRA Part B Operating Permit; they are being investigated and addressed in the same manner as if they were listed on the permit.

#### **ER Project Awards and Commendations**

*All performance measures were completed on or ahead of schedule and received the highest rating of "Outstanding" by the DOE and Sandia Corporation appraisal system (DOE/SNL 2001). This was the seventh year in a row (ending FY 2001) that the ER Project has received this rating; a very noteworthy achievement for Sandia Corporation. In addition, the ER Project received the "Green Zia Environmental Excellence Award" from the NMED.*



SNL/NM personnel sorting debris in a tent building at the Chemical Waste Landfill.

The ongoing voluntary corrective measure (VCM) (excavation) at the Chemical Waste Landfill (CWL) is being conducted as part of the ER program. As discussed in Section 2.1.3, the CWL was operated under interim status for hazardous waste disposal and is undergoing closure.

### 3.1.2 Cleanup and Site Closures

Waste generated from SNL/NM ER sites include radioactive low-level waste (LLW), MLLW, and RCRA-hazardous waste, Toxic Substances Control Act (TSCA) waste (primarily polychlorinated biphenyls [PCBs] and some asbestos), and industrial solid waste. Radioactive and MLLW generated by the ER Project is handled by the Radioactive and Mixed Waste Management Facility (RMWMF). RCRA-regulated hazardous waste and TSCA-regulated waste is handled by the HWMF. Other solid waste is disposed of directly to local landfills, such as the KAFB Landfill and the Tarrant County Landfill, just east of Albuquerque. The waste management section in this chapter shows the waste volumes generated by the ER Project.

### No Further Action (NFA) Status

Many ER sites were proposed for NFA based on insignificant contamination present or after remediation had already been completed. At SNL/NM, remediation is accomplished through VCMs or Voluntary Corrective Actions (VCAs). Once the New Mexico Environment Department (NMED) grants NFA status, the site is removed from the RCRA permit, although responsibility for any future actions, should they become necessary, remain with the site owner. The appropriate land-use category (i.e., industrial use) is used as part of the input for calculating the remaining risks to

human health and the ecosystem. This method is used to ensure these calculated risks are small enough to warrant NFA status, if any residual contamination remains.

Table 3-1 shows the ER Project status since 1992. Sandia Corporation continues to actively pursue the closure of proposed NFA sites by working with the NMED to provide adequate and/or further verification, as requested, for a successful determination.

### 3.1.3 2001 Status and Activities

At the close of 2001, there were 158 regulated ER sites remaining on Sandia Corporation's RCRA Part B Operating Permit and eight sites were being actively remediated at SNL/NM. During 2001, a Class III Permit modification and request proposed removal of 30 sites from the permit. Approval was granted by NMED on November 2001. In 2002, the ER Project expects to remove approximately 10 sites from the permit, as well as to propose three more sites for NFA status. All NFA proposals (Class III Permit modifications) are available for review at the University of New Mexico (UNM) Zimmerman Library.

### ER Project History

The initial identification of ER sites at SNL/NM was completed in 1987. At that time, 117 sites under Sandia Corporation's jurisdiction were identified in the initial *Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment* (DOE 1987). By 1992, the year Sandia Corporation's ER Project was initiated, a total of 172 sites were identified. By the end of FY 1992, the number of identified sites reached 219. These included SNL/NM-operated sites in other locations such as California, Nevada, and Hawaii.

Between 1992 and 1998, a total of 500 individual sites, potential sites, or individual historical activities had been identified for investigation. Many of these sites were confirmed to contain little or no contamination of regulatory concern.

In 1992, the ER Project at SNL/NM was officially initiated to implement assessment and remediation activities for sites that had been contaminated or potentially contaminated because of Sandia Corporation's past operations. In addition to the SNL/NM site, other sites included in the original scope of Sandia Corporation's ER Project were Sandia National Laboratories, Livermore, California (SNL/CA), the Kauai Test Facility (KTF), and the Tonopah Test Range (TTR). There

### Project Highlights

Of the eight sites undergoing remediation in 2001, the following two sites are highlighted:

- **Classified Waste Landfill (ER Site 2)** – The Classified Waste Landfill contained waste that is classified based on its shape or components. Contaminants of concern at this landfill included radionuclides, metals, and volatile organic compounds (VOCs). Cleanup at the landfill began in March 1998; two years later, in February 2000, excavation was completed (four and a half months ahead of schedule). Approximately 50,000 yd<sup>3</sup> of soil were excavated, more than 600 tons of scrap objects were removed, and more than 175 tons of materials have been recycled. Final work to complete this project includes waste sorting/segregation, demilitarization, recycling, waste management, confirmatory soil sampling, and revegetation. Final closure is expected in FY 2003.
- **CWL (ER Site 74)** – The CWL is the most significant cleanup project remaining to be completed by the ER Project. Excavation at the CWL began in September 1998 and was completed to 12 feet in June 2001. Some areas will be excavated deeper depending on the presence of debris and/or contaminated soil.

In 2001, approximately 45,000 yd<sup>3</sup> of soil were excavated. Additionally, over 2,000 intact chemical containers and over 350 unbreached compressed gas cylinders were exhumed and managed. Final work to complete this project includes waste management, defining the nature and extent of residual contamination, closure of the site operational boundary, backfilling, and revegetation.

In August 1998, the Vapor Extraction Project (VEP) at the CWL was completed. This system was emplaced in three existing monitoring wells and several boreholes to remove VOCs from the vadose zone. Approximately 5,000 lbs of VOCs were removed from the soil over the course of the project. Prior to vapor extraction, groundwater results showed trichloroethene (TCE) in groundwater samples at about four times the regulatory standard of 5 µg/L in some wells. Based on nine quarterly sampling events after vapor extraction, no VOCs have been detected in the groundwater above the drinking water standards in any CWL monitoring well, demonstrating the success of the program. FY 2001 groundwater results for the CWL are presented in Section 7.2.2 of this report.

TABLE 3-1. Summary of ER Project Status

Year	A Total ER Sites at Start of FY	B ER Sites Proposed for NFA in FY	C Sites Approved for NFA in FY	D Corrective Actions Completed by End of FY	E New ER Sites Identified During FY	F ** Total ER Sites at End of FY
2001	87	7	0	4	71	158
2000	146	10	64	10	5	87
1999	146	4	0	20	0	146
1998	146	16	0	0	0	146
1997	153	30	7	4	0	146
1996	155	35	2	29	0	153
1995	191	61	36	34	0	155
1994	219	48	28	3	0	191
1993	219	0	0	0	0	219
1992	172	0	0	0	47	219

NOTE: FY = Fiscal Year

ER = environmental restoration

NFA = No Further Action

\*The "new" sites are the result of reconciliation of Sandia Corporation and U.S. Department of Energy (DOE) records with the New Mexico Environment Department (NMED) tabulations, as well as inclusion of areas of concern, which the NMED consider to be qualified to be on the permit (i.e., equivalent to ER sites). No truly "new" sites were identified during FY 2001.

\*\* Column totals: F = A - C + E

Some of the original 219 sites included Tonopah Test Range (TTR), Kauai Test Facility (KTF), and other off-site areas in New Mexico and internationally.

were also a number of miscellaneous sites located in other areas, both nationwide and internationally. Currently, the only ER sites remaining to be addressed are located at SNL/NM. All other sites have been closed out or transferred to other agencies. All ER sites at SNL/NM are scheduled for completion in 2009 with LTES to follow. This date, however, may be subject to change based on available funding.

#### **Corrective Action Management Unit (CAMU)**

The CAMU is permitted under RCRA as a storage, treatment, and containment facility for the management of remediation waste generated by ER Project activities.

The CAMU contains a number of areas and facilities for the management of hazardous waste materials that include a bulk waste staging area (BWSA), four temporary tent-like buildings called Sprung™ structures, a containerized waste staging area, a waste treatment area, a treated waste staging area, and a containment cell designed to hold approximately one million cubic feet (37,000 yd<sup>3</sup>) of waste material.

Drainage within the CAMU boundaries is routed to a series of storm water retention ponds to prevent uncontrolled runoff. The storm water retention ponds are designed to accommodate a 25-year, 24-hour storm event. During Calendar Year (CY) 2001, approximately 560,000 gallons of storm water was sampled, analyzed, and discharged from the CAMU in compliance with NMED regulations and permit requirements.

In 2001, inflatable covers were installed in each of the six bays of the BWSA. These covers have improved the operational efficiency and safety of BWSA activities and provide increased environmental protection for the soil staged at the CAMU.

Originally, the CAMU was designed to accept only hazardous waste, which includes soil VOCs, semi-volatile organic compounds (SVOCs), and heavy metals. The waste acceptance criteria for the CAMU was revised to accept low-concentration tritium-contaminated soils beginning in November 1999 and PCB-contaminated soils beginning in May 2000.

It is anticipated that all of the remediation waste to be accepted into the CAMU will come from the excavation of the CWL. In FY 2001, approximately 530,000 ft<sup>3</sup> of soil was sent to the



*View of the CAMU Bulk Waste Storage Area*

CAMU and a cumulative total of approximately 800,000 ft<sup>3</sup> of soil is currently being managed. In addition, approximately 1600 ft<sup>3</sup> of contaminated debris is temporarily staged in roll-off bins in the waste staging area.

Current plans are for soil contaminated with VOCs and SVOCs to be treated at the CAMU by low temperature thermal desorption (LTTD). Soil contaminated with heavy metals will be stabilized in a pug mill using a cement-based mixture. Both LTTD-treated and stabilized soil that meet permit-specific treatment criteria will be placed in the containment cell, which contains leak detection monitors and a leachate collection and removal system. Any treated waste that does not meet permit criteria will be disposed of at off-site permitted facilities. Once closed, the containment cell will be capped and subject to long-term monitoring for approximately 30 years.

#### **LTES Plan**

In 2001, Sandia Corporation and DOE completed a LTES Plan to address residual contamination that will remain at some ER sites after remediation, and submitted the plan to DOE, Headquarters (HQ). Initial cost estimates have been determined through 2070, as addressed by the budgeting software. Actual stewardship responsibilities by the DOE are not limited by that date (DOE/SNL 2001a).

In 2001, other activities conducted by the ER Project included media and public events for discussion of issues related to the Mixed Waste Landfill (MWL) and other sites that will be incorporated into the LTES Plan.

## 3.2 WASTE MANAGEMENT

With hundreds of individual research laboratories, SNL/NM generates over 15,000 different waste streams. Waste at SNL/NM is processed at three facilities: the HWMF, the RMWMF, and the Solid Waste Transfer Facility (SWTF). The primary waste types handled by these waste management facilities are shown below.

### 3.2.1 HWMF Characterization

The HWMF packages, segregates, stores, and ships hazardous and chemical wastes. A lined catchment pond within the HWMF perimeter is used to contain all storm water runoff.

HWMF	RMWMF	SWTF
Hazardous & Chemical Waste	Radioactive & Mixed Waste	Non-hazardous Solid Waste
Hazardous	LLW	Sanitary
Biohazardous	MW	Recycled Paper
Chemical	Transuranic Waste (TRU)	Other Recyclables
Asbestos	TRU/MW	
PCB	Special Case	
Recyclables	Waste	

Hazardous waste is tracked from the point of generation to final disposal through meticulous documentation at each waste-handling step. Each generator at SNL/NM initiates the “cradle to grave” tracking process by preparing a waste description Disposal Request (DR) describing the quantity and type of waste requested for pickup. Generators characterize their own waste by either process knowledge or, if necessary, sampling and analysis. Each waste item received at the HWMF is labeled with a unique bar code, linking the item to the original DR. The item is also labeled with the Department of Transportation (DOT) hazard



A front view of the HWMF

class and RCRA waste code, if applicable. RCRA hazardous waste is waste that has the characteristics of ignitability, corrosivity, reactivity, or toxicity—or is otherwise listed as hazardous. An individually coded waste item typically is a bottle, plastic bag, or other small item that contains chemical materials.

All waste is reviewed at the HWMF before being placed in isolated bays according to DOT waste categories. These categories ensure that incompatible wastes are segregated. The bays are designed with a secondary containment to hold any spills and are equipped with earthquake shelving to withstand minor tremors. After sufficient quantities of items have accumulated in the bays, the items are packed into larger containers, which are also bar coded. These packages are moved to an adjacent building to await shipment to a permitted treatment, storage, and disposal (TSD) facility or recycling center. Waste is usually processed and shipped off-site within 60 days of receipt.

All applicable regulations for hazardous and chemical waste handled by the HWMF are listed in Appendix B.

### 2001 Activities at the HWMF

In 2001, a total of 11,219 individual items were handled by the HWMF. The HWMF shipped a total of 97,755 lbs (44,341 kg) of RCRA-regulated hazardous waste (including recyclable waste). Figure 3-1 summarizes waste handling operations at the HWMF over the last five years. Specific waste categories managed in 2001 are shown in Table 3-2.

### Recycling

Sandia Corporation recycles all categories of hazardous and chemical waste, where feasible. RCRA recycled waste includes various batteries, silver compounds, mercury compounds, lamps, capacitors, and toxic metals. A total of 19,592 lbs (8,887 kg) of RCRA hazardous waste and 30,821 lbs (13,980 kg) of used oil was recycled. “Other recyclable waste” includes miscellaneous recycled categories not regulated under RCRA or TSCA. This category includes various batteries, fluorescent lamps, various oils, and non-PCB ballasts, lead, and capacitors. A total of 94,891 lbs (43,042 kg) of material was recycled in this category.

### Asbestos Waste Handling

Asbestos waste is tracked through Sandia Corporation’s Asbestos Program working in tandem with the Facilities Asbestos Program. Facilities is responsible for removal of asbestos

from building demolitions or renovations and the proper packaging of all waste generated asbestos. Facilities-generated asbestos waste is stored in a building adjacent to the main HWMF compound.

At SNL/NM, the abatement of asbestos-containing equipment and building materials is ongoing. Asbestos material removal is only done if the material presents an inhalation hazard, or if the building is to be torn down or renovated. Typical asbestos-containing building materials consist of floors, ceilings, and roofing tile, certain types of insulation, and other fire retardant construction materials.

Similarly, in instances where laboratory equipment has asbestos-containing material in a non-friable form (which poses no inhalation risk), the item is allowed to remain in service or is redistributed through the property reapplication program. Typical asbestos waste generated from equipment abatement consists of fume hoods, ovens, and cable insulation. Asbestos waste from SNL/NM is disposed at a New Mexico landfill permitted to accept friable asbestos waste. In 2001, a total of 131,895 lbs (59,827 kg) of asbestos waste was generated and disposed.

### **PCB Handling**

PCBs are a class of organic chemicals that were widely used in industrial applications due to their practical physical and chemical properties. Use of PCBs included dielectric fluids (used in transformers, capacitors, etc.), hydraulic fluids, and other applications requiring stable, fire-retardant materials. Due to findings that PCBs may cause adverse health effects and because of their persistence and accumulation in the environment, the TSCA banned the manufacture of PCBs after 1978. PCB regulations, as promulgated in 40 CFR 761, include requirements specifying use, storage, marking, disposal, cleanup, decontamination, and record keeping.

Sandia Corporation has identified and replaced most PCBs and PCB-containing equipment. The largest source of regulated PCBs that remain in use at SNL/NM are capacitors contained inside fluorescent light ballasts manufactured before July 2, 1979. Other than ballasts, ten PCB regulated items remain in use or storage for reuse at SNL/NM. Eight areas of existing PCB spill contamination at SNL/NM are being actively managed through a regulatory use authorization. Significant quantities of PCB-contaminated soils were generated in 2001 as a result of an ER project at the CWL.

PCB waste is managed by HWMF personnel and stored at an adjoining storage facility. Most of the PCB-contaminated soil is generated and managed by ER and stored in two locations: the CWL and the CAMU.

In 2001, a total of 28,737 lbs (13,035 kg) of PCB waste was shipped off-site, 21,290 lbs (9,657 kg) of PCB waste for disposal, and 7,447 lbs (3,378 kg) of PCB waste for recycling. No ER-generated PCB-contaminated soil was shipped in 2001.

### **Explosive Waste**

Explosive waste generated at SNL/NM is usually managed at the point of generation until it can be shipped for treatment. SNL/NM has a permitted facility for the treatment of certain explosive waste streams; however, this facility was not used in 2001. In 2001, 862 lbs (391 kg) were sent to the Explosive Ordnance Disposal (EOD); four large rocket motors totalling 29,844 lbs (13,537 kg) were sent to Hill Air Force Base for treatment.

### **3.2.2 RMWMF Characterization**

The RMWMF, located in the southeast corner of Technical Area III (TA-III), manages LLW, MLLW, transuranic (TRU), and TRU/MLLW. No high-level radioactive waste (HLW) is generated at SNL/NM. Although Sandia Corporation operates several nuclear reactors, no spent fuel has ever been produced since the original fuel rods are still viable. Furthermore, because SNL/NM is not a power-producing utility, any spent fuel that would eventually be removed from the research reactors would not be classified as HLW.

Most radioactive and MLLW generated on-site is processed through the RMWMF. However, some waste, which is already sealed and characterized, is put directly into temporary storage areas on-site. The waste processing functions at the RMWMF include waste characterization, segregation, treatment, packaging, storage, and shipment to permitted off-site facilities.

The primary waste handling facility at the RMWMF is equipped with a main control room for monitoring activities and controlling airflow throughout the facility. Handling bays, sorting rooms, and various waste storage areas operate under negative airflow to ensure that all emissions are channeled through the facility's stack.

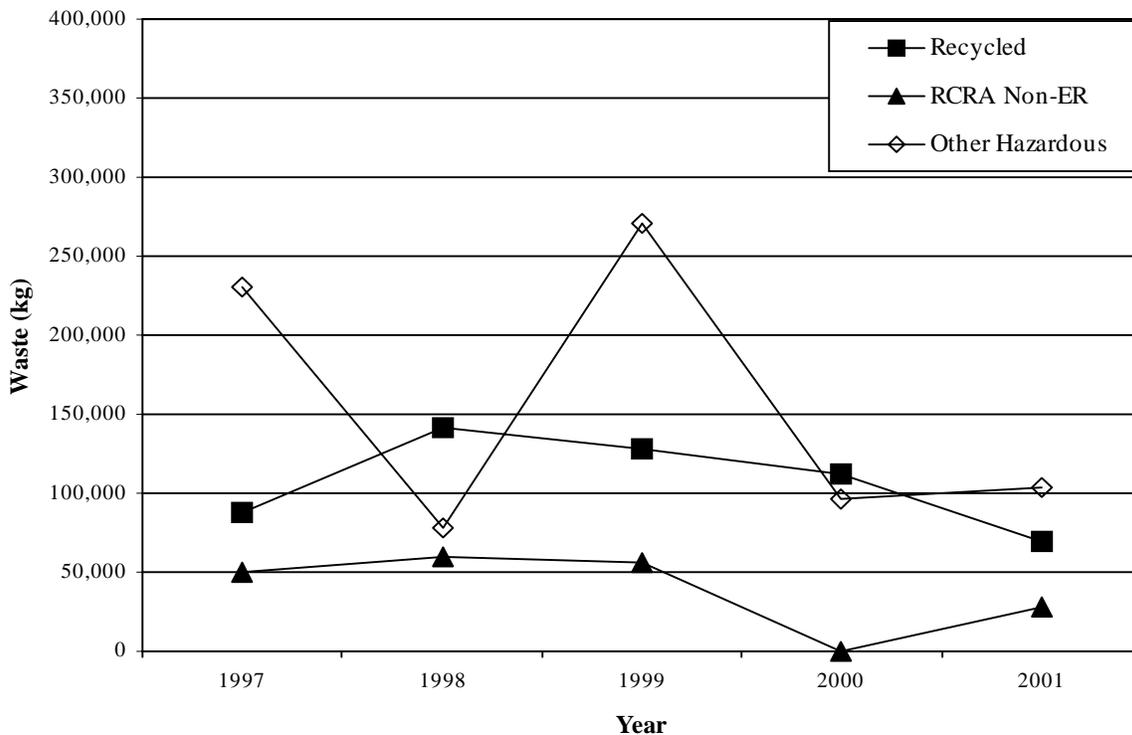


FIGURE 3-1. Five-Year Summary of Waste Shipped at the HWMF

TABLE 3-2. Waste Shipped by the HWMF in 2001

Waste Categories Handled at the HWMF	2001 Waste Shipped	
	(kg)	(lbs)
<b>RCRA Waste</b>		
Hazardous Waste	28,083	61,912
Hazardous Waste (Generated by ER Project)	7,371	16,250
Hazardous Waste (recycled)	8,887	19,592
Total	<b>44,341</b>	<b>97,755</b>
<b>TSCA</b>		
Asbestos	59,827	131,896
Polychlorinated Biphenyl (PCB)	9,657	21,290
PCB (recycled)	3,111	6,859
Total	<b>72,595</b>	<b>160,045</b>
<b>BIOHAZARDOUS</b>		
Infectious Waste	<b>338</b>	<b>745</b>
<b>OTHER</b>		
Chemical Waste	32,958	72,660
Non-hazardous Solid Waste (RCRA Subtitle D)	627	1,382
Non-RCRA (Generated by ER Project)	1,201,641	2,649,164
Used Oil (recycled)	13,980	30,821
Lead (recycled)	11,882	26,195
Other (recycled) – various batteries, fluorescent lamps, and non-PCB (ballasts, capacitors, and oils)	31,160	68,696
Total	<b>1,292,248</b>	<b>2,848,919</b>
<b>Total Waste and Recyclables Shipped</b>	<b>1,409,522</b>	<b>3,107,464</b>

NOTE: RCRA = Resource Conservation and Recovery Act  
TSCA = Toxic Substances Control Act (primarily regulates asbestos and PCBs)

Sandia Corporation has developed a comprehensive plan for all radioactive waste disposal. All radioactive and mixed waste (MW) generators must contact the Radioactive Waste Program before generating waste and obtain prior approval. This will ensure that a proper waste pathway is in place before any waste is generated. Radioactive waste is shipped off-site within a one-year time frame in accordance with DOE Orders. This is similar to the RCRA mandates for hazardous waste and MW.

Applicable DOE Orders and regulations for radioactive waste and MLLW management are listed in Appendix B.

### Radioactive Waste Storage

Presently, radioactive waste generated from SNL/NM is temporarily stored at the RMWMF, the Manzano Storage Bunkers, and the High Bay Waste Storage Facility (HBWSF) in TA-V. TRU and TRU/MW will be routed through Los Alamos National Laboratory (LANL) or directly to the Waste Isolation Pilot Plant (WIPP) for final disposal.

### Sorting at the RMWMF

RMWMF personnel sort all radioactive and MLLW that has not been fully characterized. There are four sorting levels based on the known hazards present or the level or prior characterization:

- **Level 1** - Radioactive waste that is well characterized, in a sealed container, and contains very low radiation levels. Personnel may open the container to verify the contents, but are not required to contact the waste. At this level, only coveralls, glasses, and work gloves are required for handling.
- **Level 2** - Radioactive waste that has been previously characterized and has very low radiation levels and minor chemical hazards associated with it. Extra precautions are taken as the waste may require handling to take samples or to be repackaged. Waste may be physically segregated to remove known hazardous chemical components, which would otherwise classify the waste as MLLW.
- **Level 3** - Radioactive waste that has not been fully characterized and therefore has a higher associated risk. RMWMF personnel handling this waste category wear fully-contained personal protective equipment (PPE), including respirators.

- **Level 4** - Radioactive waste with a high hazard level. The waste is either poorly characterized (e.g., some legacy waste), or is known to contain high radiation levels. All waste is contacted through a glove box; workers wear full-containment PPE.

### 2001 Activities at the RMWMF

In 2001, the RMWMF managed all four waste types (LLW, MLLW, TRU, and TRU/MW). LLW and MW was shipped to permitted off-site facilities for treatment and disposal.

In 2001, the RMWMF shipped 683,761 lbs (310,149 kg) of LLW, 117,082 lbs (53,108 kg) of MW, and 0 lbs (0 kg) of TRU waste at SNL/NM. A five-year summary of radioactive waste shipped at SNL/NM during 2001 is shown in Figure 3-2. ER waste makes up the bulk of radioactive waste managed by the RMWMF.

#### SNL/NM's Radioactive Waste

**LLW** - LLW is primarily contaminated with isotopes of strontium, plutonium, cobalt, americium, thorium, cesium, tritium, and uranium. (Plutonium and americium in LLW are below the activity level designated for TRU waste.) Sandia Corporation's LLW inventory is radioactively-contaminated soils excavated from ER sites, decontamination and demolition (D&D) debris, PPE, and laboratory waste.

**MLLW** - Generally consists of the same materials as LLW, with the addition of RCRA-hazardous components such as metals and solvents. The radioactive component in MW results primarily from tritium, cesium, strontium, plutonium, americium, and uranium.

**TRU** - May derive from sealed instrument sources, D&D waste, PPE, and laboratory waste. The radioactive component in TRU is generally americium, plutonium, neptunium, and curium.

**TRU/MLLW** - A combination of radioactive and hazardous waste as described above.

**Waste Generated by the ER Project in FY01**

LLW (Managed) = 7,609 ft<sup>3</sup>  
 MLLW (Managed) = 246 ft<sup>3</sup>  
 TRU (None generated in 2001)

**3.2.3 Mixed Waste (MW) Management Regulatory Status**

As discussed in Section 2.1.4, Sandia manages mixed wastes in compliance with the Federal Facility Compliance Order (FFCO) (SNL 2001f). The requirements include:

- Deadlines for processing and/or disposing of various types of waste, and
- Providing an annual update of activities and the current inventory of stored waste still on-site.

During CY 2001, Sandia Corporation proposed Revision 6 to the FFCO, submitted the proposal to the NMED, and is currently awaiting approval.

Sandia Corporation operates the RMWMF, the HBWSF, and the Manzano Storage Bunkers (MSB) under interim status as noted in Section 2.1.3. SNL/NM's compliance history regarding MW management is shown in Table B-3 of Appendix B.

**MW Treatment**

Table 3-3 lists the current MW categories (TG-1 to TG-20 including TRU/MW), with the preferred treatment options and the status for each category.

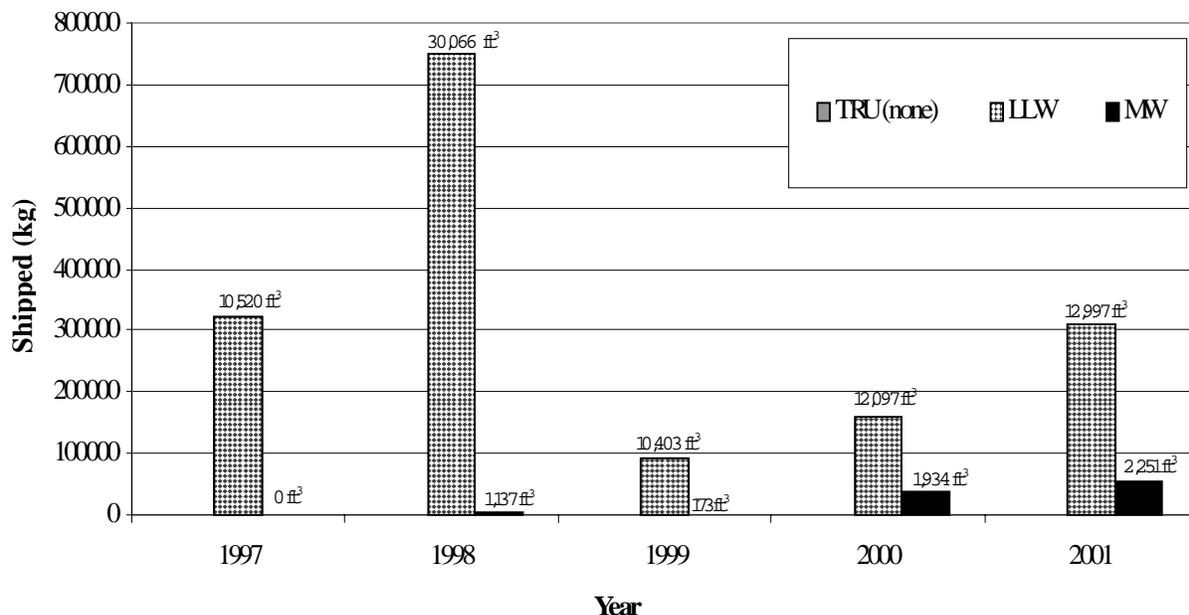
Five of the treatment technologies listed in the table are performed on-site at the RMWMF: mechanical processing (including shredding) chemical deactivation (including pH neutralization), thermal deactivation, stabilization, and macroencapsulation. These are described in the current RCRA Part B Operating Permit application (submitted to NMED in 1996). They are also included in the updated and revised application submitted to NMED in February 2002.

**Status of MW Management in 2001**

The majority of MW now being stored on-site consists of very low-level radioactive sludges from ER Project septic tank system closeouts, oils and absorbed oils, and radioactive metallic objects with RCRA metals. No off-site MW was received from other DOE sites in 2001.

**3.2.4 SWTF Characterization**

The SWTF is designed to process sanitary waste consisting primarily of office trash, recyclable paper, and cardboard. The primary purpose of the facility is to screen all solid waste generated at SNL/NM to ensure compliance with solid waste regulations. A secondary feature of the SWTF is to act as the recycling center for SNL/NM.



**NOTE:** Both mass and volume are shown since mass alone can be misleading due to the weight of the containers (e.g., a 2,000 lb container may hold less than 100 lb of waste)

**FIGURE 3-2.** Five-Year Summary of Total Radioactive Waste Shipped at SNL/NM

TABLE 3-3. Mixed Waste Treatment and Disposal Status

Waste Category	Volume (m <sup>3</sup> )	Preferred Treatment Technology	Description	Status and Plans
TG-1	0.01	Deactivation	Inorganic Debris with Explosive Component	Investigating treatment and disposal options.
TG-2	0	Deactivation	Inorganic Debris with Water Reactive Component	No waste currently in inventory
TG-3	0	Deactivation	Reactive Metals	No waste currently in inventory
TG-4	0.3	Macro-encapsulation	Elemental Lead	Performing on-site treatment in compliance with interim status requirements for MW management, or shipping to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-5	0	Neutralization/ Stabilization	Aqueous Liquids (Corrosive)	No waste currently in inventory
TG-6	0	Amalgamation	Elemental Mercury	No waste currently in inventory
TG-7	0	Incineration	Organic Liquids I	No waste currently in inventory
TG-8	4.8	Thermal Desorption	Organic Debris with Organic Contaminants	Off-site treatment. <sup>a</sup>
TG-9	25.8	Macro-encapsulation	Inorganic Debris with TCLP Metals	Performing on-site treatment in compliance with interim status requirements for MW management, or shipping to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-10	2.2	Sorting/ Reclassification	Heterogeneous Debris	Sort waste as needed to determine more suitable treatability groups
TG-11	0.11	Hydrothermal Processing	Organic Liquids II	Shipment to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-12	5.6	Macro-encapsulation	Organic Debris with TCLP Metals	Performing on-site treatment in compliance with interim status requirements for MW management, or shipping to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-13	0	Deactivation/ Stabilization	Oxidizers	No waste currently in inventory
TG-14	0	Evaporative Oxidation	Aqueous Liquids with Organic Contaminants	No waste currently in inventory
TG-15	0.02	Stabilization	Soils <50% Debris and Particulates (w/TCLP Metals)	Performing on-site treatment in compliance with interim status requirements for MW management, or shipping to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-16	0	Oxidation	Cyanide Waste	No waste currently in inventory
TG-17	9.1	Incineration followed by Stabilization	Liquid/Solid with Organic and/or Metal Contaminants	Shipment to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-18	1.15	Incineration	Particulates with Organic Contaminants	Shipment to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-19	0.01	Stabilization	Liquids with Metals	Performing on-site treatment in compliance with interim status requirements for MW management, or shipping to one or more permitted off-site facilities for treatment. <sup>a</sup>
TG-20	0.3	Deactivation/ Stabilization	Propellant with TCLP Metals	Investigating on-site treatment in compliance with interim status requirements for MW management. Investigating treatment at permitted off-site facilities.
TRU/MW	0.8	To be Determined	TRU with Hazardous Components	Investigating treatment at permitted off-site facilities.

NOTE: <sup>a</sup>Disposal at one or more permitted off-site facilities.

Treatments are detailed in the *Site Treatment Plan for Mixed Waste, Sandia National Laboratories, New Mexico* (SNL 2001f) and the *Site Treatment Plan for MW, FY01 Update* (SNL 2002b).

TCLP = toxicity characteristic leaching procedure

m<sup>3</sup> = cubic meters

TRU/MW = transuranic/mixed waste

*SNL/NM met all four 2001 milestone deadlines set forth in the FFCO and STP regarding the treatment and shipment of specific MW stored at SNL/NM (SNL 2001f). Sandia Corporation submitted an annual update for the STP covering FY 2000 activities by the March 2001 deadline.*

Materials routinely recycled through the SWTF include paper, cardboard, mixed paper (junk mail), plastic, aluminum cans, toner cartridges, and computers.

SNL/NM's sanitary waste is brought into the facility and dumped on the tipping floor. The waste is then inspected (screened) for hazardous or prohibited materials. After screening, the material is delivered to a baler via a conveyor belt where the waste is compacted and baled. Each bale of waste is about the size of an office desk and weighs approximately one ton. The bales are then staged for transportation and disposal at an off-site permitted disposal facility. Applicable DOE Orders and regulations are listed in Appendix B.

### **SWTF Operations**

All solid waste accepted at the SWTF must be sanitary non-hazardous waste. Any waste with hazardous characteristics are placed on a DR and managed through the HWMF. The SWTF does not accept food service waste, construction debris, radioactive, explosive, or other hazardous waste streams. Construction debris and food service waste is collected and transported directly to local landfills. All non-recyclable solid waste handled by the SWTF is disposed of at the Torrance County Landfill, approximately 30 miles east of Albuquerque.

### **Recyclables**

The SWTF is the central processing point for recyclable paper, cardboard, and other materials generated from SNL/NM and several outside cooperating agencies including LANL, KAFB, DOE field offices, and the Lovelace Respiratory Research Institute (LRRRI).

Profits from the sale of recyclable materials are split among the cooperating agencies and are used to increase recycling programs.

Figure 3-3 illustrates the type and volume of recyclable material processed by the SWTF during CY 2001.

### **2001 Activities at the SWTF**

*In 2001, two major activities were accomplished at the SWTF:*

- *SNL/NM was a primary partner in KOB-TV's "Waste to Warmth" project. This project allowed SNL/NM to collect, process, bale, and ship approximately 200,000 lbs of recycled newsprint from the greater Albuquerque area. The newsprint was processed into cellulose insulation and used to insulate low-income homes in Albuquerque.*
- *SNL/NM also started a pilot program with KAFB to investigate the potential of combining SNL/NM and KAFB waste streams. If this pilot program is successful, it would greatly assist KAFB with solid waste management requirements and demonstrate potential cost savings.*

*Additionally, a new shredder was added to the SWTF in 2001. The shredder is used to shred unusable computers, thus producing valuable recyclable material.*

## **3.3 WASTE MINIMIZATION AND P2 PROGRAMS**

### **3.3.1 Program Scope**

The focus of the P2 Program is to reduce resource use, generated waste, and enhance the overall efficiency of processes and organizations within Sandia Corporation. The program focuses on reducing all waste streams—air emissions, water discharges, and hazardous, radioactive, and solid wastes. Additional efforts focus on energy and water conservation as well as reduction of overall impacts to the environment. P2 also assists SNL/NM's line organizations to meet regulatory goals associated with recycling, waste generation, purchase of material containing recycled content, and reduction of energy use.

The P2 Program forms partnerships with numerous organizations at SNL/NM, including line organizations and ES&H personnel. P2 also provides background research on waste reduction technologies and products, performs cost-benefit analyses, and locates funding for new waste reduction processes. Waste minimization is

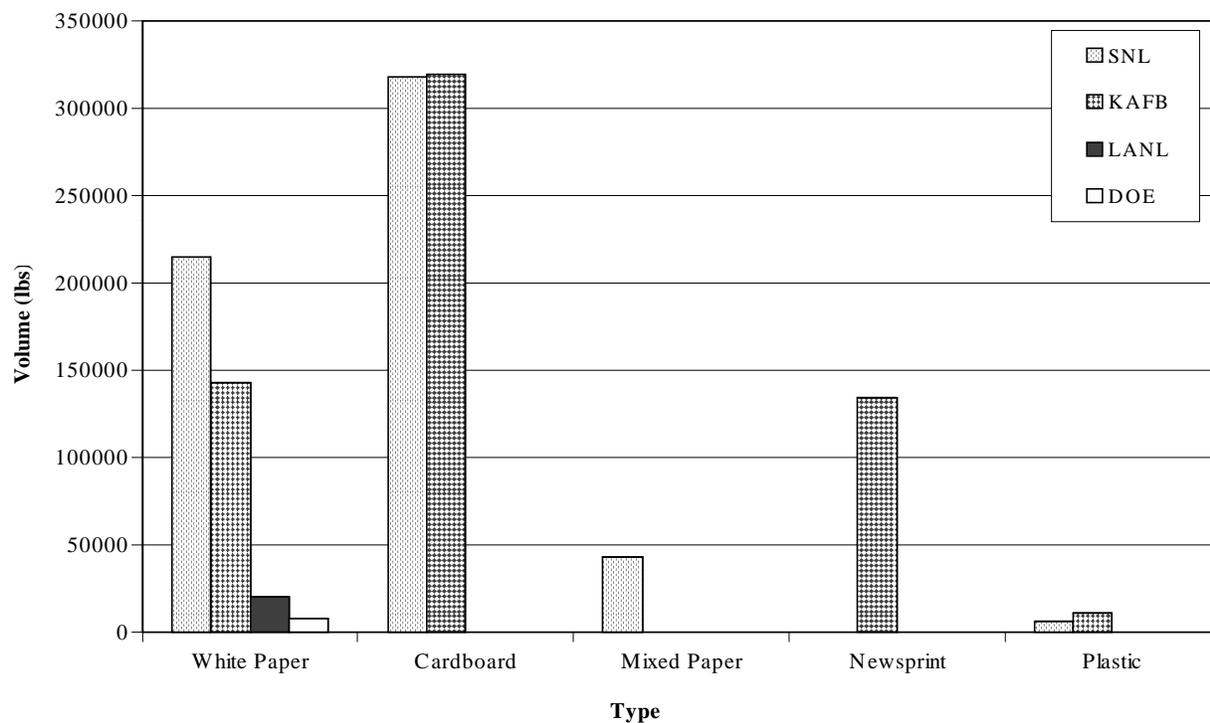


FIGURE 3-3. Recyclable Material Processed by the SWTF During Calendar Year 2001

promulgated by federal EOs as listed in Appendix B.

**P2 Awards**

Sandia Corporation received recognition by the NMED for participating in NMED’s prestigious Environmental Excellence Program. This is the third year SNL/NM has received this recognition. The three level of awards given to companies that have shown significant efforts are Commitment, Achievement, and Environmental excellence. In October 2001, Governor Gary Johnson presented three Sandia Corporation organizations with “Commitment Level” awards:

- **Fleet Services**

In receiving the Green Zia Commitment level award, Fleet Services has retained its reputation and its long record of excellence. Fleet Services has managed to eliminate the use of hazardous solvents by substituting them with citrus cleaners and power washers. Closed loop contracts for used oil recycling and re-refined oil purchased have been set up. Engine coolants are reclaimed and reused. Between 1994 and 1997 Fleet Services

reduced its total waste by 6,151 lbs (2,790 kg) thus reducing its waste disposal costs by \$31,200.

- **ER**

ER has been committed to waste minimization and environmentally sound practices for several years. Since 1997, P2 opportunities identified have reduced 600 m<sup>3</sup> of waste, with a cost savings of over one million dollars:

Site	Waste Reduction (tons)
Site 2	253 tons waste reduction
Site 16	1,070 tons waste avoided
Site 228	2,229 tons waste avoided
Site 74	6,400 tons waste avoided

- **Manufacturing Science and Technology**

In 2000, the Machine Shop (a subunit of 14100) was awarded the “Green Zia Award” based on their energy and hazardous waste reduction and overall commitment efforts to environmental excellence. An estimated 15 to 30 percent reduction in overall energy will be obtained within the next three years.

### Other Environmental Awards in 2001

Sandia Corporation has been recognized for various other efforts and has been given the following awards:

- The U.S. Environmental Protection Agency (EPA) selected Sandia Corporation for the “2001 Waste-Wise Federal Partner Award” in recognition of accomplishments in the federal government category. The award recognizes noteworthy practices for waste prevention, recycling, and purchasing of recycled-content products. This award recognized Sandia Corporation’s efforts in sustainable design (SD), construction and demolition waste recycling, waste reduction efforts within Custodial Services and the Cafeteria, and results in environmentally preferable procurement. There is only one award given nation-wide in this category.
- The DOE also awarded Sandia Corporation its “Pollution Prevention Accomplishment Award” for efforts in SD and environmentally preferable or “green” purchasing. This award will also allow Sandia Corporation to be considered for the prestigious “White House Closing the Circle Award” to be presented in CY 2002.

### 3.3.2 Environmentally Preferable Purchasing (EPP) Program

In 2001, a significant advancement was seen in the area of “green” purchasing. The Just-in-Time (JIT) Procurement team in conjunction with P2 developed a method called “dedicated contracting” to ensure that suppliers provide recycled content products to Sandia Corporation. Through the three dedicated contracts there has been remarkable improvement to Sandia Corporation’s EPP Program. In total these contracts (1) have saved Sandia Corporation \$72,000; (2) increased the total dollars spent on recycled products from these categories from \$223,000 to one million dollars; and (3) increased SNL/NM total compliance from 42 percent in FY 1998 to 85 percent in FY 2001. This system of initiating dedicated contracts is applicable to the entire DOE/NNSA Complex. SNL/NM purchasing has already shared its success with several of its service contractors who have also initiated remanufactured toner cartridge contracts with Document Solutions Inc. and LANL for office products. This approach has streamlined

the procurement process for Sandia Corporation personnel, while providing quality environmentally preferable products and has led to better relations with our suppliers. This program takes an innovative approach to purchasing by working within the constraints of the current procurement system, but goes beyond typical purchasing by looking for environmentally preferable suppliers to achieve a long-term solution.

### 3.3.3 SD Concept

The SD concept is based on the idea that buildings, processes, and products should be designed and built with the environment in mind. The concept uses a variety of methods to reduce the environmental impact of human activities including preference for renewable and or recycled materials, incorporating systems for water harvesting, using alternative energy such as photovoltaics, and choosing building materials that reduce waste or require great amounts of energy to manufacture, maintain, or dispose.

Sandia Corporation is revising its procurement procedures, standard construction specifications, and the Design Manual to reflect industry best practices for SD in the construction of large facilities. SD is also gradually being included in smaller projects site-wide. The goal is to minimize overall resource consumption by using building products with a high recycled content and selecting materials and designs that will contribute to lower operational costs for the facility. Designs also incorporate “indoor environmental quality” concepts such as maximizing natural light sources and incorporating harmonious meeting places for Sandia Corporation personnel.

Integrating SD into the following two construction projects at SNL/NM involves the collaborative effort of the Energy Manager, the Water Conservation Officer, the P2 Program, and Facilities engineers and architects. Design Team members look at materials, components, and systems from different perspectives and work together for the optimum solution. The solutions are based on the following parameters:

- quality of workplace
- initial cost
- life cycle cost
- overall efficiency
- environmental impact
- productivity
- creativity
- future flexibility

SD was integrated into the following two construction projects at SNL/NM:

- **Model Validation Facility (MVF)** - Renovations to the MVF were designed to incorporate day lighting to both improve indoor environmental quality and reduce energy costs by 30 percent. The design also incorporates water harvesting, use of recovered materials, and a “built-in” recycling center. The use of native plants in landscaping will provide a water-conserving, pleasing, southwestern look to the exterior of the facility. The design also required construction contractors to recycle construction debris. To date, 676 tons of material have been recycled.
- **The Joint Computational Engineering Laboratory (JCEL) and the Microsystems and Engineering Sciences Application (MESA)** - The JCEL and MESA facilities, totaling over 400,000 ft<sup>2</sup>, are both in the early design stages. The architects chosen to design these facilities were evaluated partially on their experience with SD. Because of SD practices, a 30 percent reduction in energy costs is expected and both buildings are expected to receive U.S. Green Building’s Leadership in Energy and Environmental Design certifications.

### 3.3.4 Waste Reduction and Recycling

Sandia Corporation continues to reduce volumes of generated waste and to improve recycling programs. Through an analysis known as P2 Opportunity Assessments, processes generating wastes are routinely assessed and waste stream methods are established.

As described under the Waste Management sections of this chapter, Sandia Corporation routinely recycles paper products, oil, metals, and office products. Additionally, other items not handled by the waste management facilities that are recycled include tires and construction materials. Table 3-4 summarizes the quantities of materials that Sandia Corporation recycled in all categories during 2001.

## 3.4 BIOLOGICAL CONTROL ACTIVITY

The Biological Control Activity provides customer support related to animal control issues and compiles information on pesticide use at SNL/NM. Animal control support includes providing general

information and resolving issues related to removing nuisance animals. Requests for assisting in resolving nuisance animal problems are relayed and documented through Sandia Corporation’s Facilities Telecon and Industrial Hygiene. This effort may entail interfacing, as necessary, with U.S. Air Force (USAF) and State of New Mexico agencies to resolve animal control issues. The Biological Control Activity also involves providing support in addressing animal-borne disease concerns (e.g., Hanta Virus) through activities such as disinfecting, sanitizing, and cleanup of areas infested with rodents or pigeons.

Pesticide use at SNL/NM includes the use of herbicides for weed control, rodenticides for controlling mice, and insecticides for the control of insects in food service and work areas. Sandia Corporation uses EPA-registered pesticides that are primarily applied by certified pest control agencies. Material Safety Data Sheets (MSDSs) and product labels for pesticides used at SNL/NM are maintained under the program. Pesticide use (product names and amounts applied) is documented in quarterly reports. Documents related to the program are listed in Chapter 9.

## 3.5 OIL STORAGE AND SPILL CONTROL

SNL/NM has an oil storage capacity of 5.5 million gallons. In 2001, DOE/NNSA-owned 98 regulated containers, including oil-containing equipment, transformers, underground storage tanks (USTs), and aboveground storage tanks (ASTs). All oil containment sites with regulated volumes must be equipped with secondary spill containment, although Sandia Corporation provides spill containment for smaller volumes as well. Secondary containment structures include concrete lined basins, retaining walls, containment reservoirs, earthen berms, sloped pads, and trenches.

The preparation of a Spill Prevention Control and Countermeasures (SPCC) Plan is required by 40 CFR 112, “Oil Pollution Prevention,” and 40 CFR 110, “Discharge of Oil,” which are promulgated under the Clean Water Act (CWA). The focus of these regulations is to protect specifically defined waterways, or “navigable waters of the United States” from potential oil contamination. “Navigable waters” is a broad term that includes rivers, lakes, oceans, water channels (tributaries) such as streambeds and arroyos that connect to a river. This applies to the Tijeras Arroyo, which discharges to the Rio Grande.

**TABLE 3-4.** Categories of Waste Recycled at SNL/NM in 2001

Recycled Categories	Weight (metric tons)
Scrap metal (steel, iron, stainless steel)	394.4
Concrete	2,471.42
Copper	21.6
Aluminum metal	24.76
Lead	13.09
Used oils	14.56
Toner cartridges	8.09
Batteries	26.99
Tires	0.82
Construction debris	705.39
Plastic	2.83
Mercury items	1.79
Transformers, Capacitors, and PCB items	11.29
Light bulbs (fluorescent, sodium, incandescent etc.)	8.61
Non-PCB light ballasts	1.68
Office paper (white and mixed)	122
Cardboard	146.17
Electronic Scrap	14.98
Phone books	1.48
Aluminum cans	1.33
Tin	18.35
Soil	0.3
Carpet	117.86
Other chemicals	0.12
<b>Total</b>	<b>4,129.91</b>

Sandia Corporation's SPCC Plan describes oil storage facilities and the mitigation controls in place to prevent inadvertent discharges of oil (SNL 1999f). Regulated facilities are those that contain 660 gallons of oil or more in one container or 1,320 gallons of oil in multiple containers at one location. Facilities at SNL/NM subject to the regulations include:

- Oil storage tanks (USTs and ASTs),
- Bulk storage areas (multiple containers),
- Electrical transformers and substations,
- Temporary or portable tanks, and
- Other oil-containing equipment.

### USTs

In 1990, the State of New Mexico adopted federal standards contained in RCRA Subpart I for USTs. There are three fiberglass USTs in inventory at SNL/NM: two 20,000 gallon tanks and one 9,750 gallon tank. Program documents are listed in Chapter 9. Applicable regulations are listed in Appendix B.

### 3.6 NEPA COMPLIANCE ACTIVITIES

The NEPA, signed into law in January 1970, is one of the nation's most comprehensive legislative and public policy statements on the protection of the environment. It requires federal agencies to consider environmental impacts of their proposed activities and to prepare documentation on potential environmental impacts. Where these impacts may be significant, the process of assessing the impacts and determining subsequent agency action must provide for public review of the decision-making process.

#### NEPA Program

Sandia Corporation's NEPA Compliance Program provides DOE/NNSA/OKSO with technical assistance on NEPA and resource protection laws, such as the Endangered Species Act (ESA) and the National Historic Preservation Act (NHPA). Under a self-managed program, Sandia Corporation personnel review projects for conformance to existing DOE NEPA documents and determinations. For some projects, a NEPA checklist or an AF Form 813 is prepared for DOE determination if the proposed action:

- (1) Does not fall within an existing SNL/NM NEPA document, or
- (2) Would occur on USAF property.

NEPA program documents are listed in Chapter 9. NEPA regulations are listed in Appendix B.

#### SNL/NM Site-Wide Environmental Impact Statement (SWEIS)

As a matter of policy, DOE prepares a SWEIS for its large, multiple-facility sites. In November 1999, DOE issued the final SWEIS for the SNL/NM site (DOE 1999), and in December 1999, issued the Record of Decision (ROD) selecting the "Expanded Operations" alternative as the preferred alternative.

The SWEIS allows DOE to “tier” subsequent NEPA documents to the larger analysis and reduce the need to revisit the same impact analysis for each new project proposed. By doing so, DOE can focus on project-specific issues in its NEPA determinations. In accordance with 10 CFR 1021, DOE will examine the SWEIS every five years to decide whether the analysis remains valid, or if a new or supplemental SWEIS should be prepared.

**ISMS Software NEPA Module**

In 2001, the ISMS and NEPA teams continued the development and deployment of the ISMS Software NEPA Module. The use of the ISMS Software NEPA Module has been proven to facilitate SNL/NM internal project reviews (citing existing NEPA documentation such as the SWEIS), and to streamline preparation of DOE NEPA checklists, when required. The NEPA Module has also supported Quality Assurance (QA) by providing a consistent framework that makes NEPA compliance documentation and information readily available. The NEPA Module also supports DOE in response to information requests, and in supplying information for appraisals and audits.

**3.7 ENVIRONMENTAL EDUCATION  
OUTREACH PROGRAM**

Sandia Corporation’s Environmental Education Outreach Program reaches out to the community at large. Presentations on both local and national environmental issues and concerns are held at community centers, schools, and environmental conferences. The hands-on approach is used wherever feasible, such as involving the community and students in field trips to perform environmental sampling, conducting in-field measurements, and observing local ecological systems. In 2001, Sandia Corporation participated in the following events:

- The 4<sup>th</sup> Annual Youth Conference on the Environment
- Explora Science Units
- The New Mexico Environmental Health Conference
- The School To World Conference
- Earth Day at the New Mexico State Fair
- School presentations throughout Albuquerque

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# Chapter 4

## Terrestrial and Ecological Surveillance

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### Chapter Summary

Terrestrial and ecological surveillance are conducted at Sandia National Laboratories, New Mexico (SNL/NM) to detect the possible migration of contaminants to off-site locations and to determine the impact, if any, of SNL/NM's operations on human health or the environment.

The Terrestrial Surveillance Program samples surface soils, arroyo and river sediments, and vegetation from various on-site, perimeter, and off-site locations to detect if radiological and non-radiological constituents are present.

There are 39 on-site, 17 perimeter, and 16 off-site fixed locations that SNL/NM typically samples each year, which effectively makes statistical comparisons with results from previous years.



**Environmental Snapshot**

- In 2001, there were no terrestrial sample results that indicated a significant level of concern that would trigger actions at locations that are not already being addressed by the Environmental Restoration (ER) Project.*

Radiological Parameters include gamma-emitting radionuclides, tritium ( $H^3$ ) radioisotope, and uranium. Non-radiological parameters include metals such as aluminum, iron, silver, and zinc.



Echinocereus fendleri at SNL/NM

## 4.1 Terrestrial Surveillance Program

Terrestrial surveillance began at SNL/NM in 1959 with the collection of environmental samples for radiological analysis. Since 1959, the number of sampling locations has increased to account for the growth of the laboratory. Several other significant programmatic changes have occurred over the years, including:

- 1983 – Added gamma radiation level measurements, utilizing thermoluminescent dosimeters (TLD's);
- 1993 – Added collection of samples from arroyo and river sediments;
- 1993 – Began non-radiological (metals) analysis of soil and sediment samples;
- 1996 – Began non-radiological (metals) analysis of vegetation samples;
- 1996 – Began the Ecological Surveillance Program; and
- 2000 – Discontinued sampling of off-site surface water (Rio Grande River and Las Huertas Creek).

### 4.1.1 Program Objectives

The Terrestrial Surveillance Program is designed to meet the objectives of the U.S. Department of Energy (DOE) Order 5400.1, *General Environmental Protection Program* (DOE 1990):

- Collect and analyze samples in order to characterize environmental conditions and identify trends;
- Establish baseline (or background) levels of radiological and non-radiological constituents;
- Assess the effectiveness of pollution abatement programs;
- Identify new or existing environmental quality problems, and their potential impacts on human health or the environment; and
- Verify compliance with applicable laws and regulations, as well as commitments made in official documents (such as Environmental Impact Statements [EISs], in accordance with

the National Environmental Policy Act [NEPA]).

### Standards for Comparison

No regulatory limits are available to directly compare concentrations of radiological or non-radiological constituents in surface soils, vegetation, or sediments; however, SNL/NM conducts statistical analyses to compare the results from on-site and perimeter samples to off-site results, and to establish trends in order to identify possible pollutants and their potential impact on human health or the environment.

In addition, sample results for metals in surface soils are compared to U.S. surface soil average concentrations, published in *Trace Elements in Soils and Plants* (Kabata-Pendias and Pendias, 1992), or local/regional surface soil average concentrations, published in *Elements in North American Soils* (Dragun and Chiasson, 1991).

The DOE, National Nuclear Security Administration (NNSA) Oversight Bureau of the New Mexico Environment Department (NMED) splits samples with SNL/NM, at several locations, for an added measure of verification. The results

<http://www.nmenv.state.nm.us/>

are available upon request from the NMED, which can be found at the following website:

### Statistical Analysis

Samples are generally collected from fixed locations to effectively make statistical comparisons with results from previous years. Statistical analyses are performed to determine if a specific on-site or perimeter location differs from off-site values, and to identify trends at a specific sampling location. Since multiple data points are necessary to provide an accurate view of a system, the Terrestrial Surveillance Program does not rely on the results from any single year's sampling event to characterize on-site environmental conditions. Results from a single sampling point may vary from year to year, due to slight changes in sampling locations, differences in climatic conditions, and laboratory variations or errors. Therefore, as the amount of data increases, the accuracy of the characterization increases.

The results of the statistical analyses allow SNL/NM to prioritize sample locations for possible follow-up action. The prioritization process is a decision-making tool to assist in determining the appropriate level of concern for each sample result. The Statistical Analysis

Prioritization Methodology (Shyr, Herrera, and Haaker, 1998) is based on two “yes or no” questions resulting in a matrix of four priority levels. The matrix is shown in Table 4-1.

Prior to 2001, there have been no terrestrial sample results that have indicated a significant level of concern (Priority-1) that would trigger actions at locations that are not already being addressed by the ER Project.

In past years, the period of time covered by the statistical analysis was from 1991 to present (for soils), and from 1993 to present (for sediments and vegetation). In Calendar Year (CY) 2001, the analysis was limited to a five-year period (beginning in 1997). The reason for the change was that SNL/NM changed analytical laboratories in CY 2000, with lower detection capabilities for many of the metals. As a result, a large number of false decreasing trends were noted for non-radiological parameters when the whole data set was analyzed. By limiting the analysis to a five-year period, the number of apparent decreasing trends was reduced, and should be eliminated over the next couple of years.

**4.1.2 Sample Media**

Samples of surface soils, arroyo and river sediments, and vegetation are collected as part of the Terrestrial Surveillance Program, and analyzed for radiological and non-radiological constituents.

**Soil**

Soil samples are collected to ascertain the presence, or buildup, of pollutants that may have been transported by air or water, and deposited on the ground surface. Approximately 1,500 grams

of sample is collected from the top two inches of soil in accordance with local procedures. In 2001, soil samples were collected from a total of 43 locations (24 on-site, 13 perimeter, and six off-site locations). Soil samples were not collected at seven on-site locations (2NE, 2NW, 2SE, 2SW, 32E, 32S, and 53) due to human error.

**Sediment**

Sediment samples are collected from arroyo beds and from the banks of rivers and creeks to ascertain the presence, or buildup, of pollutants deposited from surface waters. Approximately 1,500 grams of sample is collected from the top two inches of sediment in accordance with local procedures. In 2001, sediment samples were collected from a total of nine locations (three on-site, three perimeter, and three off-site locations). One on-site sediment sample was not collected (79 – Arroyo del Coyote Upstream) due to human error.

**Vegetation**

Vegetation is sampled to monitor for potential uptake of pollutants, which could provide an exposure pathway to forage animals, as well as to humans through the food chain. In actuality, human exposure to contaminants through the food chain is highly unlikely on Kirtland Air Force Base (KAFB), since there is no hunting, livestock or commercial farming within the boundaries of the base. Approximately 500 grams of sample is collected, preferably from perennial grasses, by cutting back several inches of growth from the plant. If grass is not available, samples from small leafy plants may be collected. In 2001, vegetation was collected at a total of 15 locations (nine on-site, three perimeter, and three off-site locations). Due to a lack of vegetation at 11 locations, samples were not collected in 2001.

**TABLE 4-1.** Decision Matrix for Determining Priority Action Levels

Priority	Are results higher than off-site?*	Is there an increasing trend ?	Priority for further investigation
1	Yes	Yes	Immediate attention needed. Specific investigation planned and/or notifications made to responsible parties.
2	Yes	No	Some concern based on the level of contaminant present. Further investigation and/or notifications as necessary.
3	No	Yes	A minor concern since contaminants present are not higher than off-site averages. Further investigation and/or notifications as necessary.
4	No	No	No concern. No investigation required.

**NOTE:** Based on Statistical Analysis Prioritization Methodology (Shyr, Herrera, and Haaker 1998).

\*While some sites may appear higher than off-site, there may not be a statistically significant difference.

Samples were also not taken at two locations (2NE and 2NW) due to human error.

#### **Gamma Radiation Levels**

Gamma Radiation Levels are measured using TLD's to determine the impact, if any, of SNL/NM's operations on ambient radiation levels. The TLD's are changed out on a quarterly basis and processed at an on-site laboratory.

#### **4.1.3 Sampling Locations**

##### **On-site**

On-site locations are selected within or near areas of past or present SNL/NM operations. These areas include the five technical areas, as well as active and inactive facilities and test areas outside the technical area boundaries. Sample locations are chosen near sites with known contamination from past operations, and near facilities that have the potential to discharge radiological or non-radiological pollutants to the environment. Other considerations in the selection of sampling locations include local topography and meteorology. The 39 routine on-site sampling locations are listed in Table 4-2 and shown in Figure 4-1. Locations where sampling did not occur for 2001 are indicated in Table 4-2 (identified with a dash).

##### **Perimeter**

Perimeter locations are selected to determine if contaminants are migrating from SNL/NM sites toward the off-site community. Perimeter locations are typically off of SNL/NM property, but (with few exceptions) within the boundary of KAFB. The 17 routine perimeter sampling locations are listed in Table 4-3 and shown in Figure 4-1. Locations where sampling did not occur for 2001 are indicated in Table 4-3 (identified with a dash).

##### **Off-site**

Off-site locations are selected to establish concentrations of radiological and non-radiological constituents for comparison with on-site and perimeter results. Sample locations have been selected within a 25-mi radius of SNL/NM in areas where the accumulation of pollutants is expected to be minimal. The 16 routine off-site sampling locations are listed in Table 4-4 and shown in Figure 4-2. Locations where sampling did not occur in 2001 are indicated in Table 4-4 (identified with a dash).

Occasionally, sampling locations are added or dropped for different reasons, including startup or closure of an existing facility or operation; additional characterization of areas with elevated

concentrations or increasing trends; or other technical or budgetary reasons. No changes were made to the sampling locations in 2001; however, soil samples were inadvertently missed at several locations and insufficient vegetation was present for sampling at several locations.

#### **4.1.4 Radiological Parameters and Results**

Radiological analyses are performed on all soil, sediment, and vegetation samples. The CY 2001 analytical results are found in Appendix E of this report. The detailed statistical analyses are documented in *2001 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2002c). Radiological parameters include:

- **Gamma-emitting radionuclides** – Gamma spectroscopy is used to detect the emission of gamma radiation from radioactive materials. Radionuclide identification is possible by measuring the spectrum of gamma energies associated with a sample, since each radionuclide has a unique and consistent series of gamma emissions. Cesium-137 (Cs-137) is an example of a long-lived gamma emitter that is prevalent in the environment (as fallout from historical nuclear weapons testing) and is used as a possible indicator of environmental contamination from reactor facilities.
- **Tritium ( $H^3$ ) radioisotope** -  $H^3$  is a radioactive isotope of hydrogen with a half-life of 12.5 years. Unlike the most common element of hydrogen ( ${}_1H^1$ ), which has a single proton in its nucleus,  $H^3$  contains one proton and two neutrons. Tritium occurs naturally at low levels in the environment and is also a common material in nuclear weapons research and development.
- **Uranium** – Uranium occurs naturally in soils and may also be present as a pollutant in the environment due to past testing conducted at SNL/NM. Total uranium ( $U_{tot}$ ) analysis is used to measure all uranium isotopes present in a sample. A high  $U_{tot}$  measurement may trigger an isotope-specific analysis to determine the possible source of uranium (natural or man-made, enriched or depleted).
- **External gamma radiation exposure rates** - TLDs are used to measure ambient gamma exposure rates. Several natural gamma radiation sources exist, including cosmic radiation and radioactive materials that exist in geologic materials at SNL/NM. Many

**TABLE 4-2.** On-site Terrestrial Surveillance Locations and Sample Types*There are 39 on-site sampling locations.*

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
1	Pennsylvania Ave.	X			X
2NW	Mixed Waste Landfill (MWL) (northwest)	—		—	X
2NE *	MWL (northeast)	—		—	
2SE	MWL (southeast)	—			
2SW	MWL (southwest)	—			
3	Coyote Canyon Control	X			X
6	TA-III (east of water tower)	X		X	X
7 *	Unnamed Arroyo (north of TA-V)	X			X
20 *	TA-IV (southwest) (KAFB Skeet Range)	X		—	X
31	TA-II Guard Gate				X
32S	TA-II, Bldg. 935 (south bay door)	—			
32E	TA-II, Bldg. 935 (east personnel door)	—			
33	Coyote Springs	X		X	
34	Lurance Canyon Burn Site	X		X	
35	Chemical Waste Landfill (CWL)	X		X	
41	TA-V (northeast fence)	X			X
42	TA-V (east fence)	X		—	X
43	TA-V (southeast fence)	X		—	X
45	Radioactive and Mixed Waste Management Facility (RMWMF), TA-III (northwest corner)	X		X	X
45E	RMWMF, TA-III (east fence)				X
46	TA-II (south corner)	X		X	X
47	Tijeras Arroyo (east of TA-IV)				X
48	Tijeras Arroyo (east of TA-II)				X
49	Near the Explosive Components Facility (ECF)	X		—	
51	TA-V (north of culvert)	X		X	
52	TA-III, northeast of Bldgs. 6716 and 6717	X		X	
53 *	TA-III south of long sled track	—			
54	TA-III, Bldg. 6630	X			
55	Large Melt Facility (LMF), Bldg. 9939	X		X	
56	TA-V, Bldg. 6588 (west corner)	X			
57	TA-IV, Bldg. 970 (northeast corner)	X			
66	KAFB Facility	X		—	
72	Arroyo del Coyote (midstream)		X		
74N	TA-IV, Tijeras Arroyo (midstream)		X		
75	Arroyo del Coyote (down-gradient)		X		
76	Thunder Range (north)	X			
77	Thunder Range (south)	X			
78	School House Mesa	X			
79	Arroyo del Coyote (up-gradient)		—		

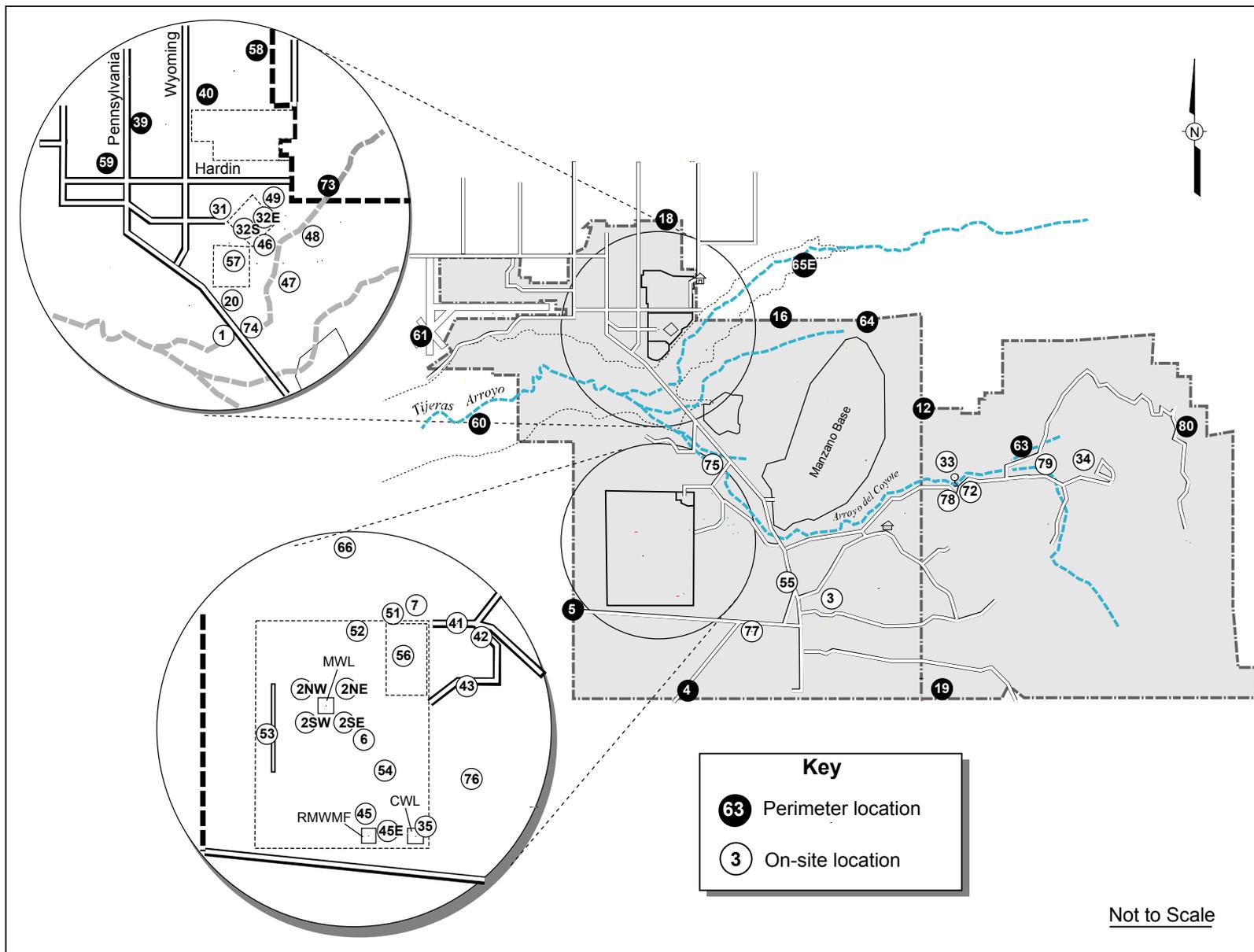
**NOTE:** \*Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling and analysis.

TLD = thermoluminescent dosimeters

“—” = Indicates location not sampled during CY 2001 either due to error or no vegetation present

TA = Technical Area

KAFB = Kirtland Air Force Base



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**FIGURE 4-1.** Terrestrial Surveillance Program On-site and Perimeter Sampling Locations  
*On-site locations are within areas of SNL/NM operations. Perimeter locations are located both on and off KAFB property*

**TABLE 4-3.** Perimeter Terrestrial Surveillance Locations and Sample Types  
*There are 17 perimeter sampling locations.*

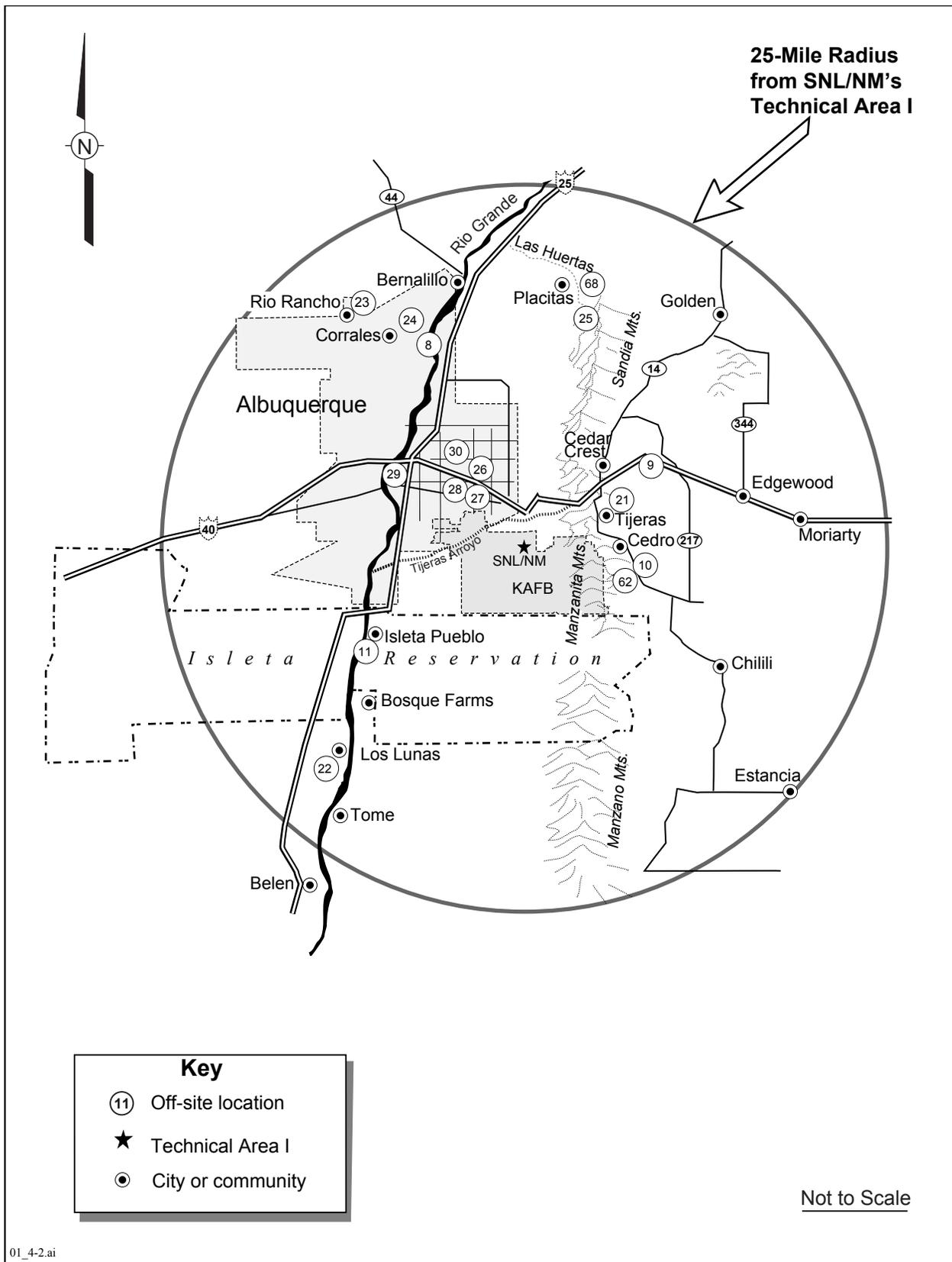
Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
4	Isleta Reservation Gate	X		X	X
5	McCormick Gate	X		—	X
12	Northeast Perimeter	X		X	
16	Four Hills	X			X
18	North Perimeter Road				X
19	USGS Seismic Center Gate	X			X
39	Northwest DOE Complex				X
40	TA-I, northeast (by Bldg. 852)				X
58	North KAFB Housing	X		—	
59	Zia Park (southeast)	X			
60	Tijeras Arroyo (down-gradient)	X	X	X	
61	Albuquerque International Sunport (west)	X			
63	No Sweat Boulevard	X			
64 *	North Manzano Base	X		—	
65E	Tijeras Arroyo, east (up-gradient)	X	X		
73 *	Tijeras Arroyo (up-gradient)		X		
80	Madera Canyon	X			

**NOTE:** \*Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling analysis.  
 TLD = thermoluminescent dosimeter  
 “—” = Indicates location not sampled during CY 2001  
 USGS = U.S. Geological Survey

**TABLE 4-4.** Off-site Terrestrial Surveillance Locations and Sample Types  
*There are 16 off-site sampling locations within a 25-mile radius of SNL/NM.*

Location Number	Sampling Location	Soil	Sediments	Vegetation	TLD
8	Rio Grande, Corrales Bridge (up-gradient)	X	X	X	
9	Sedillo Hill, I-40 (east of Albuquerque)	X		X	
10	Oak Flats	X		—	X
11 *	Rio Grande, Isleta Pueblo (down-gradient)	X	X	X	X
21	Bernalillo Fire Station 10, Tijeras				X
22	Los Lunas Fire Station				X
23	Rio Rancho Fire Station, 19th Ave.				X
24	Corrales Fire Station				X
25	Placitas Fire Station	X		—	X
26	Albuquerque Fire Station 9, Menaul NE				X
27	Albuquerque Fire Station 11, Southern SE				X
28	Albuquerque Fire Station 2, High SE				X
29	Albuquerque Fire Station 7, 47th NW				X
30	Albuquerque Fire Station 6, Griegos NW				X
62	East resident	X		—	
68	Las Huertas Creek		X		

**NOTE:** \*Replicate sampling locations: In addition to single samples taken for each medium, two replicated samples are collected for internal checks on comparability of sampling and analysis.  
 TLD = thermoluminescent dosimeter  
 “—” = Indicates location not sampled during CY 2001



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FIGURE 4-2. Terrestrial Surveillance Program Off-site Sampling Locations

sources of man-made gamma radiation also exist at SNL/NM, such as reactor and accelerator facilities. The TLD network was established to determine the regional gamma exposure rate due to natural sources and to determine the impact, if any, of SNL/NM's operations on these levels. The dosimeters are placed on aluminum poles at a height of approximately one meter, and are exchanged and measured quarterly (January, April, July, and October) at 34 on-site, perimeter, and off-site locations.

### Radiological Results

The results of the statistical analysis showed no on-site or perimeter soil, sediment, or vegetation locations that were both higher than off-site and with an increasing trend (Priority-1). Several locations were identified as either Priority-2 or Priority-3 (higher than off-site or increasing trend). The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-5 through 4-7.

#### Cs-137

Three perimeter locations (12, 64, and 80) continue to be identified as Priority-2 (higher than off-site) for Cs-137 in surface soils. Locations 12 and 80 are located on the U.S. Forest Service (USFS) land withdrawn area. Location 64 is located north of Manzano Base, near the KAFB boundary. Cs-137 is prevalent in surface soils worldwide. Higher Cs-137 at these sample locations is a result of their being at a higher elevation and not due to SNL/NM operations. It should also be noted that one off-site location (9) showed an increasing trend for Cs-137 in soil. Location 9 is at Sedillo Hill, east of Albuquerque. The reported results at this location ranged from 0.08 to 0.683 pCi/g.

One on-site location (75) was identified as Priority-3 (increasing trend) for Cs-137 for sediments. This is the first time this location has

been observed. Location 75 is located in the Arroyo de Coyote (down-gradient). The recorded values for Cs-137 ranged from 0 to 0.143 pCi/g; there was no statistical difference when compared to the off-site values.

All other locations were identified as Priority-4 (consistent with off-site results and no increasing trends) for Cs-137 for vegetation.

#### Tritium

No locations were identified as Priority-1 in CY 2001. Although not sampled in CY 2001, two on-site locations (2NE and 32E) are still identified as Priority-2 (higher than off-site) for tritium in soils. These locations have been identified in past years, and are associated with ER sites. Location 2NE (ER Site 76) is located just outside the Mixed Waste Landfill (MWL) in Technical Area III (TA-III) and location 32E (ER Site 159) is located outside Building 935 in Technical Area II (TA-II). Although elevated, the concentration of H<sup>3</sup> at these locations does not present a hazard to workers in these areas. It should be noted that both locations 2NE and 32E show a decreasing trend for H<sup>3</sup>. Both locations have shown a significant decrease in the amount of H<sup>3</sup> present from 1997 through 2000. Location 2NE had a maximum concentration of 43.0 pCi/mL in 1997 with a minimum concentration of 1.48 pCi/mL in 2000 while location 32E had a maximum concentration of 98.0 pCi/mL in 1997 with a minimum concentration of 0.181 pCi/mL in 2000.

Location 2NE was also noted to be Priority-2 for H<sup>3</sup> in vegetation. (Again, this location was not sampled during CY 2001.) Although elevated, the concentration of H<sup>3</sup> at these locations does not present a hazard to workers in these areas.

All locations were identified as Priority-4 for H<sup>3</sup> in sediment.

**TABLE 4-5.** Summary Statistics for Soil Locations (1997-2001) Noted as PRIORITY-2 During Calendar Year 2001

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Cesium-137	pCi/g	12	5	1.108	1.20	0.416	0.430	1.54
		64	5	0.890	0.84	0.408	0.435	1.40
		80	5	0.819	0.78	0.632	0.050	1.50
Tritium	pCi/mL	2NE	4	14.02	5.80	19.66	1.48	43.0
		32E	4	24.81	0.54	48.79	0.181	98.0

**NOTE:** Std Dev = Standard deviation  
pCi/g = picocurie per gram  
pCi/mL = picocurie per milliliter

**TLD**

TLD exposure by quarter and location class for 2001 is shown in Appendix E, Table E-20.

Data for 1997 through 2001 was analyzed to determine if any statistical differences were observed for either location class (on-site, perimeter, or community) or year. The statistical analysis did show that TLD exposure for 1999 was higher than any other year while the total exposure for 2000 and 2001 were significantly less than any other year. TLD exposure for community locations were significantly less than on-site or perimeter locations. (Note: There was no statistical difference between on-site or perimeter locations.) Table 4-8 shows the overall summary statistics for TLD Exposure for 1997 - 2001. Figure 4-3 shows the TLD exposure by year and location class.

Data for locations 20 and 39 are incomplete for CY 2001, so the data for these locations are not included in the annual summary statistics.

**4.1.5 Non-Radiological Parameters and Results**

All soil, sediment, and vegetation samples are analyzed for the following 21 metals:

Aluminum (Al)	Antimony (Sb)
Arsenic (As)	Barium (Ba)
Beryllium (Be)	Cadmium (Cd)
Chromium (Cr)	Cobalt (Co)
Copper (Cu)	Iron (Fe)
Lead (Pb)	Magnesium (Mg)
Manganese (Mn)	Mercury (Hg)
Nickel (Ni)	Potassium (K)
Selenium (Se)	Silver (Ag)
Thallium (Tl)	Vanadium (V)
Zinc (Zn)	

**TABLE 4-6.** Summary Statistics for Vegetation Locations (1997-2001) Noted as PRIORITY-2 During Calendar Year 2001

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Tritium	pCi/mL	2NE	4	6.66	5.47	6.76	0.68	15.0

NOTE: Std Dev = Standard deviation  
pCi/g = picocurie per gram  
pCi/mL = picocurie per milliliter

**TABLE 4-7.** Summary Statistics for Sediment Locations (1997-2001) Noted as PRIORITY-3 During Calendar Year 2001

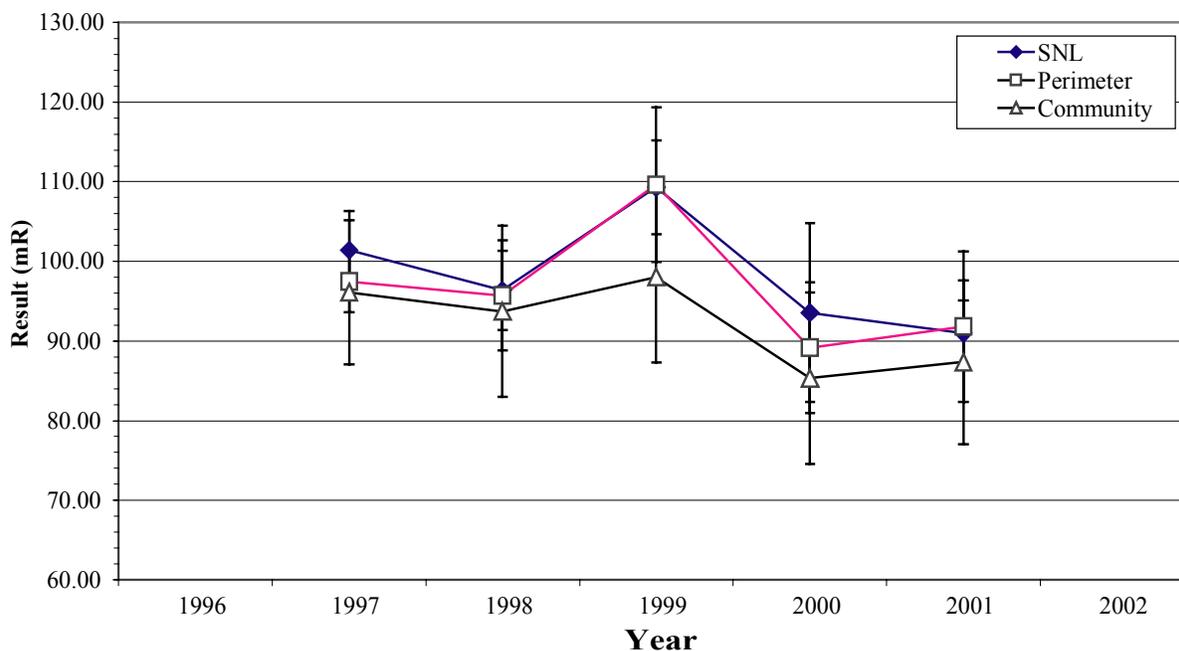
Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Cesium-137	pCi/g	75	4	0.073	0.074	0.060	0	0.143

NOTE: Std Dev = Standard deviation  
pCi/mL = picocurie per milliliter

**TABLE 4-8.** Summary Statistics for TLD Exposure, 1997 - 2001

Location Class	No. of Obs	Average	Median	Std Dev	Minimum	Maximum
Community	59	92.04	90.4	11.18	73.2	116.9
Perimeter	32	96.87	95.9	10.62	78.9	127.2
On-Site	66	98.37	97.3	9.40	82.7	119.7

NOTE: If a location had missing data for one quarter, it was excluded from the analysis for the year.  
TLD = thermoluminescent dosimeter  
Std Dev = standard deviation  
Obs = observations



**FIGURE 4-3. TLD Results By Year and Location Class**

All metals, except for mercury, are determined using the Inductively Coupled Plasma-Atomic Emission Spectrum (ICP-AES) method. Mercury is determined by the Cold Vapor Atomic Absorption (CVAA) method.

The CY 2001 analytical results are found in Appendix E of this report. The detailed statistical analyses are documented in *2001 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2002c).

### Non-Radiological Results

The results of the statistical analysis showed one perimeter soil sampling location (64) with manganese results that were both higher than off-site and with an increasing trend (Priority-1). No other on-site or perimeter locations were identified as Priority-1 (soil, sediment, or vegetation). Several locations were identified as either Priority-2 or Priority-3 (higher than off-site or increasing trend). The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-9 and 4-10.

Several metals were listed as Priority-4 for all soil, sediment, and vegetation samples: antimony, arsenic, beryllium, chromium, copper, mercury, nickel, selenium, silver, and thallium.

### Aluminum

One on-site location (52) and one perimeter location (65E) were identified as Priority-2 (higher than off-site) for aluminum in surface soils. The concentration at both locations is well within the range of background identified for New Mexico surface soils and is expected to be naturally occurring.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for aluminum.

### Barium

One on-site location (3) was identified as Priority-2 (higher than off-site) and one perimeter location (80) was identified as Priority-3 (increasing trend) for barium in surface soils. The concentration of barium at both locations is well within the range of background identified for New Mexico surface soils and is expected to be naturally occurring.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for barium.

**TABLE 4-9.** Summary Statistics for All Locations (1997-2001) Identified as PRIORITY-2 for Metals During Calendar Year 2001 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	Aluminum	On-site	52	5	15160	2479	11700	18000
		Perimeter	65E	5	15540	5626	8300	24000
	Barium	On-site	3	5	266	121	99	400
	Cadmium	On-site	20	5	1.81	0.85	0.5	2.8
	Cobalt	Perimeter	64	5	8.10	0.88	7	9.07
		Perimeter	65E	5	9.26	2.73	5.2	12
	Iron	Perimeter	64	5	18960	1877	17000	21700
		Perimeter	65E	5	21740	6187	12000	28000
	Lead	On-site	20	5	1435	2203	62.6	5300
	Magnesium	On-site	3	5	5142	1565	2900	6600
		Perimeter	64	5	6442	957	5600	7770
		Perimeter	65E	5	7986	2748	3900	11000
	Manganese	Perimeter	65E	5	559	207	220	750
	Potassium	Perimeter	60	5	3752	239	3380	4000
		Perimeter	65E	5	4786	1673	2200	6800
Vanadium	Perimeter	65E	5	38.4	10.2	23	50	
Zinc	Perimeter	64	5	73.2	7.0	65	78.9	
	Perimeter	65E	5	79.2	26.4	41	110	
Sediment	Iron	On-site	74N	5	14520	5626	8500	23000
	Vanadium	On-site	74N	5	28.1	10.9	16	45
Vegetation	Magnesium	Perimeter	60	4	4625	1387	3000	6300

NOTE: Std Dev = Standard deviation  
mg/kg = milligram per kilogram

**TABLE 4-10.** Summary Statistics for Soil Locations (1997-2001) Identified as PRIORITY-3 for Metals During Calendar Year 2001 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	Barium	Perimeter	80	5	140	20	120	171
	Cobalt	Perimeter	80	5	4.82	0.70	4	5.78
	Lead	On-site	33	5	14.6	1.1	13	15.6
	Manganese	On-site	33	5	318	33	280	368
		Perimeter	80	5	281	28	240	319
	Potassium	Perimeter	80	5	2462	441	2000	3060
Zinc	Perimeter	33	5	59.9	15.7	43	82.3	
Sediment	Magnesium	Perimeter	65E	5	2262	265	1800	2460

NOTE: Std Dev = Standard deviation  
mg/kg = milligram per kilogram

**Cadmium**

One on-site location (20) continues to be identified as Priority-2 for cadmium in surface soils. This location is associated with the old KAFB skeet range and the elevated cadmium is associated with the operation of the skeet range. Although the cadmium is recognized as a contaminant (in addition to natural background concentration) at this site, the concentration is within the range of background for New Mexico surface soils, and well below the NMED's soil screening levels (SSLs) (NMED 2000).

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for cadmium.

**Cobalt**

Two perimeter locations (64 and 65E) continue to be identified as Priority-2 (higher than off-site) and one perimeter location (80) was identified as Priority-3 (increasing trend) for cobalt in surface soils. The concentration at all three locations is well within the range of background for cobalt in New Mexico surface soils and is expected to be naturally occurring.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for cobalt.

**Iron**

Two perimeter locations (64 and 65E) continue to be identified as Priority-2 (higher than off-site) for iron in surface soils and one on-site location (74N) was identified as Priority-2 for iron in sediments. The concentration at all three locations is well within the range of background for iron in Western U.S. surface soils and is expected to be naturally occurring.

All vegetation samples, and the remaining soil and sediment sample locations were identified as Priority-4 for iron.

**Lead**

One on-site location (20) continues to be identified as Priority-2 (higher than off-site) and one on-site location (33) was identified as Priority-3 (increasing trend) for lead in surface soils.

Location 20 is associated with the old KAFB skeet range and the elevated lead is associated with the operation of the skeet range. Although lead is recognized as a contaminant (in addition to the natural background concentration) at this site, the concentration is well below the NMED's SSLs (NMED 2000).

The lead concentration at location (33) is within range of background for lead in New Mexico surface soils and is expected to be naturally occurring.

All sediment and vegetation samples and the remaining soil sample locations were identified as Priority-4 for lead.

**Magnesium**

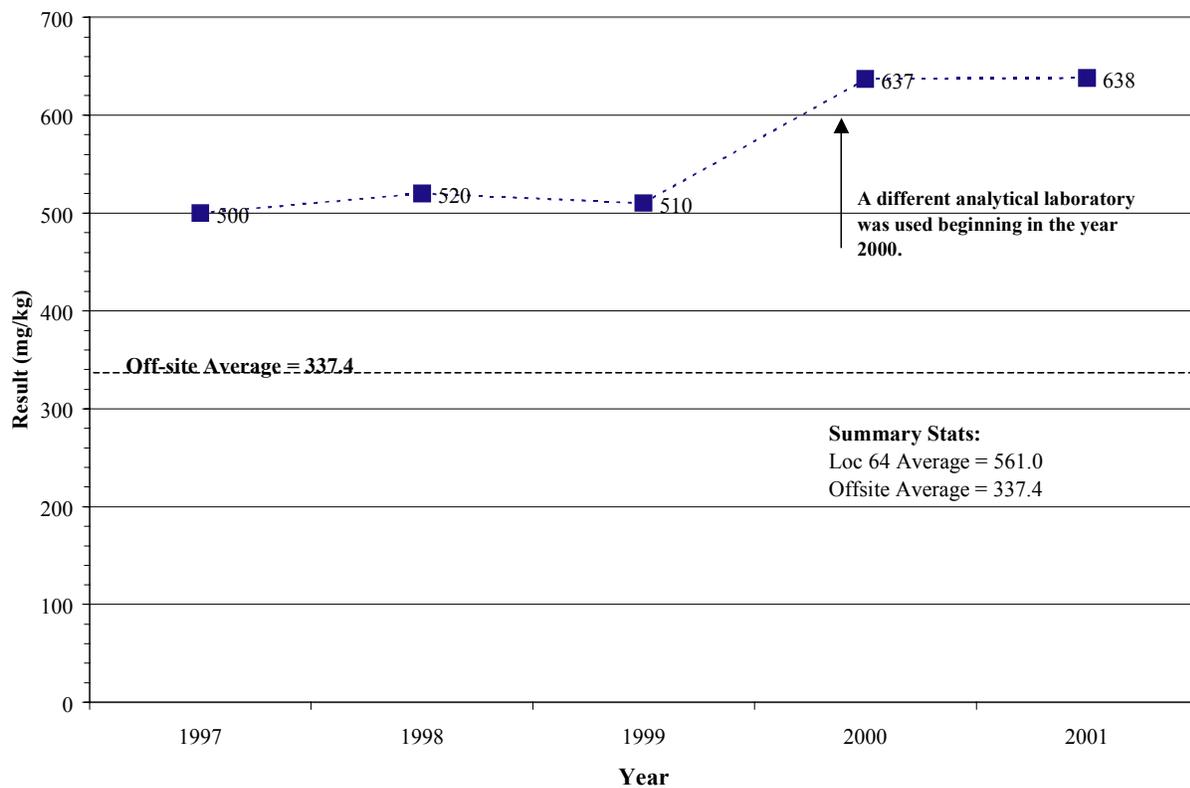
One on-site location (3) and two perimeter locations (64 and 65E) were identified as Priority-2 (higher than off-site) for magnesium in surface soils. One perimeter sediment location (65E) was identified as Priority-3 (increasing trend) and one perimeter vegetation location (60) was identified as Priority-2 (higher than off-site). The concentration at all soil and sediment locations is within the range of background for magnesium in New Mexico surface soils.

All remaining soil, sediment, and vegetation samples were identified as Priority-4 for magnesium.

**Manganese**

One perimeter location (64) was identified as Priority-1 (higher than off-site and increasing trend) for manganese in surface soils. In addition, one perimeter location (65E) was identified as Priority-2 (higher than off-site) and one on-site (33) and one perimeter (80) location were identified as Priority-3 (increasing trend) for manganese in surface soils.

Possible causes for the Priority-1 designation at location 64 are being investigated. This location has routinely been identified as higher than off-site, but this is the first year that an increasing trend has been identified. It is suspected that the change in analytical laboratories that occurred in CY 2000 is the cause of the increasing trend. The increasing trend can be seen in Figure 4-4. The concentration at location 64, as with the other locations, is within the range of background for manganese in New Mexico surface soils, and the concentration does



**FIGURE 4-4.** Observed Concentration of Manganese Within Western U.S. Surface Soil Limits (30-500 mg/kg)

not indicate a risk (it is well below the New Mexico SSLs). Figure 4-4 shows the concentrations of manganese at location 64 over the past five years.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for manganese.

#### Potassium

Two perimeter locations (60 and 65E) were identified as Priority-2 (higher than off-site) for potassium in surface soils. One perimeter location (80) was identified as Priority-3 (increasing trend). All soil concentrations are within soil concentrations identified in the Western U.S. soils concentrations.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for potassium.

#### Vanadium

One perimeter location (65E) was again identified as Priority-2 (higher than off-site) for vanadium in surface soils. One on-site location (74N) was

identified as Priority-2 for vanadium in sediments. The concentration at both locations is within the range of background for vanadium in New Mexico surface soils.

All vegetation locations and the remaining soil and sediment locations were identified as Priority-4 for vanadium.

#### Zinc

Two perimeter locations (64 and 65E) were again identified as Priority-2 (higher than off-site) for zinc in surface soils. One on-site location (33) was identified as Priority-3 (increasing trend) for zinc in surface soils. The concentration at locations 64 and 33 were within the range background for zinc in New Mexico surface soils. Location 65E had two values that were outside the range for New Mexico surface soil concentrations, but both of these values were observed prior to the change in analytical laboratories in 2000.

All sediment and vegetation locations, and the remaining soil locations were identified as Priority-4 for zinc.

## 4.2 Ecological Surveillance

Biota monitoring began in 1996 as an additional element of environmental monitoring within the Terrestrial Surveillance Program. The biota data collected are a part of the suggested requirements under DOE Order 5400.1 (DOE 1990). Data are collected on small mammal, reptile, amphibian, bird, and plant species currently inhabiting SNL/NM. Data are also collected in support of Facilities and the National Environmental Policy Act (NEPA) Program. Data collected includes information on population abundance, species diversity, and land use patterns.

### TA-II Monitoring Study

Site-specific monitoring was conducted from June through September 2001. The study site is located at the perimeter of TA-II and the control site in the southeastern end of the perimeter fence separating KAFB and Isleta Pueblo (SNL 2000j). Baseline data sets are compiled through visual population counts of plants and mark-and-release trapping of animals. Information collected includes species information, sex, various body dimensions, and number of recaptures. During the study, a total of 20 animal species and 42 plant species were recorded (Table 4-11).

Contamination data sets are compiled through tissue samples collected at the study sites. Whole body tissue analysis helps to determine if contaminant loads are present within the biota.

Tissue samples are analyzed for  $H^3$ ,  $U_{tot}$ , gamma spectroscopy, ICP-20 metals, and strontium-90. The two sample t-test was used in the analysis of analytes exceeding the minimum detectable activity (MDA). These analytes were then compared between the study site and control site in order to determine if a statistically significant variation in analyte concentrations occurred. No analytes exhibited a concentration difference between the two sites.

TABLE 4-11. Species Identified in TA-II Monitoring Study During Calendar Year 2001

BIRDS			
Mourning dove	<i>Zenaida macroura</i>	Northern mockingbird	<i>Mimus polyglottos</i>
Western meadowlark	<i>Sturnella neglecta</i>	Loggerhead shrike	<i>Lanius ludovicianus</i>
American robin	<i>Turdus migratorius</i>	European starling	<i>Sturnus vulgaris</i>
Western kingbird	<i>Tyrannus verticalis</i>	Black-chinned hummingbird	<i>Archilochus alexandris</i>
House finch	<i>Carpodacus mexicanus</i>	Barn swallow	<i>Hirundo rustica</i>
Say's phoebe	<i>Sayornis saya</i>	Canyon Towhee	<i>Pipilo fuscus</i>
Broad-tailed hummingbird	<i>Selasphorus platycercus</i>		
MAMMALS			
Deer mouse	<i>Peromyscus maniculatus</i>	White-footed mouse	<i>Peromyscus leucopus</i>
Silky pocket mouse	<i>Perognathus flavus</i>	Desert shrew	<i>Notiosorex crawfordi</i>
REPTILES			
New Mexico whiptail	<i>Cnemidophorus neomexicanus</i>	Great Plains skink	<i>Eumeces obsoletus</i>
Side-blotched lizard	<i>Uta stansburiana</i>		
PLANTS			
Purple three-awn	<i>Aristida purpurea</i>	Nightshade	<i>Solanum eleagnifolium</i>
Crescent milkvetch	<i>Astragalus amphioxys</i>	Scaly globe mallow	<i>Sphaeralcea leptophylla</i>
Hoary Aster	<i>Machaeranthera canescens</i>	Spike dropseed	<i>Sporobolus contractus</i>
Six-weeks grama	<i>Bouteloua barbata</i>	Ring muhly	<i>Muhlenbergia torreyi</i>
Black grama	<i>Bouteloua eriopoda</i>	Four-wing saltbush	<i>Atriplex canescens</i>
Hoffmannseggia	<i>Caesalpinia drepanocarpa</i>	Summer cypress	<i>Kochia scoparia</i>
Rush pea	<i>Caesalpinia jamesii</i>	Annual Goldenweed	<i>Machaeranthera gracilis</i>
Alkali weed	<i>Cressa truxillensis</i>	Globe mallow	<i>Sphaeralcea angustifolia</i>
Mesa dropseed	<i>Sporobolus flexuosus</i>	Perennial golden- weed	<i>Machaeranthera pinnatifida</i>
Snakeweed	<i>Gutierrezia sarothrae</i>	Nuttall locoweed	<i>Astragalus nuttallianus</i>
Winterfat	<i>Krascheninnikovia lanata</i>	Soapweed Yucca	<i>Yucca glauca</i>
Bladderpod	<i>Lesquerella fendleri</i>	Buffalo grass	<i>Buchloe dactyloides</i>
Globe mallow	<i>Sphaeralcea incana</i>	Rush pea	<i>Caesalpinia jamesii</i>
New Mexico porcupine grass	<i>Stipa neomexicana</i>	Fluff grass	<i>Dasyochloa pulchella</i>
Club cholla	<i>Opuntia clavata</i>	Hairy evolvulus	<i>Evolvulus nuttallianus</i>
Galleta	<i>Pleuraphis jamesii</i>	Plains prickly pear	<i>Opuntia polyacantha</i>
Purple sage	<i>Psoralea scoparius</i>	Gamma grass cactus	<i>Sclerocactus papyracantha</i>
Tumbleweed	<i>Salsola kali</i>	Bush muhly	<i>Muhlenbergia porteri</i>
Burro grass	<i>Scleropogon brevifolius</i>	Tree cholla	<i>Opuntia imbricata</i>

NOTE: TA = Technical Area

# Chapter 5

## Air Quality Compliance and Meteorological Monitoring

### In this Chapter ...

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### Chapter Summary

Sandia National Laboratories, New Mexico (SNL/NM) conducts air quality monitoring and surveillance under three programs: (1) the Clean Air Network (CAN) Program, (2) the National Emission Standards for Hazardous Air Pollutants (NESHAP) Program, and (3) the Air Quality Compliance (AQC) Program.

Meteorological monitoring and ambient air surveillance are conducted by the CAN Program within the Environmental Management (EM) Department. In 2001, data was collected from eight meteorological towers located throughout KAFB. The data collected from the meteorological towers provide air dispersion and transport modeling information. The ambient air surveillance data is utilized to establish background concentration levels for pollutants of concern and evaluate potential effects of Sandia Corporation's operations on air quality.

The NESHAP Program monitors radionuclide air emissions at 18 facilities (16 point and two diffuse emission sources). As required by the U.S. Environmental Protection Agency (EPA), the

### Environmental Snapshot



- *In 2001, SNL/NM earned the "Large Business Air Quality Pollution Prevention (P2) Award for 2001" given by the New Mexico Facility Managers Network.*

NESHAP Program must assess the dose to the maximally exposed individual (MEI) for radionuclide air emissions. In 2001, the MEI dose was 0.0030 mrem/yr, lower than the EPA limit of 10 mrem/yr.

The AQC Program maintains compliance with Title V regulations. In 1996, a Title V Operating Permit Application was submitted to the City of Albuquerque. Issuance of a final permit was anticipated in 2001. To date, the City of Albuquerque has yet to issue the final permit.



SNL/NM personnel surveying a meteorological tower location.

The following three programs at SNL/NM conduct air quality monitoring and surveillance:

- CAN Program - conducts meteorological monitoring and ambient air surveillance.
- NESHAP Program - coordinates with facility owners to meet radiological air emission regulations.
- AQC Program - ensures that all nonradiological air emission sources at SNL/NM, such as generators, boilers, chemical users, and vehicles meet applicable air quality standards.

## 5.1 METEOROLOGICAL MONITORING PROGRAM

The Meteorological Monitoring Program at SNL/NM commenced operations in 1994. The main objective of the Meteorological Monitoring Program is to provide site-specific representative data for SNL/NM. Data from the Meteorological Monitoring Program supports various operations and programs across SNL/NM. The data is used for air dispersion and transport modeling, to support emergency response activities, and to support regulatory permitting and reporting processes. Additional uses of meteorological data include the support of various environmental activities and programs, and providing data to SNL/NM's research and development (R&D) projects.

U.S. Department of Energy (DOE) Orders and regulations applicable to the Meteorological Monitoring Program are listed in Appendix B.

### Tower Instrumentation

SNL/NM conducts meteorological monitoring through a network of eight meteorological towers located throughout Kirtland Air Force Base (KAFB) on or near SNL/NM property. The network includes:

- Six 10-meter towers,
- One 50-meter tower, and
- One 60-meter tower.

Routine instrument calibrations and weekly tower site visits are performed as part of the Quality Assurance (QA) Program for the monitoring

network. Both meteorological and ambient air monitoring (Section 5.2) are conducted under the CAN Program within the EM Department. The CAN network of meteorological towers and ambient air monitoring locations are shown in Figure 5-1.

### 5.1.1 Meteorological Monitoring Results

The A36 60-meter tower is used to describe general meteorology at SNL/NM due to its central geographic position and availability of data at all instrument levels. Data taken at the A15 50-meter tower, while close to the densely populated area of SNL/NM, shows micro-scale urbanization effects and is not used to describe general meteorology. The 2001 annual climatic summary for tower A36 is shown in Table 5-1.

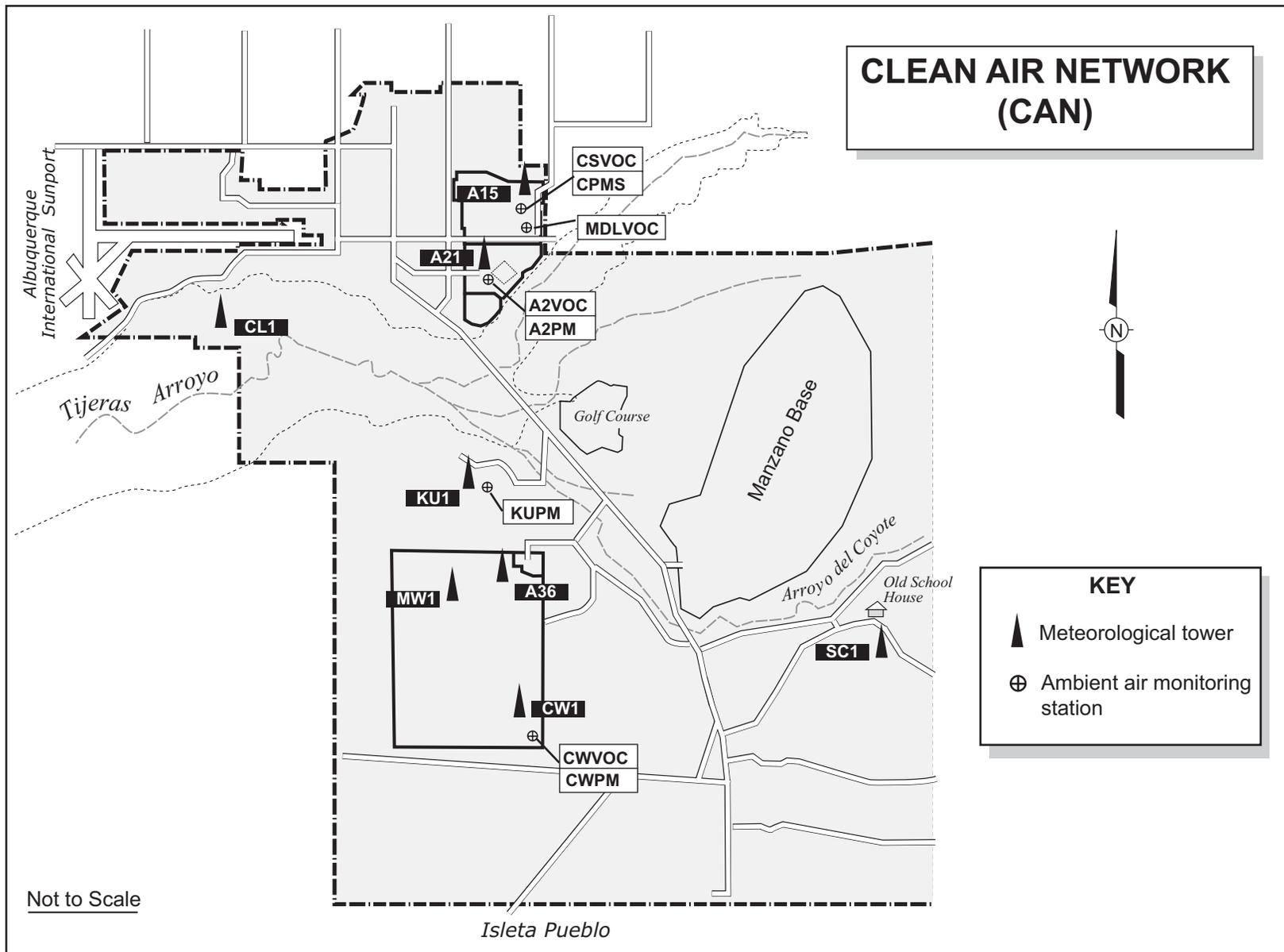
In general, the annual statistics for each of the towers are similar; however, daily meteorology varies considerably across the CAN network. This real-time variability of meteorological conditions has implications on transport and dispersion of pollutants, which are important in atmospheric emergency release scenarios and air dispersion modeling. Figure 5-2 shows some of the extremes and variations found in meteorological measurements across SNL/NM.

#### Meteorological Monitoring Towers

*All meteorological towers are instrumented to measure temperature and wind velocity\* at 3- and 10-meter levels, with the exception of tower A15, which only has a 10-meter level. Temperature and wind velocity are also measured at the top of the two tallest towers (50- and 60-meters).*

*Additionally, relative humidity is measured at the 3-meter level. Rainfall is measured at the 1-meter level at towers A36, A21, and SC1. Barometric pressure is measured at the 2-meter level at towers A36 and A21.*

*\*Including the standard deviation of horizontal wind direction ( $\sigma$  theta).*



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**FIGURE 5-1.** The Clean Air Network (CAN) of Meteorological Towers and Ambient Air Monitoring Stations

TABLE 5-1. 2001 Annual Climatic Summary from Tower A36

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Totals
<b>Temperature (°C)</b>													
Daily Max	6.67	10.41	15.90	19.00	25.35	27.60	26.42	27.41	24.30	20.31	15.59	9.76	19.1
Daily Min	-4.36	-2.32	3.18	6.47	9.36	15.56	21.06	19.82	16.55	10.81	-3.59	-3.59	7.4
Average	0.91	6.04	8.59	13.70	19.90	24.24	24.66	22.90	21.55	15.78	8.59	2.51	14.1
<b>Temperature Extremes (°C)</b>													
High	12.35	18.52	23.45	27.01	32.46	35.39	34.97	33.30	31.98	26.84	21.55	15.45	35.4
Low	-11.51	-8.49	-3.29	0.04	2.31	6.90	15.62	12.73	6.09	2.83	-6.90	-9.17	-11.5
<b>Relative Humidity (%)</b>													
	42.13	39.52	41.85	28.55	17.82	33.71	37.51	39.89	29.90	61.17	56.22	52.17	40.0
<b>Precipitation (cm)</b>													
Monthly	0.81	0.66	0.89	1.17	0.89	3.25	2.46	2.49	0.64	0.03	1.96	1.07	16.3
24 Hour Max	0.33	0.28	0.51	0.51	0.43	2.29	1.27	0.48	0.36	0.03	0.94	0.46	2.3
<b>Wind (m/s)</b>													
Monthly	3.56	3.73	3.91	4.51	4.49	4.23	3.52	3.47	3.55	3.57	3.43	2.97	3.7
24 Hour Max	11.04	7.56	9.57	9.10	8.16	7.30	7.01	5.35	5.73	6.50	7.37	6.11	11.0
Max Gust	25.25	21.25	21.25	26.05	22.05	23.65	23.65	25.25	23.65	18.85	22.05	22.05	26.1
<b>Barometric Pressure (mb)</b>													
	835.84	833.82	832.39	833.04	833.64	834.77	836.99	838.38	836.76	836.10	836.14	834.67	835.2

**NOTE: Conversions to English Units:** Temperature .... °F = (1.8)(°C) + 32  
 Wind Speed ..... mph = (2.2369)(m/s)  
 Rainfall ..... in. = (2.54)(cm)

°C = degree centigrade  
 cm = centimeter  
 m/s = meters per second  
 mb = millibars

### 5.1.2 Wind Analysis

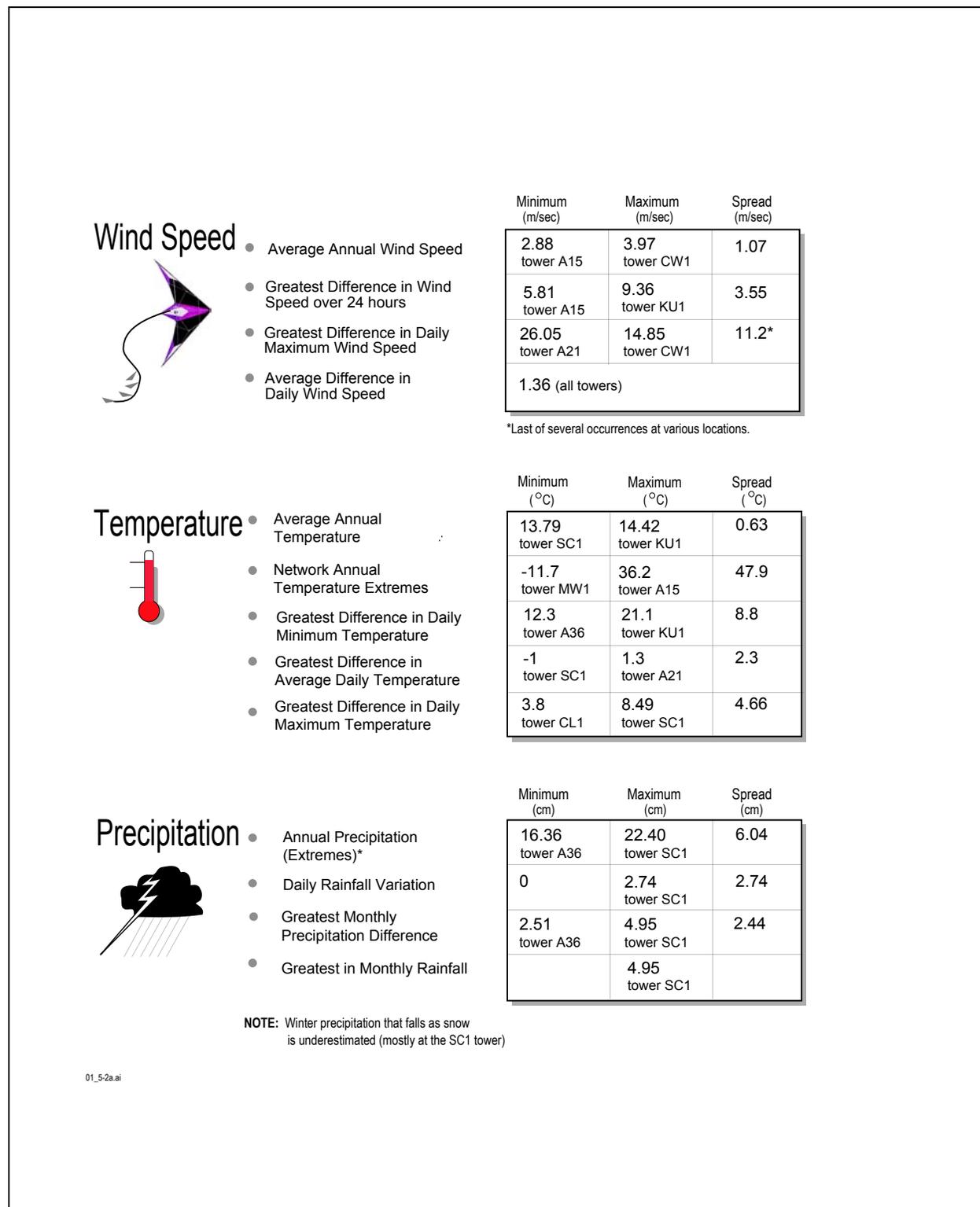
Annual wind roses for three locations across SNL/NM are illustrated in Figure 5-3. A wind rose is a graphical presentation of wind speed and direction frequency distribution. Wind direction is the true bearing when facing the wind (the direction from which the wind is blowing). As shown in Figure 5-3, wind directions and speeds can vary significantly across SNL/NM. Although not shown, the annual wind frequency distribution for Technical Area I (TA-I) shows yet another pattern with the greatest direction frequency from the east and east-northeast, as winds blow from Tijeras Canyon. The predominant wind direction at most locations is produced by topographic influences that also create nocturnal drainage flows.

A comparison of the A15 tower wind speed data with the rest of the CAN network reveals building effects on wind speed. The larger percentage of calms and low wind speeds produces the lowest average annual wind speed, as shown in Figure 5-2. In addition to the lower wind speeds, stability class frequency (not shown in the table)

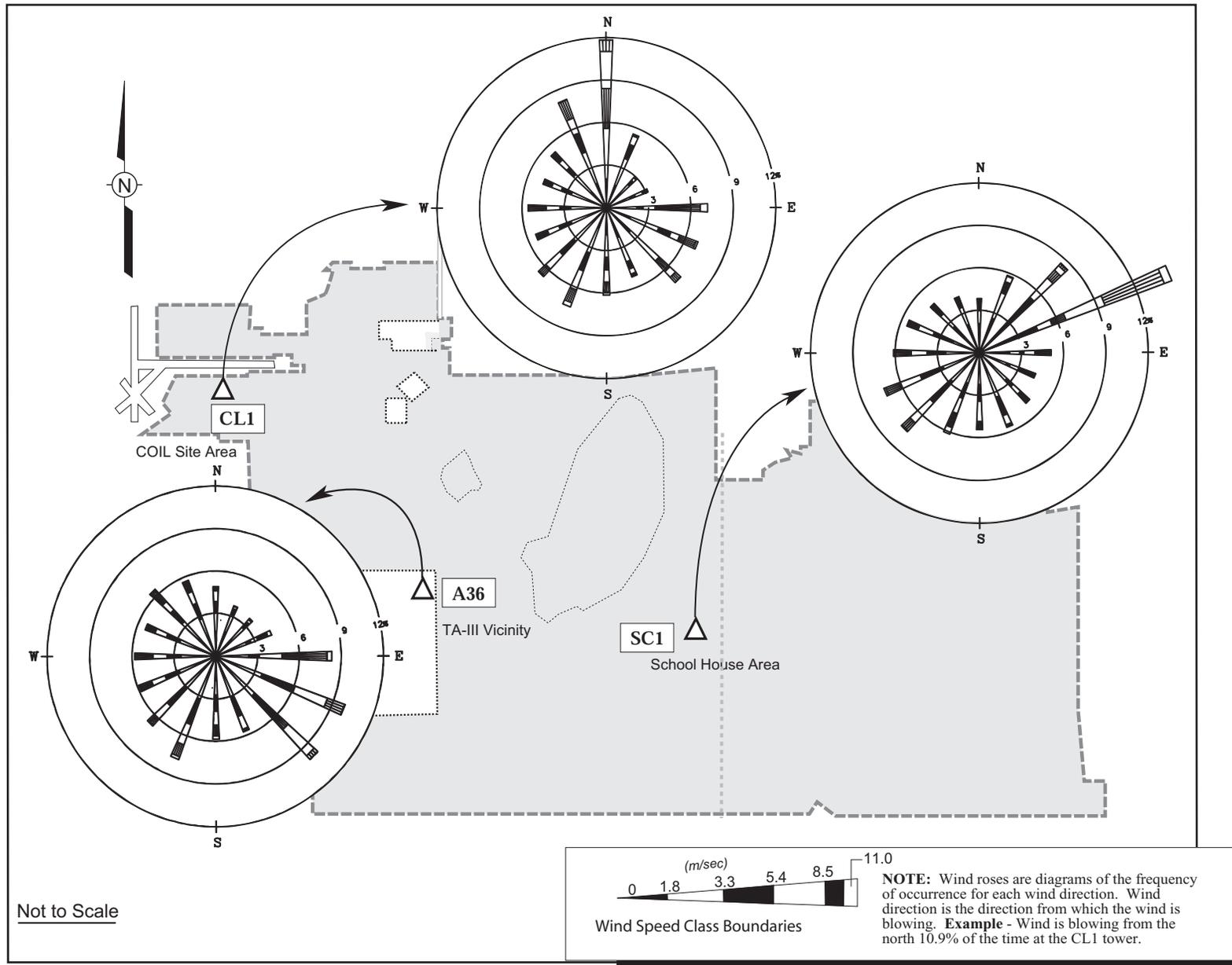
is also affected by the variations in wind direction by flow around and over buildings. The diurnal pattern of wind flow common through many areas KAFB is not apparent in the annual frequency distribution. Figure 5-4 shows the day and night wind frequency distributions for tower A36, respectively. In general, the closer to the mountains or canyons, the greater the frequency of winds coming from the easterly directions at night. Daytime wind patterns are not quite as pronounced, but winds generally flow towards the mountains or channel into the canyons.

## 5.2 AMBIENT AIR SURVEILLANCE PROGRAM

Ambient air surveillance is conducted under the CAN Program through a network of air monitoring stations located throughout KAFB on or near SNL/NM property. The primary objective of the Ambient Air Surveillance Program is to show compliance with the National Ambient Air Quality Standards (NAAQS) (40 CFR 50) and New Mexico Ambient Air Quality Standards (NMAAQs). Ambient air surveillance is also

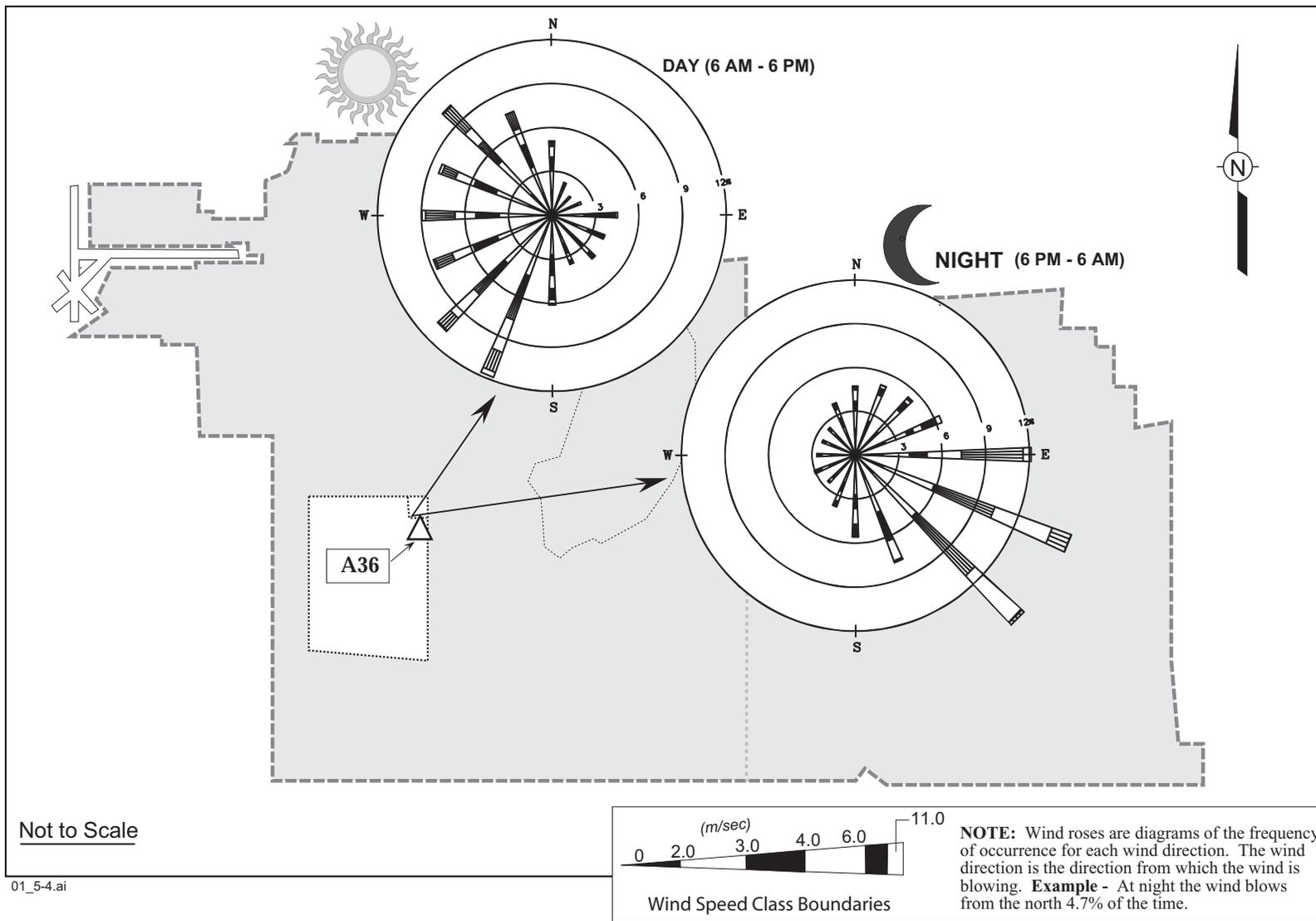


**FIGURE 5-2.** Variations and Extremes in Meteorological Measurements Across the Meteorological Tower Network During Calendar Year 2001



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FIGURE 5-3. 2001 Annual Wind Roses for Towers CL1, A36, and SC1



**FIGURE 5-4.** 2001 Annual Wind Roses for Daytime and Nighttime Wind Frequency at the A36 Tower



The SC1 meteorological tower is located near the foothills of the Manzanita Mountains on the east side of KAFB.

effects, if any, from SNL/NM operations on the public and the environment due to operations at SNL/NM. DOE Orders and applicable regulations are listed in Chapter 9 and Appendix B, respectively.

Ambient air surveillance is performed at five locations and is discussed below and illustrated in Figure 5-1.

- Criteria Pollutant Monitoring Station (CPMS)** – There is one CPMS in the CAN network, which is located in the most populated area of SNL/NM on the northeast corner of TA-I. The CPMS is used to perform continuous monitoring for sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), and ozone (O<sub>3</sub>). Data are then compiled into hourly averages. A particulate matter (PM) is a part of the CPMS. Lead, a criteria pollutant, is one of 23 metals analyzed from PM samples at this station.
- PM Stations** – There are four PM monitoring locations (CPMS, A2PM, KUPM, and CWPM) distributed throughout SNL/NM. Samples are collected over a 24-hour period starting and ending at midnight, every sixth day. This schedule is consistent with the National Air Sampling Program. Samples are analyzed for 23 metals, gross alpha, gross beta, beryllium-7, potassium-40, and total uranium.
- Volatile Organic Compound (VOC) Stations** There are four VOC monitoring stations (CSVOC, MDLVOC, CWVOC, and A2VOC). VOC samples are collected once a month over a 24-hour period.

important to establish background concentration levels for pollutants of concern and evaluate the New air quality standards for PM<sub>2.5</sub> (with a diameter equal to or less than 2.5 microns) were finalized in 2001. The annual PM<sub>2.5</sub> standard is 15 µg/m<sup>3</sup> and the 24-hour standard is 65 µg/m<sup>3</sup>. SNL/NM plans to monitor for PM<sub>2.5</sub> during 2002.

## 5.2.1 Ambient Air Monitoring Results

### Criteria Pollutants

In 2001, the automated data recovery for criteria pollutants was 94.1 percent for SO<sub>2</sub>, 59.5 percent for NO<sub>x</sub>, 95.1 percent for CO, and 92.8 percent for O<sub>3</sub>. Table 5-2 lists the results from the CPMS and compares them to NAAQS and NMAAQs for criteria pollutants.

Although violations of annual federal standards for criteria pollutants are not allowed, exceedences for short-term standards are allowable once a year. State standards also allow short-term exceedences due to meteorological conditions such as in the case of an atmospheric inversion where air mixing may be extremely restricted.

### PM

Data recovery for PM<sub>10</sub> (with a diameter equal to or less than 10 microns) was 56 percent complete based on an every-sixth-day sampling schedule. The highest daily particulate loading (103 µg/m<sup>3</sup>) occurred at the KUPM site (Table 5-2). This station also had the highest annual loading for 2001. Due to the variable number of samples per season and site that existed as a result of the poor data recovery, no additional meaningful comparisons between stations can be made. During 2001, there were no violations or exceedences of federal or state standards for PM<sub>10</sub>.

All filters collected from the PM<sub>10</sub> stations that have complete field data are analyzed for 23 metals plus five radionuclides (gross alpha, gross beta, beryllium-7, potassium-40, and uranium). Filters are collected every sixth day and are consolidated into monthly composites for analyses. In 2001, monthly composites varied from one to five filters per month, depending on the sampling schedule and missed samples. Analyses are conducted by an EPA-approved off-site laboratory. The laboratory results for the samples are subtracted from the monthly blank analysis and are averaged over the year. Due to the lack of appropriate monthly blanks and data quality problems, results for 2001 cannot be reliably calculated. Problems were corrected in

### Criteria Pollutants

The EPA has listed the following as criteria pollutants:

**SO<sub>2</sub>** is a primary contributor to acid rain and lower visibility resulting largely from coal and oil combustion, steel mills, refineries, pulp and paper mills, and from nonferrous smelters.

**NO<sub>2</sub>** is a reddish brown, highly reactive gas. **NO<sub>x</sub>** is an important precursor for both O<sub>3</sub> and acid rain. The two major emission sources for NO<sub>x</sub> are transportation and stationary fuel combustion, such as electric utility and industrial boilers.

**CO** is a colorless, odorless, and poisonous gas produced by incomplete burning of carbon fuels. Most CO emissions nationwide come from motor vehicles. Other major CO sources include wood-burning stoves, incinerators, and industrial sources.

**O<sub>3</sub>** is a photochemical oxidant and a primary ingredient in smog. Although O<sub>3</sub> is an important component of the upper atmosphere to shield the earth from harmful ultraviolet light, it is an air quality concern at ground level. O<sub>3</sub> is formed with sunlight through a complex chemical reaction involving VOC and NO<sub>x</sub> precursors.

**PM** is dust, dirt, soot, smoke, and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activities, fires, and natural windblown dust. **PM<sub>10</sub>** (with a diameter equal to or less than 10 microns) is considered a criteria pollutant because it poses an inhalation hazard. **PM<sub>2.5</sub>** (with a diameter equal to or less than 2.5 microns) is considered a criteria pollutant because it is respirable into the lungs.

**TABLE 5-2.** 2001 Criteria Pollutant Results as Compared to Regulatory Standards

Criteria Pollutant	Averaging Time	Unit	NMAAQS Standard	NAAQS Standard	Yearly Summary of Measured Concentrations
<b>Carbon Monoxide</b>	1 hour	ppm	13.1	35	4.60
	8 hours	ppm	8.7	9	2.21
<b>Nitrogen Dioxide</b>	24 hours	ppm	0.10	-	0.035
	Annual	ppm	0.05	0.053	0.009
<b>Sulfur Dioxide</b> <sup>§</sup>	3 hours	ppm	-	0.50	0.011
	24 hours	ppm	0.10	0.14	0.006
	Annual	ppm	0.02	0.03	0.001
<b>Ozone</b>	1 hour	ppm	0.12	0.12	0.066
	8 hour	ppm	-	0.080	0.062
<b>PM<sub>10</sub></b>	24 hours	µg/m <sup>3</sup>	-	150	103
	Annual	µg/m <sup>3</sup>	-	50	15.9
<b>PM<sub>2.5</sub></b>	24 hours	µg/m <sup>3</sup>	-	65	-
	Annual	µg/m <sup>3</sup>	-	15	-
<b>Total Suspended Particulates</b>	7 days	µg/m <sup>3</sup>	110	-	-
	30 days	µg/m <sup>3</sup>	90	-	-
<b>Lead</b>	30 days	µg/m <sup>3</sup>	-	-	NA
	Any quarter	µg/m <sup>3</sup>	-	1.5	NA

**NOTE:** ppm = parts per million

µg/m<sup>3</sup> = micrograms per cubic meter

NMAAQS = New Mexico Ambient Air Quality Standards

NAAQS = National Ambient Air Quality Standards

PM<sub>10</sub> = particulate matter (diameter equal to or less than 10 microns)

PM<sub>2.5</sub> = respirable particulate matter (diameter equal to or less than 2.5 microns)

<sup>§</sup>Standards are defined in µg/m<sup>3</sup> and have been converted to ppm.

NA = not available

### 2001 Ambient Air Monitoring Results

**Criteria Pollutants** – There were no violations or short-term exceedences in 2001. Measured criteria pollutants were significantly below maximum EPA standards.

**PM** – There were no violations of federal or state standards for  $PM_{10}$  during 2001.

**VOC** – All measured VOCs were significantly below TLVs.

early 2002, and data will be available in subsequent years.

#### VOCs

VOCs are highly evaporative chemicals that off-gas into the air from various sources such as petrochemical and synthetic materials, including fossil fuels, solvents, glues, plastics, paints, dry cleaning fluids, and cleaning chemicals. In 2001, the data recovery for VOC monitoring was 96 percent. Monthly VOC samples were analyzed for 33 VOC species plus total non-methane hydrocarbon (TNMHC). As shown in Table 5-3, monthly results for compounds detected are reported as averaged concentrations. These are not considered annual averages due to the method of including the sample only if the compound is detected. This method of averaging is done to prevent diluting the reported average.

The VOCs generally observed at SNL/NM are products or by-products of fossil fuels or are found in solvents. An analysis of variance was performed to determine if any statistical differences existed between locations for each VOC. The analysis of variance did not reveal any unexpected results. VOC results were significantly below TLVs, where established.

## 5.3 RADIOLOGICAL AIR EMISSIONS

The EM Department provides NESHAP compliance support to all SNL/NM facilities and operations. The EPA regulates radionuclide air emissions in accordance with 40 CFR 61, Subpart H, “National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities.” The EPA

has set a MEI radiological dose limit of 10 millirems per year (mrem/yr) resulting from all radiological air emissions produced from a DOE facility.

### 5.3.1 Compliance Reporting

Sandia Corporation prepares an annual NESHAP report that summarizes radionuclide air emission releases from SNL/NM facilities and presents the results of the annual dose assessment. The EPA requires this report to be submitted by June 30<sup>th</sup> following the reporting year. The DOE, National Nuclear Security Administration (NNSA), Office of Kirtland Site Operations (OKSO) submits the annual report to EPA, and the City of Albuquerque, Environmental Health Division. The NESHAP report is complimented by a more comprehensive report detailing facility emission factors, demographic data, and dose assessment calculations and is available to the EPA, the DOE, and the New Mexico Environment Department (NMED) upon request. The NESHAP reports prepared in 2001 include the *NESHAP Annual Report for CY01, Sandia National Laboratories, New Mexico* (SNL 2002d) and the *Radiological Dose Calculations and Supplemental Dose Assessment Data for NESHAP Compliance, Sandia National Laboratories, New Mexico 2001* (SNL 2002e).

### 5.3.2 SNL/NM NESHAP Facilities

SNL/NM currently has 18 NESHAP facilities that may be defined as either point or diffuse emissions sources. Point sources are produced from an exhaust stack or vent, while diffuse sources emanate from broad areas of contamination, such as radionuclide-contaminated soils present at some Environmental Restoration (ER) sites.

Table 5-4 lists the radionuclides and the total reported emissions (in curies) from each SNL/NM NESHAP source in 2001. Of the 18 sources, 16 were point sources and two were diffuse sources (landfills). Three of the 18 facilities reported zero emissions in 2001. Calculations were used to estimate the emissions from the Chemical Waste Landfill (CWL), which is another non-routine source.

The 18 SNL/NM NESHAP facilities located in five TAs (Figure 5-5) are described below. Each facility process that produces radioactive air emissions is also briefly described.

**TABLE 5-3.** VOC Average Concentrations Compiled from Monthly Results at Four Stations  
Average was computed using only detected results.

Compound	VOC Stations				TLV* (ppbv)
	CPMS (ppbv)	CWLVOG (ppbv)	MDLVOG (ppbv)	A2VOG (ppbv)	
1,1,1-Trichloroethane	0.068	5.642	30.112	0.074	350,000
1,1,2-Trichlorotrifluoroethane	0.112	0.094	0.084	0.077	1,000,000
1,2-Dichlorobenzene	0.139	--	--	--	10,000
1-Butene/Isobutene	0.553	0.243	0.636	0.430	N/A
2,2,4-Trimethylpentane	0.224	0.053	0.471	0.099	N/A
2-Butanone	1.058	0.468	1.367	0.734	200,000
2-Methylbutane	3.294	0.379	1.682	1.756	1,770,000
3-Methylpentane	0.390	0.043	0.295	0.136	N/A
4-Methyl-2-pentanone (MIBK)	0.076	--	--	--	50,000
Acetone	6.166	5.455	6.743	6.285	500,000
Benzene	0.540	0.086	0.384	0.206	500
Carbon tetrachloride**	0.084	0.086	0.084	0.077	5,000
Chlorobenzene	0.055	0.070	0.056	--	10,000
Chloromethane	0.594	0.587	0.584	0.557	50,000
Dichlorodifluoromethane	0.628	0.738	0.592	0.584	10,000
Ethylbenzene	0.155	0.063	0.263	0.216	100,000
Isohexane	0.442	0.083	0.256	0.247	500,000
Methylene chloride**	1.002	1.143	1.340	6.507	50,000
n-Butane	1.481	0.390	0.923	0.776	800,000
n-Hexane	0.649	0.325	0.334	0.171	50,000
n-Pentane	1.932	0.273	0.895	0.958	600,000
n-Undecane	0.483	--	0.598	1.180	N/A
o-Xylene	0.163	0.085	0.214	0.167	100,000
m/p-Xylene	0.402	0.155	0.350	0.337	100,000
Tetrachloroethene	0.099	0.344	0.050	0.095	25,000
Toluene	2.029	0.124	1.906	0.684	50,000
Trichloroethene	5.610	--	0.030	0.048	50,000
Trichlorofluoromethane	0.429	0.327	0.522	0.307	1,000,000*
TNMHC (total non-methane hydrocarbons)	33.231	10.075	33.063	15.829	N/A

**NOTE:** ppbv = parts per billion by volume

ND = not detected

N/A = not applicable or not measured or not available

VOC = volatile organic compounds. VOCs may be shown of as separate species as well as in combination with another analyte.

TLV= threshold limit value. (TLVs are guidelines and not legal standards. TLV guidelines assist in the control of health hazards.) (ACGIH 2002)

\*Values listed are time-weighted averages (TWAs) except where marked. TWA is the concentration for a normal 8-hour workday and a 40-hour week, to which nearly all workers may be repeatedly exposed without adverse effect. Short-term exposure limit (STEL) is a 15-minute TWA which should not be exceeded at any time during the workday even if the 8-hour TWA is within the TLV.

\*\* Ozone depleting compounds.

TABLE 5-4. Summary of Radionuclide Releases from the 18 NESHAP Sources in 2001

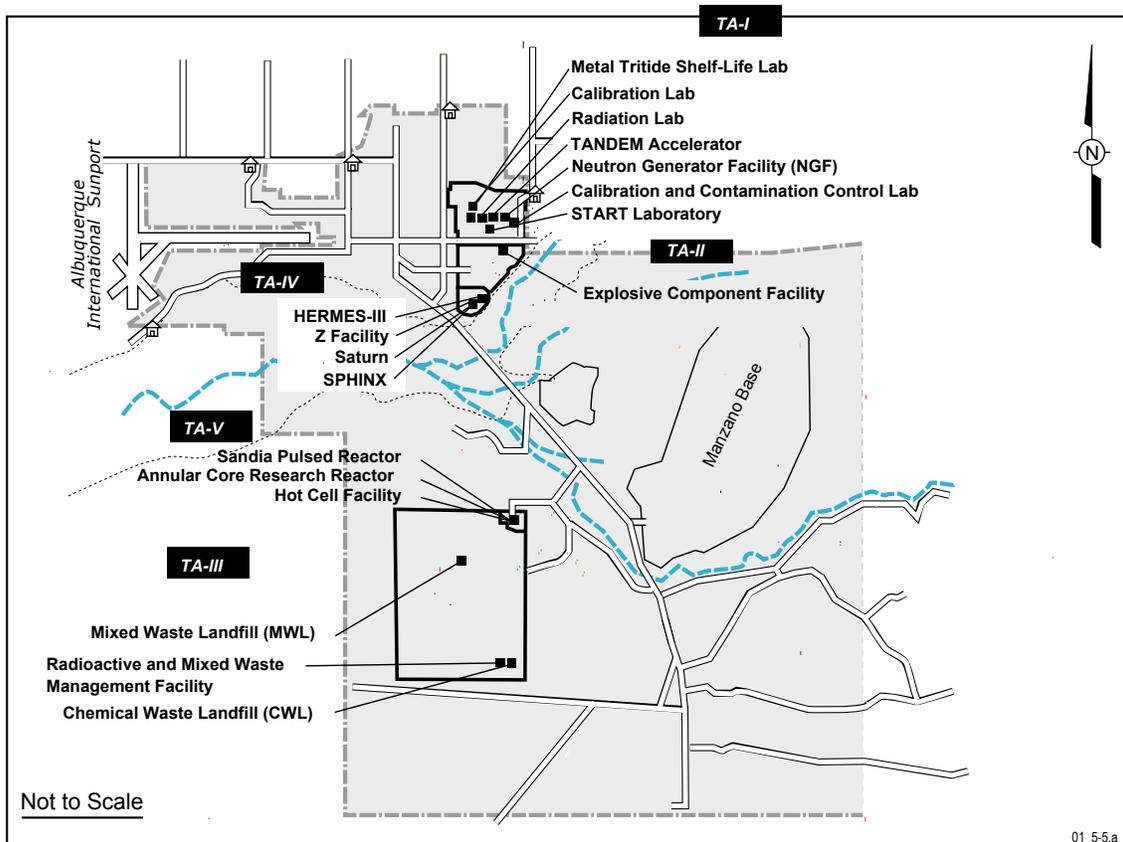
TA	Facility Name	Monitoring Method *	CAP88 Input?	Radionuclide	Reported Release (Ci/yr)
I	Sandia Tomography and Radionuclide Transport (START) Laboratory	Calculation	no	Sodium-22 Technetium-99 Uranium-232 Americium-241 Plutonium-241	$1.0 \times 10^{-13}$ $1.0 \times 10^{-13}$ $1.0 \times 10^{-13}$ $1.0 \times 10^{-13}$ $1.0 \times 10^{-13}$
I	Radiation Laboratory	Calculation	no	Tritium Nitrogen-13 Nitrogen-16 Argon-41	$1.0 \times 10^{-5}$ $2.0 \times 10^{-7}$ $1.0 \times 10^{-6}$ $1.0 \times 10^{-9}$
I	Calibration Laboratory	Calculation	no	Tritium	$2.75 \times 10^{-4}$
I	NGF – North Wing Tritium Envelope	Calculation	yes	Tritium	4.2
I	TANDEM Accelerator	Calculation	no	Tritium	$1.0 \times 10^{-6}$
I	Metal Tritide Shelf-Life Laboratory	Calculation	no	Tritium	$< 5.0 \times 10^{-9}$
I	Cleaning and Contamination Control Laboratory (CCCL)	Calculation	no	Carbon-14	$3.5 \times 10^{-6}$
II	Explosive Components Facility (ECF)	Calculation	no	Tritium	$4.65 \times 10^{-4}$
III	MWL (Diffuse emissions)	Periodic	yes	Tritium	0.294
III	RMWMF	Continuous	yes	Tritium Americium-241 Strontium-90 Cesium-137	$6.43 \times 10^{-3}$ $2.52 \times 10^{-7}$ $3.83 \times 10^{-7}$ $1.06 \times 10^{-8}$
III	Chemical Waste Landfill (CWL) (Diffuse emissions)	Calculation	yes (not routine)	Cobalt-60 Tritium Thorium-232 Radium-228 Thorium-228 Actinium-228 Radium-224 Lead-212 Bismuth-212 Thallium-208 Uranium-235 Thorium-231 Uranium-238 Radium-226 Lead-214 Bismuth-214 Cesium-144 Chromium-51 Iron-59 Thorium-234 Americium-241 Cesium-137 Ruthenium-106 Cesium-134 Ruthenium-103 Zirconium-95 Yttrium-88 Potassium-40	$1.69 \times 10^{-8}$ $1.31 \times 10^{-5}$ $3.99 \times 10^{-6}$ $3.74 \times 10^{-6}$ $9.3 \times 10^{-7}$ $3.8 \times 10^{-6}$ $1.09 \times 10^{-6}$ $3.86 \times 10^{-6}$ $1.16 \times 10^{-6}$ $9.08 \times 10^{-7}$ $1.14 \times 10^{-7}$ - $6.11 \times 10^{-7}$ $4.12 \times 10^{-6}$ $3.37 \times 10^{-6}$ $7.15 \times 10^{-7}$ $4.41 \times 10^{-8}$ $5.29 \times 10^{-8}$ $5.61 \times 10^{-8}$ $7.03 \times 10^{-7}$ $5.54 \times 10^{-8}$ $5.13 \times 10^{-8}$ $5.13 \times 10^{-8}$ $1.19 \times 10^{-8}$ $1.06 \times 10^{-8}$ $5.08 \times 10^{-8}$ $3.19 \times 10^{-8}$ $8.89 \times 10^{-5}$

NOTE: See notes at end of table.

**TABLE 5-4.** Summary of Radionuclide Releases from the 18 NESHAP Sources in 2001  
(concluded)

TA	Facility Name	Monitoring Method *	CAP88 Input?	Radionuclide	Release (Ci/yr)
IV	HERMES III	Periodic	no	Nitrogen-13 Oxygen-15	6.87 x 10 <sup>-4</sup> 6.87 x 10 <sup>-5</sup>
IV	Saturn Facility	Calculation	no (no releases in 2001)	none	0
IV	SPHINX	Periodic	no (no releases in 2001)	none	0
IV	Z-Facility (Accelerator)	Calculation	yes	Uranium-234 Uranium-235 Uranium-238	2.05 x 10 <sup>-7</sup> 9.10 x 10 <sup>-9</sup> 1.99 x 10 <sup>-7</sup>
V	Hot Cell Facility (HCF)	Periodic	no (no releases in 2001)	none	0
V	Annular Core Research Reactor (ACRR)	Periodic	yes	Argon-41	16.2
V	Sandia Pulsed Reactor (SPR)	Periodic	no (no releases in 2001)	none	0

**NOTE:** \*Monitoring Method: Periodic = Based on periodic measurements  
 Calculation = Calculated from known parameters  
 Continuous = Based on continuous air monitoring results  
 HERMES III = High Energy Radiation Megavolt Electron Source III  
 CAP88 = Clean Air Act Assessment Package (EPA 2001)S  
 SPHINX = Short Pulse High Intensity Nanosecond X-Radiator  
 Ci/yr = curies per year  
 TA= Technical Area



**FIGURE 5-5.** Locations of the 18 Facilities at SNL/NM that Provided Radionuclide Release Inventories in 2001

### TA-I Sources

**Calibration Laboratory** – Calibration on radiation detection equipment resulted in small releases of tritium.

**Cleaning and Contamination Control Laboratory (CCCL)** – The CCCL is used for R&D of new and superior materials for government and industrial needs. Carbon-14 was the only radionuclide emission reported in 2001.

**Metal Tritide Shelf-Life Laboratory** – This laboratory, which conducts research on tritium materials, released negligible levels of tritium (five billionths of a curie).

**Neutron Generator Facility (NGF)** – The NGF is the nation's principal production facility for neutron generators used in nuclear weapons. This facility currently emits only tritium. The facility has two stacks, but only utilizes the main stack in the Tritium Envelope North Wing. In 2001, 4.2 Curies (Ci) were reported released from the North Wing stack, based on continuous stack monitoring. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, it is performed voluntarily at the NGF as a best management practice (BMP).

**Radiation Laboratory** – Small-scale radiation experiments resulted in the release of air-activation products and tritium.

**Sandia Tomography and Radionuclide Transport (START) Laboratory** – This laboratory is used to perform small-scale experiments. In 2001, the facility reported emissions of sodium-22, technetium-99, plutonium-241, americium-241, and uranium-232.

**TANDEM Accelerator** – This is an ion solid interaction and defect physics accelerator facility. Although the TANDEM did not operate in 2001, the facility reported emissions of tritium that was being housed in the facility.

**Weapons Assembly (WA) System Level Testing Facility** – This is a research facility that assembles weapons trainers for various tests. Zero emissions have been reported since 1997. Operations within the facility are not expected to change in the future. As a result, the WA System Level Testing Facility has been removed from the NESHAP program.

### TA-II Sources

**Explosive Components Facility (ECF)** – The ECF conducts destructive testing on neutron generators. The only release in 2001 was tritium. Noise caused by explosive testing activities is addressed in the *SNL Final Site-Wide Environmental Impact Statement* (DOE 1999).

### TA-III Sources

**CWL** – The CWL is a non-routine NESHAP source. The primary contaminants identified at this diffuse source are cobalt-60, tritium, potassium-40, and uranium and thorium series radionuclides. Remediation on the CWL began in 1998. Soil and debris samples were collected and analyzed for radioactive content and used to estimate the total radioactivity excavated in 2001. A worst case analysis was performed, which assumed that all radioactivity present was re-suspended into the air.

**Mixed Waste Landfill (MWL)** – The MWL was closed in 1988. Although a diverse inventory of radionuclides is present in the MWL, measurements indicate that tritium is the only radionuclide released into the air. In 1992 and 1993, two special studies were conducted to quantify the tritium emissions (Radian 1994).

**Radioactive and Mixed Waste Management Facility (RMWMF)** – The RMWMF primarily handles low-level waste (LLW), mixed waste (MW), and some transuranic (TRU) waste. In 2001, the RMWMF reported tritium releases, americium-241, strontium-90, and cesium-137 as determined by continuous stack monitoring. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, it is performed voluntarily at the RMWMF as a BMP.

### TA IV Sources

**High-Energy Radiation Megavolt Electron Source - III (HERMES - III)** – The HERMES-III accelerator is used to test the effects of prompt radiation on electronics and complete military systems. This facility produces air activation products, primarily nitrogen-13 and oxygen-15.

**Saturn Accelerator** – This is a modular, high powered, variable spectrum, x-ray simulation source that reproduces the radiation effects of nuclear countermeasures on electronic and

material components. Zero emissions were reported in 2001.

**Short Pulsed High Intensity Nano-second X-Radiator (SPHINX) Facility** – The SPHINX is a high voltage, high shot rate bremsstrahlung accelerator used to measure the x-ray induced photo currents from short, fast rise time pulses in integrated circuits. Zero emissions were reported in 2001.

**Z Facility** – The Z Facility is an accelerator used for research on light ion inertial confinement fusion. Large amounts of electrical energy are stored over several minutes and then released as an intense concentrated burst (shot) at a target. In 2001, uranium targets were utilized. Consequently, the facility reported releases of uranium-234, uranium-235, and uranium-238.

### **TA V Sources**

**Annular Core Research Reactor (ACRR)** – This reactor is used primarily to support defense program projects. If required in the future, the facility also has the capability to support the Medical Isotope Production Project (MIPP). Argon-41, an air activation product, was the only reported release in 2001.

**Hot Cell Facility (HCF)** – The HCF provides full capability to remotely handle and analyze radioactive materials such as irradiated targets. The facility is in standby mode to support MIPP should production be required in the future. No emissions were reported in 2001.

**Sandia Pulsed Reactor (SPR)** – The SPR is used to produce intense neutron bursts for effects testing on materials and electronics. No emissions were reported in 2001. In September 2000, the reactor was placed in temporary storage. Operations are expected to resume in Calendar Year (CY) 2003.

## **5.4 ASSESSMENT OF POTENTIAL DOSE TO THE PUBLIC**

In general, the dose received by a person is dependent on the distance from the source, the available pathways in the environment (food chain, air, and water), radionuclide quantities and properties, and meteorological conditions. Historically, radioactive releases from SNL/NM have resulted in doses to the public that are several

orders of magnitude below the EPA's standard of 10 mrem/yr. Radiation protection standards specific to DOE facilities are given in Appendix B.

### **5.4.1 NESHAP Dose Assessment Input**

#### **Emission Sources**

To assess compliance, all NESHAP facilities at SNL/NM must submit annual facility emission data to the NESHAP Program administrator. The emissions from eight "primary" sources (ACRR, CWL, SPR, HCF, Z Facility, NGF, RMWMF, and MWL) are modeled using version 2 of the EPA's Clean Air Act (CAA) Assessment Package-1988 (CAP88) (EPA 2001a) to estimate the annual dose to each of 29 identified public receptors. Primary sources are those that determine their emissions by direct measurements or by calculations based on measured operational parameters. The HCF and SPR were the only primary sources to report zero emissions in CY 2001.

The NESHAP regulation requires DOE to continuously monitor any radionuclide air emission source that has the potential to produce a dose of 0.1 mrem/yr to the MEI; however, there are no facilities at SNL/NM that exceed this criterion. As a BMP, some SNL/NM facilities do perform continuous stack monitoring. Other facilities base their emission estimates on periodic confirmatory measurements or engineering calculations.

In 2001, the highest emissions were argon-41 and tritium. Historically, these radionuclides have been the most significant contributors to the effective dose equivalent (EDE) of the MEI. Figure 5-6 shows the annual reported release in curies of argon-41 and tritium over the past 12 years.

#### **Demographic Data**

Demographic data includes resident population, the number of beef and dairy cattle, and the utilized food crop area fraction for the 50-mi radius study area. The densities for resident population, cattle, and food crops are calculated as the quotient of the most recent county data and the county land area (e.g., cows per acre). In 2001, the NESHAP calculation for resident population was based on the state's 1994 to 1995 estimated urban and county population data and U.S. Census Bureau data (DOC 2002). The beef and dairy cattle numbers and the food crop area fractions were calculated using the 1995 agricultural statistics supplied by the New Mexico Department of

Agriculture (NMDOA 2002). The following values were used in the 2001 CAP88 calculation:

15,790	Dairy cattle
32,696	Beef cattle
87.7	Food crops square miles (sq mi)
695,406	Population (within 50-mi radius)

### On-site and Off-site Public Receptors

A total of 29 receptor locations (22 on-site at KAFB and seven off-site) in the vicinity of SNL/NM have been identified as potential locations of maximum exposure to a member of the public. Off-site receptor locations extend to the Isleta Indian Reservation, the Four Hills subdivision north of KAFB, the Manzanita Mountains (east mountain residents), and areas near the Albuquerque International Sunport west of KAFB. On-site receptors include U.S. Air Force (USAF) facilities, offices and housing areas, as well as other non-DOE and non-U.S. Department of Defense (DoD) facilities on KAFB. In October 2000, the United States Geological Survey (USGS) Seismic Center receptor was relocated to the former location of KAFB's Space Vehicle Directorate. USAF occupants at this location were moved to various other areas within KAFB that are already on SNL/NM's list of receptors. The USGS receptor has been removed from the list of SNL/NM receptors for CY 2001.

### Meteorology

Data from four meteorological towers (CW1, A36, A21, and MW1) in the proximity of NESHAP emission sources were used in 2001. Data from each tower consisted of approximately 35,000 hourly observations of wind direction, wind speed, and stability class (inferred from wind and solar insolation data). The data are compiled into a normalized distribution from which all wind and stability frequency-of-occurrence data were derived.

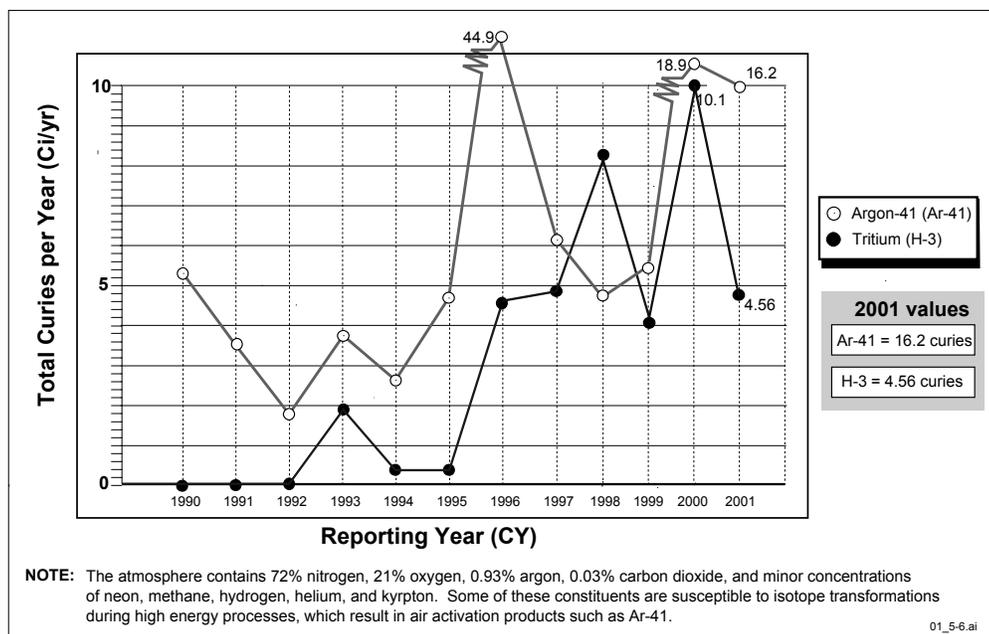
### 5.4.2 Dose Assessment Results

CAP88 utilizes a gaussian plume equation that estimates air dispersion in both the horizontal and vertical directions. Individual EDEs to off-site and on-site receptors are presented in Tables 5-5 and 5-6, respectively. Dose assessment results are summarized in Table 5-7.

The total dose at each receptor location is determined by summing the individual doses resulting from each source. The dose to the MEI member of the public is then compared to the EPA limit of 10 mrem/yr.

In 2001, the MEI was again located on KAFB, at the KAFB Storage Facility, northwest of TA-V. The MEI dose of 0.0030 mrem/yr resulted primarily from releases of argon-41.

### Collective Dose



**FIGURE 5-6.** Summary of Atmospheric Releases in Argon-41 and Tritium from SNL/NM Facilities Since 1990

**TABLE 5-5.** Annual Source-Specific Effective Dose Equivalent (EDE) to Off-site Receptors in 2001

Receptor	ACRR	SPR	CWL	RMMWF	MWL	NGF	Z Facility	EDE (mrem/yr)
Albuquerque City Offices	3.60E-04	0.00E+00	4.00E-05	3.50E-06	7.80E-06	2.10E-04	9.50E-06	<b>6.31E-04</b>
East Resident	2.10E-05	0.00E+00	7.30E-06	9.90E-07	5.50E-06	1.90E-04	6.90E-07	<b>2.25E-04</b>
Eubank Gate Area	2.30E-04	0.00E+00	1.90E-05	1.80E-06	6.40E-06	3.50E-04	1.50E-05	<b>6.22E-04</b>
Four Hills	2.50E-04	0.00E+00	2.00E-05	1.90E-06	6.30E-06	2.10E-04	6.40E-06	<b>4.95E-04</b>
Isleta Bingo	5.30E-05	0.00E+00	2.10E-05	2.00E-06	6.00E-06	2.00E-04	1.90E-06	<b>2.84E-04</b>
Northeast Resident	1.10E-04	0.00E+00	1.70E-05	1.70E-06	5.90E-06	2.00E-04	1.80E-06	<b>3.36E-04</b>
Tijeras Arroyo (West)	5.10E-04	0.00E+00	5.20E-05	4.40E-06	9.00E-06	2.20E-04	8.60E-06	<b>8.04E-04</b>

**NOTE:** mrem/yr = millirem per year  
 SPR = Sandia Pulsed Reactor  
 RMWMF = Radioactive Mixed Waste Management Facility

ACRR = Annular Core Research Reactor  
 CWL = Chemical Waste Landfill  
 MWL = Mixed Waste Landfill  
 NGF = Neutron Generator Facility

**TABLE 5-6.** Annual Source-Specific Effective Dose Equivalent (EDE) to On-site Receptors in 2001

Receptor	ACRR	SPR	CWL	RMMWF	MWL	NGF	Z Facility	EDE (mrem/yr)
Airport	4.80E-04	0.00E+00	2.20E-05	1.60E-06	1.40E-06	4.80E-05	2.20E-05	<b>5.75E-04</b>
Airport East	2.40E-04	0.00E+00	1.90E-05	1.40E-06	1.10E-06	5.40E-05	1.10E-05	<b>3.27E-04</b>
U.S. Air Force (USAF) #1	3.40E-04	0.00E+00	1.70E-05	1.20E-06	1.10E-06	8.20E-05	4.70E-05	<b>4.88E-04</b>
USAF #2	2.10E-04	0.00E+00	1.40E-05	1.00E-06	8.70E-07	1.10E-04	1.20E-05	<b>3.48E-04</b>
Chestnut Test Site	5.00E-04	0.00E+00	4.00E-04	2.80E-05	2.60E-06	7.00E-06	2.20E-06	<b>9.40E-04</b>
East Capehart	1.80E-04	0.00E+00	1.30E-05	9.40E-07	7.80E-07	3.30E-05	9.90E-06	<b>2.38E-04</b>
Golf Course Clubhouse	1.20E-03	0.00E+00	3.70E-05	2.70E-06	2.40E-06	1.70E-05	1.20E-05	<b>1.27E-03</b>
Golf Course Maintenance Area	8.00E-04	0.00E+00	3.00E-05	2.20E-06	1.80E-06	2.40E-05	2.50E-05	<b>8.83E-04</b>
Honeywell Instrument Support Site	4.50E-04	0.00E+00	2.00E-05	1.40E-06	1.40E-06	6.30E-05	2.10E-04	<b>7.46E-04</b>
ITRI/Lovelace	1.50E-04	0.00E+00	3.40E-05	2.30E-06	6.20E-07	4.00E-06	1.10E-06	<b>1.92E-04</b>
KAFB Landfill	4.30E-04	0.00E+00	2.20E-05	1.60E-06	1.20E-06	5.00E-05	4.90E-05	<b>5.54E-04</b>
Kirtland Air Force Base (KAFB) Fire Station #4	2.40E-04	0.00E+00	6.90E-05	5.20E-06	1.30E-06	4.80E-06	1.30E-06	<b>3.22E-04</b>
KAFB Storage Facility	2.90E-03	0.00E+00	5.60E-05	4.10E-06	5.60E-06	1.90E-05	1.10E-05	<b>3.00E-03</b>
Loop Housing	2.00E-04	0.00E+00	1.40E-05	1.00E-06	8.60E-07	1.20E-04	1.90E-05	<b>3.55E-04</b>
Manzano Offices (Fire Station)	6.10E-04	0.00E+00	4.30E-05	2.90E-06	1.50E-06	9.70E-06	3.30E-06	<b>6.70E-04</b>
Maxwell Housing	2.50E-04	0.00E+00	1.50E-05	1.10E-06	1.40E-06	2.70E-05	5.70E-06	<b>3.00E-04</b>
Pershing Park Housing	2.10E-04	0.00E+00	1.20E-05	9.00E-07	7.60E-07	7.00E-05	1.30E-05	<b>3.07E-04</b>
Riding Club	1.30E-03	0.00E+00	4.70E-05	3.30E-06	2.30E-06	1.20E-05	6.10E-06	<b>1.37E-03</b>
Sandia Federal Credit Union	2.90E-04	0.00E+00	1.50E-05	1.10E-06	9.90E-07	2.20E-04	3.10E-05	<b>5.58E-04</b>
Seismic Center (USGS)	1.90E-04	0.00E+00	3.20E-05	2.10E-06	7.70E-07	4.60E-06	1.40E-06	<b>2.31E-04</b>
West Capehart	2.30E-04	0.00E+00	2.10E-05	1.00E-06	7.70E-07	1.70E-05	3.90E-06	<b>2.74E-04</b>
Zia Park Housing	2.80E-04	0.00E+00	1.60E-05	1.50E-06	1.20E-06	9.10E-05	2.20E-05	<b>4.12E-04</b>

**NOTE:** ACRR = Annular Core Research Reactor  
 SPR = Sandia Pulsed Reactor  
 CWL = Chemical Waste Landfill  
 RMWMF = Radioactive Mixed Waste Management Facility  
 mrem/yr = millirem per year Storage Complex

MWL = Mixed Waste Landfill  
 NGF = Neutron Generator Facility  
 USGS = U.S. Geological Survey  
 KAFB = Kirtland Air Force Base

**TABLE 5-7.** Calculated Dose Assessment Results for On-site and Off-site Receptors and for Collective Populations in 2001

Dose to Receptor	Location	2001 Calculated Dose	NESHAP Standard
<b>Individual Dose</b>			
On-site Receptor EDE to the MEI	KAFB Facility	0.0030 mrem/yr (0.000030 mSv/yr)	10 mrem/yr (0.1 mSv/yr)
Off-site Receptor EDE to the MEI	Tijeras Arroyo (West) West of KAFB	0.0008 mrem/yr (0.000008 mSv/yr)	10 mrem/yr (0.1 mSv/yr)
<b>Collective Dose</b>			
Collective Regional Population <sup>1</sup>	Residents within an 80-km (50-mi) radius	0.0682 person-rem/yr (0.000682 person-Sv/yr)	No standard available
Collective KAFB Population <sup>2</sup>	KAFB housing	0.00144 person-rem/yr (0.000023 person-Sv/yr)	No standard available

**NOTE:** <sup>1</sup>Based on a population of 695,406 people estimated to be living within an 80-km (50-mi) radius.

<sup>2</sup>Based on a population of 3,285 people estimated to be living in permanent on-base housing.

mSv/yr = millisievert per year

person-Sv/yr = person-seviert per year

mrem/yr = millirem per year

EDE = effective dose equivalent

MEI = maximally exposed individual

KAFB = Kirtland Air Force Base

NESHAP = National Emissions Standards for Hazardous Air Pollutants

The collective population dose resulting from all SNL/NM radiological emissions was calculated for both KAFB and the regional area (Table 5-7). Collective dose calculations are not required by NESHAP regulations; however, it provides a useful numerical comparison of the public dose from year to year. Collective dose is calculated by multiplying a representative individual dose, within a population, by the total population. SNL/NM calculates the collective population dose for both the KAFB housing areas and the general Albuquerque area population within an 80-km (50-mi) radius.

- **Regional** – The Albuquerque regional collective population dose in 2001 was 0.0682 person-rem/yr. For the purpose of calculating the collective dose, all releases are assumed to occur from a location centered in TA-V. The population dose was calculated by multiplying 695,406 residents by doses per sector.
- **KAFB** – A collective population dose for

KAFB residents was calculated based on six main housing areas. The total population dose for KAFB was obtained by summing the six areas based on a total residential population of 3,285. This resulted in an estimated population dose of 0.00144 person-rem/yr.

## 5.5 AIR QUALITY REQUIREMENTS AND COMPLIANCE STRATEGIES

Air quality standards are implemented by regulations promulgated by local and federal governments in accordance with the CAA and the CAA amendments (CAAA) of 1990. The Albuquerque/Bernalillo County Air Quality Control Board (ABC/AQCB), the State of New Mexico, and the EPA determine applicable air quality standards for non-radiological pollutants. Radionuclide air emissions are currently regulated by the EPA under NESHAP, as discussed in Section 5.4, although the radionuclide NESHAP regulations are in the process of being delegated

by the EPA to the ABC/AQCB. A complete list of air quality regulations applicable to SNL/NM is given in Appendix B .

### 5.5.1 SNL/NM Air Emission Sources

As discussed in Section 5.2, criteria pollutants include SO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, PM, and lead. For these criteria and other pollutants, the EPA:

- Sets ambient air quality standards, including motor vehicle emissions;
- Requires state plans for protection and improvement of air quality;
- Institutes air quality programs to prevent the nation's air from deteriorating; and
- Establishes hazardous air pollutant (HAP) control programs.

EPA standards for criteria pollutants are given in 40 CFR 50, "National Ambient Air Quality Standards" and implemented in 20 NMAC 11.01 "General Provisions." Compliance with criteria pollutant standards for ambient air is met through ambient air surveillance, periodic direct emission sampling, and fuel throughput tracking and reporting. As discussed in the previous section, ambient air measurements taken in the vicinity of SNL/NM facilities have been well below maximum TLVs and guidelines for criteria pollutants.

The significant sources of criteria pollutants at SNL/NM are listed below.

#### Steam Plant

The Steam Plant produces steam heat for buildings in TA-I as well as some facilities in KAFB east. The plant has run continuously since 1949. The five boilers (Boilers 1, 2, 3, 5, and 6) run primarily on natural gas, but can also burn diesel. All five boilers were used in 2001. The volume of fuel throughput used in the boilers is reported to the City of Albuquerque. In 2001, fuel throughput reported at the Steam Plant was as follows: As defined by 20 NMAC 11.67, "Equipment,

<b>Natural Gas (scf)</b>	<b>Diesel (gal)</b>
579,270,350	610,967

**NOTE:** scf = standard cubic feet  
gal = gallon

Emissions, and Limitations," the Steam Plant falls below the applicable minimum emission limits for NO<sub>x</sub>. Stack sampling is not required for the Steam Plant since it is a "grandfathered" source and no permit has been previously required. There are no other air quality regulations that apply to the Steam Plant. However, the Steam Plant's air emissions may be subject to the requirements of Title V, since it has the potential to emit greater than 100 tons per year (tpy) of criteria pollutants. As a "grandfathered" existing source, Title V does not require the Steam Plant to change or replace equipment. However, Sandia Corporation initiated the Steam Plant Optimization Project in 1997 to determine ways to improve fuel efficiency and reduce emissions and remain below 100 tpy.

#### Vehicles

The majority of government vehicles at SNL/NM are owned and managed by the General Services Administration (GSA). Currently, there are approximately 775 GSA vehicles in SNL/NM's fleet. All GSA vehicles must comply with the same emission standards set for all personal and non-personal vehicles that are issued KAFB vehicle passes. As required by 20 NMAC 11.100, "Motor Vehicle Inspection-Decentralized," Sandia Corporation submits an annual vehicle inventory update and inspection plan to the City of Albuquerque for approximately nine SNL/NM-owned vehicles.

#### Emergency Generators

Sandia Corporation operates four main standby diesel generators for emergency power supply. These generators are some of SNL/NM's largest generators, each with a 600-kilowatt (kW) capacity. These generators, permitted by the City of Albuquerque (Appendix B, Table B-1) are exercised monthly and their electrical systems are tested quarterly. As required by Title V, all fuel used in the generators is reported to the City of Albuquerque. One additional generator was added at the Processing and Environmental Technology Laboratory (PETL) in 2001.

In 2001, the fuel throughput reported was 6,291 gallons of diesel. In anticipation of a Title V permit being issued by the City of Albuquerque, Sandia Corporation has already instituted a self-imposed fuel cap upon which the Title V air emission fee is based. Sandia Corporation has assumed a maximum use of 500 hours a year for the main standby generators, which is the same usage assumed for all other on-site generators.

#### Open Burns

### New EPA Standard for Ozone

*As discussed in Section 2.3, the EPA revoked the NAAQS in 1998 for the 1-hour standard of 0.12 ppm for O<sub>3</sub>. However, on May 14, 1999, a federal appeals court blocked the EPA from imposing tougher air quality requirements for ozone and PM. The EPA decided that tougher laws were needed to protect children and adults with respiratory problems. On July 5, 2000, the EPA officially reinstated its 1-hour ozone standard in nearly 3,000 counties across the U.S. On January 19, 2001, the EPA issued a proposed response to a court remand of the 8-hour ozone standard.*

As required by 20 NMAC 11.21, "Open Burning," DOE obtains open burn permits for each of Sandia Corporation's applicable scheduled event or test series. The regulation differentiates the permit basis into two categories: multiple-event and single-event. The single-event permit was designed to regulate individual burns having significant were impact. As shown in Appendix B, Table B-1, there were 12 permits issued in 2001. Open burn permits are required for:

- Disposal of Explosives by Burning (avoids the hazards of transport and handling);
- Aboveground Detonation of Explosives (over 20 lb);
- Burning Liquid Fuel 2,000 gallons or more or solid fuel of 5,000 lb in a single-event research and development activity; and
- Igniting Rocket Motors with greater than 4,000 lb of fuel.

### 5.5.2 New Directions Under Title V

The CAAA of 1990 contained provisions under Title V requiring all existing major air emission sources to obtain an operating permit. A major source is defined as the combined emissions from any facility with the potential to emit:

- 100 tpy or greater of any criteria pollutant,
- 10 tpy of any HAP, or
- 25 tpy of any combination of HAPs.

SNL/NM is considered a major source based on

### Steam Plant Optimization Project

*The Steam Plant is SNL/NM's largest air emission source. In 1997, Sandia Corporation initiated the Steam Plant Optimization Project to determine ways to improve fuel efficiency and reduce emissions for the facility's five boilers. In 1998, design work to retrofit Boilers 5 and 6 for flue gas recirculation (FGR) was completed, and actual retrofitting was accomplished in 1999. Plans were also drawn up to retrofit the remaining boilers (1, 2, and 3). Boiler 3 was retrofitted with FGR in 2000, while Boilers 1 and 2 were retrofitted in 2001. Retrofitting the two large boilers resulted in a reduction of the emission factor from 280 to 100 lb per million standard cubic feet of natural gas burned. NO<sub>x</sub> emissions from the Steam Plant boilers with FGR have since been reduced by 68 percent.*

*The success of the Steam Plant Optimization Project earned SNL/NM the "Large Business Air Quality Pollution Prevention (P2) Award for 2001" given by the New Mexico Facility Managers Network in conjunction with the City of Albuquerque.*

its potential to emit NO<sub>x</sub> and CO. Since potential emissions from the Steam Plant are greater than 100 tpy of criteria pollutants, this facility is considered a major source in itself. The intent of Title V is not to add new requirements, but rather to pull together existing requirements under one umbrella regulation, thereby eliminating the need to permit individual sources. SNL/NM sources listed on the permit application include the Steam Plant, the emergency generators, and smaller combustion sources. (Burn permits may continue to be permitted on an individual basis.)

### Background

The City of Albuquerque implements Title V regulations for Albuquerque and the rest of Bernalillo County under its Operating Permit Program as described in 20 NMAC 11.42, "Operating Permits." The Permit Program received interim approval by the EPA on March 13, 1995. Title V required all existing major sources to apply for a Title V Operating Permit by March 13, 1996. The DOE/NNSA/OKSO submitted Sandia Corporation's Title V Operating Permit application (No. 515, Volume 1) on March 1, 1996; the application, was deemed complete on

May 1, 1996. Although the regulatory due date was March 13, 1998, and the permit was anticipated to be issued in 2001, the City of Albuquerque has yet to issue the final permit.

#### **Small Business Assistance**

In 2001, the New Mexico Small Business Assistance (NMSBA) Program, which is managed by SNL/NM, began assisting a Las Cruces, New Mexico cotton gin cooperative in reaching compliance with 20 NMAC 2.72 Construction Permit No. 961.

#### **Title V Fee Structure**

The City of Albuquerque's Title V requires major source owners to pay air emission fees, which are implemented under 20 NMAC 11.02, "Permit Fees." Since 1997, source owners were able to submit an inventory of their actual emissions or fuel throughput for the year and pay an annual fee based on this amount. This fee reduction provision was eliminated in a modification to 20 NMAC 11.02 that became effective on July 1, 2001. Annual fees are now based on an assessed value of a source's maximum allowable to emit regardless of actual emissions, thereby increasing SNL/NM's fees from \$2,290 for 2000 to potentially \$78,430 for 2001. (For example, the Steam Plant would be assessed on the assumption that it operated at full capacity year-round). Sandia Corporation now intends to meet compliance with Title V by applying for a synthetic minor permit to take federally-enforceable limits on its emission sources to remain below the 100 tpy Title V

threshold.

#### **Risk Management Plan (RMP)**

A self-assessment audit in 2000 found the hydrochloric acid (HCl) storage tank at the Microelectronics Development Laboratory (MDL), to be below the 37 percent threshold quantity (TQ) requirement for an RMP (40 CFR 68).

#### **5.5.3 Ozone Depleting Substance (ODS) Reductions**

Sandia Corporation made progress in Fiscal Year (FY) 2001 towards the secretarial goal of replacing Class I refrigerant chillers greater than 150 tons capacity, manufactured prior to 1984. This replacement was part of a larger upgrade to improve the reliability and the overall efficiency of the associated chilled water system.

In FY 2001, SNL/NM overhauled a CFC chiller, which was necessary to keep it operational. As part of the overhaul, the chiller service contractor installed a new higher-efficiency purge unit and replaced all gaskets, significantly reducing the chance of a CFC leak. The chiller contains a rupture disk and vent guard from a previous retrofit. Expectation is that the chiller is operational for the remainder of the life of the building in which it was installed.

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# Chapter 6 Wastewater, Surface Discharge, and Storm Water Monitoring Programs

## In this Chapter ...

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## Chapter Summary

Sandia National Laboratories, New Mexico (SNL/NM) conducts effluent monitoring through wastewater, surface water, and storm water monitoring and surveillance programs.

The Wastewater Discharge Program currently monitors both sanitary discharges and industrial discharges at five on-site outfalls permitted by the City of Albuquerque. In 2001, no discharges to the sanitary sewer exceeded standards for radionuclides.

Surface discharges are monitored through an approval and permitting process by the Surface Discharge Program. Current water quality regulations protect groundwater and surface water for the potential use as a domestic potable water source. The Surface Discharge Program also tracks and reports any accidental surface releases or spills. In 2001, all surface discharge requests met state standards and were approved.



### Environmental Snapshot

- Sandia Corporation received three “Gold Pre-treatment Awards” from the City of Albuquerque for 100 percent compliance to discharge limits set in permits.
- SNL/NM discharges approximately 800,000 gallons of wastewater per day to the public sewer.

The Storm Water Program monitors storm water runoff at eight stations throughout SNL/NM. The program strives to maintain compliance with the National Pollutant Discharge Elimination System (NPDES) and protects “Waters of the U.S.” At SNL/NM, Tijeras Arroyo is defined as a “Water of the U.S.” In 2001, no analytical monitoring was required under NPDES.



SNL/NM personnel collecting wastewater monitoring data.

Effluent monitoring is the collection of samples or direct measurements taken from liquid or gaseous waste stream processes for the purpose of quantifying contaminants and determining regulatory compliance. In this chapter, effluent monitoring is confined to water monitoring activities that include wastewater discharges, which are made up of sanitary and industrial effluents, surface discharges, and storm water runoff. Water quality monitoring at SNL/NM is conducted by Sandia Corporation's Environmental Management (EM) Department.

Sandia Corporation complies with water quality regulations established by local, state, and federal agencies. U.S. Environmental Protection Agency (EPA) standards are implemented at the state and local level by the New Mexico Environment Department (NMED) and the City of Albuquerque. Currently, EPA Region VI implements storm water regulations under the NPDES; SNL/NM's five on-site outfalls are permitted by the City of Albuquerque. Storm water is the only discharge at SNL/NM regulated by NPDES. Sandia Corporation also adheres to the water quality guidelines contained in U.S. Department of Energy (DOE) Orders 5400.1, *General Environmental Protection Program* (DOE 1990) and 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1993).

## 6.1 WASTEWATER DISCHARGE PROGRAM

Wastewater that is discharged to the public sewer system from SNL/NM facilities is divided into two categories: sanitary discharges and industrial discharges. Sanitary waste streams include wastewater from restrooms and showers, food service establishments, and other domestic-type activities. Industrial discharges are produced from general laboratory research operations, including electroplating, metal finishing, microelectronic development, and photographic processes.

Sandia Corporation closely monitors its liquid effluent discharges to meet regulatory compliance. Sandia Corporation further reduces its toxic discharges by implementing Toxic Organic Management Plans (TOMPs) and general good housekeeping and engineering practices. Pollution prevention (P2) measures to reduce, substitute, or eliminate toxic chemicals are implemented, where feasible, as discussed in Section 3.3.

### 6.1.1 SNL/NM and the City of Albuquerque Sewer System

#### City of Albuquerque Publicly-Owned Treatment Works (POTW)

SNL/NM's sewer system connects to the City of Albuquerque's sanitary sewer line at four permitted outfalls. SNL/NM also has one additional industrial permitted wastewater outfall at the Microelectronics Development Laboratory (MDL), which is upstream of the final discharge points. Wastewater effluent discharged from any of the five outfalls must meet the City of Albuquerque's Sewer Use and Wastewater Control Ordinance (SUWCO) requirements. SUWCO information can be found at the American Legal Publishing Corporation's website, which publishes the City of Albuquerque's Code of Ordinance:

[www.amlegal.com/albuquerque\\_nm/](http://www.amlegal.com/albuquerque_nm/)

All SNL/NM effluent discharge standards were within the City of Albuquerque's SUWCO established limits.

#### Wastewater Compliance Awards

The City of Albuquerque's reporting requirements are defined under its SUWCO. The SUWCO specifies the discharge quality and requirements that the City of Albuquerque will accept at its POTW. Sandia Corporation received three "Gold Pre-treatment Awards" and two "Silver Pre-treatment Awards" from the City of Albuquerque for the 2000 to 2001 reporting year. A "Gold Pre-treatment Award" is given based on a facility's 100 percent compliance to discharge limits set in permits or exceptional source reduction and P2.

### 6.1.2 Permitting and Reporting

The City of Albuquerque Public Works Department, Liquid Waste Division, implements the EPA's water quality standards under the authority of the SUWCO. Sandia Corporation submits semi-annual wastewater reports to the City of Albuquerque. Results from the January 1 to June 30, 2001 period were submitted by July 31, 2001; results from the July 1 to December 31, 2001 period were submitted by January 31, 2002. The primary regulatory drivers for the Wastewater Program are listed in Appendix B. Important program documents and reports are listed in Chapter 9.

### Discharge Control Program

The Water Quality Group (WQG) at Sandia Corporation maintains a Discharge Control Program to track wastewater discharges resulting from ongoing chemical, manufacturing, and industrial processes conducted at SNL/NM facilities. Facility processes are reviewed for contaminants, concentrations, and discharge frequencies to determine if the effluent will meet regulatory criteria. Once approved, a facility is issued an internal SNL/NM permit, which is reviewed annually. If there are any process or discharge changes to the facility prior to the annual review, the facility owner must notify the WQG. Generally, processes are well characterized and any constituents that are detected over the limits at a wastewater monitoring station can usually be tracked back to the source facility. Corrective actions to mitigate further releases are implemented, as necessary.

One-time releases are approved on a case-by-case basis. Buildings that only produce domestic sewage, such as from lavatories, sinks, and fountains, are not required to obtain an internal permit.

#### 6.1.3 Wastewater Monitoring Stations

SNL/NM has five on-site outfalls permitted by the City of Albuquerque (Figure 6-1). Wastewater permits are listed in Appendix B, Table B-1. Four of these stations discharge directly to the public sewer, which flows into the Tijeras Arroyo Intercept and one station is for an upstream categorical pre-treatment process. SNL/NM discharges approximately 800,000 gallons of wastewater per day to the public sewer.

The EPA has established categorical pre-treatment standards for specified classes of industrial discharges. Station WW007 monitors the wastewater discharged from the Acid Waste Neutralization (AWN) System at the MDL in Technical Area I (TA-I).



*The MDL uses acids for etching electronic boards and other components.*

### Wastewater Monitoring

All outfall stations are equipped with flow meters and pH sensors to continuously monitor wastewater 24 hours-a-day, 365 days-a-year. In the event that an exceedence is detected, an auto-dialer will contact personnel at SNL/NM and the DOE/NNSA/OKSO will notify the City of Albuquerque within 24 hours. Station equipment parameters are listed in Table 6-1.

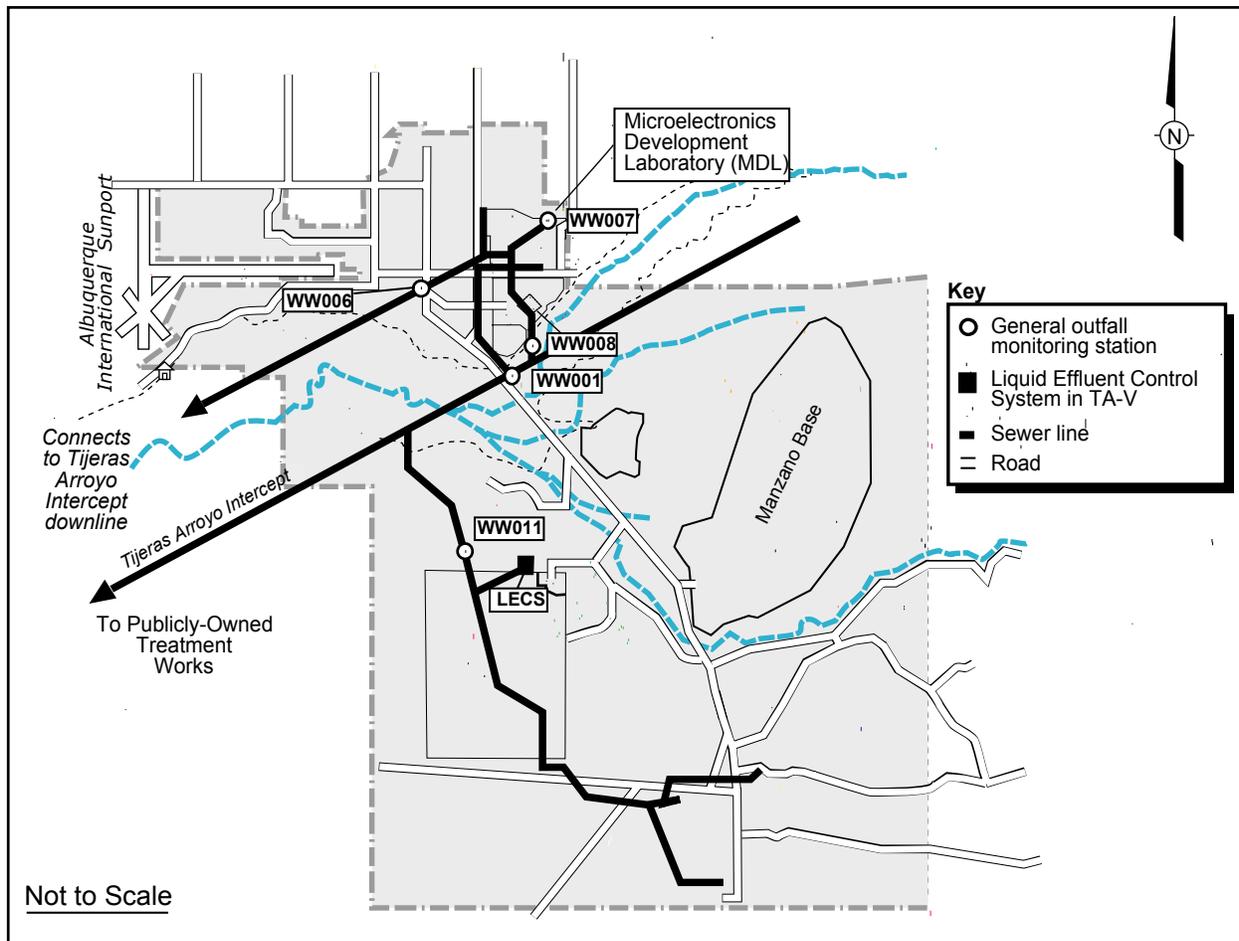
Sandia Corporation splits quarterly wastewater samples taken from SNL/NM outfalls with the City of Albuquerque to determine compliance with permit requirements. NMED is notified when sampling is scheduled to occur and is offered the opportunity to obtain samples for analysis. All samples are obtained as 24-hour flow proportional or time-weighted composites. Sandia Corporation sends SNL/NM split samples to an EPA-approved laboratory for analysis. Sandia Corporation sampling results are compared with results obtained by the City of Albuquerque. Currently, the procedure is to sample randomly from a list of potential pollutants. The City of Albuquerque determines which parameters it plans to analyze. Analytes are chosen from the parameters shown in the shaded box (shown on page 6-5).

### Septic Systems

Sandia Corporation maintains three active septic tank systems in remote areas on Kirtland Air Force Base (KAFB), which are used only for domestic sanitary sewage collection. Since these tanks receive only domestic sewage and no industrial discharges, they do not require sampling prior to pumping and discharge to the public sewer. However, as a Best Management Practice (BMP), Sandia Corporation periodically obtains samples from these active tanks prior to pumping and discharge.

#### 6.1.4 TA-V Radiological Screening

Several research reactors in TA-V have the potential to produce radiologically-contaminated process wastewater. To ensure that all wastewater from these facilities meets regulatory standards, liquid effluent is separated into two streams: reactor and non-reactor wastewater. Reactor process wastewater is defined as any effluent to a drain that is generated from a building or facility in TA-V that uses, processes, or stores radioactive materials. Reactor process wastewater is channeled to holding tanks where it can be screened using the Liquid Effluent Control System (LECS) and can be sampled for radiological



01\_6-1.ai

FIGURE 6-1. Wastewater Monitoring Station Locations

TABLE 6-1. SNL/NM Wastewater Discharge Permits and Station Characteristics

Permit	Waste Stream Process	Flume Size
<b>General Outfall</b>		
WW001	All waste streams	3 in. Parshall*
WW006	All waste streams	6 in. Parshall
WW008	All waste streams	6 in. Parshall
WW011	All waste streams	6 in. Parshall
<b>Categorical</b>		
WW007	MDL	45" v-notch Weir
<b>Not Permitted</b>		
LECS	Radiological screening of TA-V process water	N/A

**NOTE:** "All waste streams" include both domestic and industrial discharges.

\*A Parshall Flume is a primary flow-measuring device characterized by a constricted throat that produces a head that is related to discharge flow rate. This type of flume is used in sanitary sewer systems because it is self-cleaning.

LECS = Liquid Effluent Control System

MDL = Microelectronics Development Laboratory

N/A = not applicable

**Wastewater Analyte Parameters****Metals**

- Aluminum
- Chromium
- Lead
- Nickel
- Selenium
- Arensic
- Copper
- Mercury
- Silver
- Zinc

**Radiological**

- Tritium
- Gross alpha
- Gross beta
- Gamma spectroscopy

**General Chemistry**

- Cyanide
- Soluble fluoride
- Formaldehyde
- Phenolic compounds
- Oil and grease
- Volatile organic compounds (VOCs)
- Semi-Volatile organic compounds

contaminants before the contents are released to the public sewer system. Discharges to the sanitary sewer have not exceeded standards for radionuclides at any of SNL/NM's wastewater stations, including the LECS.

The LECS consists of three 5,000-gallon tanks and one ion exchange and filter system. The LECS is monitored 24 hours-a-day and is equipped with alarms to alert SNL/NM personnel to the presence of radioactive materials or high water levels. Water samples are analyzed for tritium, gross alpha, gross beta, and gamma spectroscopy to ensure radiological levels meet regulatory standards before the water is released to the public sewer system. If radioactivity levels are detected above permit limits, the water will not be released and an alternative disposal path will be found or the radionuclides will be allowed to decay in place over a matter of days or weeks if the contamination is due to short-lived radioisotopes. Once the activity is at or below regulatory levels, the water can be safely discharged to the public sewer system.

**6.1.5 Summary of Monitoring Results**

During 2001, Sandia Corporation split quarterly SNL/NM wastewater samples with both the City of Albuquerque and the NMED. The City of Albuquerque staff also inspected SNL/NM facilities to ensure that Sandia Corporation was in compliance with the City of Albuquerque's discharge requirements. In 2001, laboratory

analysis results for wastewater samples taken at SNL/NM's monitoring stations confirmed that Sandia Corporation was in compliance with all state and local regulations. All water discharged from the LECS in 2001 also met federal regulatory standards and DOE Orders for radiological levels in wastewater.

Reportable releases that occurred in 2001 are discussed under occurrence reporting in Section 2.4.2. All permit conditions were met in 2001.

**6.2 SURFACE DISCHARGE PROGRAM**

All water and water based compounds that discharge to the ground surface are evaluated for compliance with New Mexico Water Quality Control Commission (NMWQCC) regulations as implemented by the NMED's Groundwater Bureau. These regulations are designed to protect the groundwater and surface water of the state for potential use as a domestic potable water source. The primary regulations are listed in Appendix B. Important program documents are listed in Chapter 9.

**6.2.1 Surface Discharge Approval and Permitting**

Surface discharges are releases of water and water based compounds made to roads, open areas, or impoundments. Surface discharges are only made with the approval of the Surface Discharge Program within the EM Department. The Surface Discharge Program assists SNL/NM facility owners in meeting requirements set forth by the state and documents all requests and discharges. Proposed discharges are evaluated for potential contaminants and concentration levels to determine if the discharge complies with strict water quality guidelines for surface releases. Uncontaminated water discharges must also be approved, since large volumes of water discharged in areas of prior contamination (such as Environmental Restoration [ER] sites) could increase infiltration rates and move contaminants deeper into the soil column. If any discharges do not meet surface water quality standards, alternative methods of disposal are found.

**2001 Surface Discharge Activities**

Surface discharge requests are generally made when access to a sanitary sewer line is not available, such as in remote locations on KAFB where no sewer lines exist. Typical surface

discharge requests include discharges made by the Groundwater Protection Program (GWPP) to dispose of well purge water from groundwater monitoring wells. Wells are purged before a representative groundwater sample can be taken. Other surface discharges are requested as a result of fire training activities, the need to flush eyewash stations, and the cleaning of building exteriors. In 2001, 28 individual surface discharge requests were made; all met state standards and were approved.

### 6.2.2 Surface Discharge Releases in 2001

The Surface Discharge Program must be contacted in the event of an accidental release or spill to the ground surface. In 2001, four reportable releases occurred. These occurrences are discussed in Section 2.4.2.

### 6.2.3 Pulsed Power Evaporation Lagoons

The Surface Discharge Program at SNL/NM reports water quality results from routine samples taken from two surface discharge lagoons in TA-IV. Both lagoons are permitted through NMED due to the ongoing nature of the discharges and the large volumes of water involved. A *Discharge Plan Renewal Application, DP-530* (SNL 2001h) was submitted to NMED in 1999 and was approved in 2001.

The two surface discharge lagoons, are primarily used to contain and evaporate water that collects in the secondary containments around seven outdoor oil storage tanks used to store dielectric oil. The largest tank is 250,000 gallons in capacity. The secondary containments are designed to hold the entire contents of a tank in the event of a spill. Significant volumes of precipitation can collect in the containments during the monsoon season. The water is visually inspected for oil contamination and any oil present is skimmed off prior to discharge. Lagoon I is a 137,500-gallon capacity rectangular pond, approximately 50 by 70 ft and 11 ft deep. Lagoon II is a 127,000-gallon capacity trapezoidal-shaped pond, approximately 40 by 70 ft and 8 ft deep.

### Water Level Measurements

Water levels in the lagoons are measured annually and water quality samples are taken biennially during even numbered years, as required by DP-530 (SNL 2001h). Water level measurements were obtained from Lagoons I and II on November 8, 2001. The water level in Lagoon I

was recorded at 13 percent of capacity and the water level in Lagoon II was at 0 percent of capacity. Biennial samples will be obtained from both lagoons during 2002. Lagoons I and II were cleaned and inspected during 2001 and the liners were determined to be sound and intact. All permit requirements for both lagoons were met in 2001.

## 6.3 STORM WATER PROGRAM

### 6.3.1 Storm Drain System

Storm water runoff flowing over the ground surface has the potential to pick up and transport contaminants. This is especially true in industrial areas where runoff can be significant after heavy showers since pavement and buildings prevent precipitation from infiltrating into the ground. The Storm Water Program works in coordination with the P2 Group, the Surface Discharge Program, and the ER Project to implement measures and BMPs to prevent or reduce potential contaminants from being transported in storm water runoff. Potential contaminants may derive from:

- Oils and solvents from machine shops and manufacturing areas;
- Vehicle residues from streets and parking lots;
- Hazardous chemicals and metals from waste handling facilities;
- Residual radioactive and hazardous constituents from Solid Waste Management Units (SWMUs);
- Building material contaminants from construction activities; and
- Pesticides and fertilizers from landscaped areas.

Sandia Corporation controls the potential contaminants that may be picked up by storm water runoff by limiting storm water contact with chemical storage containers and carefully controlling runoff in areas where wastes, chemicals, and oils are stored or handled. Secondary containments for all outdoor oil storage tanks and chemical containers prevent potential pollutants from being transported in storm water runoff. Some facilities, such as the Hazardous Waste Management Facility (HWMF) and the Radioactive and Mixed Waste Management Facility (RMWMF) are designed to divert all runoff from the facility to a lined catchment basin. Water that accumulates in the basin evaporates. If evaporation is not adequate due to meteorological conditions, the accumulated water

is evaluated and pumped to either the storm drain system or to the sanitary sewer for disposal. Approval must be granted by the City of Albuquerque through the DOE.

### NPDES Regulations

The NPDES regulates storm water runoff from industrial facilities in order to protect “Waters of the U.S.” as defined by the Clean Water Act (CWA). As it applies to SNL/NM, the Tijeras Arroyo, which discharges to the Rio Grande, is a “Water of the U.S.” The arroyo is generally dry, but during heavy downpours it has significant water-carrying capacity. Any runoff that flows into the arroyo through a channel, arroyo conduit, or overland surface flow is considered a discharge point.

As shown in Figure 6-2, Tijeras Arroyo enters KAFB from the northeast, flows just south of TA-I, TA-II, and TA-IV, exits at KAFB’s west boundary, and continues about eight miles to its discharge point at the Rio Grande River. The arroyo has created a significant topographic feature across KAFB where erosion of unconsolidated basin sediments has resulted in a channel over one half mile wide in some areas.

### Affected Areas at SNL/NM

NPDES permits are required if storm water runoff discharges to “Waters of the U.S.” Sandia Corporation facilities in TA-I, TA-II, and TA-IV have storm drains, culverts, and channels that divert storm water runoff to discharge points on the north side of Tijeras Arroyo which is classified as “Waters of the U.S.” Sandia Corporation also conducts various activities in remote mountain and canyon areas in the Arroyo del Coyote watershed which empties into Tijeras Arroyo northwest of the KAFB Golf Course. Activities in all of these areas are evaluated for possible NPDES permitting.

Drainages south of the Arroyo del Coyote watershed are generally short and undeveloped. Runoff in this area infiltrates quickly into highly permeable soils. Discharges from these areas do not reach any designated “Waters of the U.S.”; therefore, NPDES permits are not required for facilities in this area. TA-III, TA-IV, and several remote sites are located in this area.

After reissuance of a new NPDES permit in January 2001, several stations were added to monitor runoff in the Arroyo del Coyote watershed. The expansion of the Storm Water Program is discussed in Section 6.3.2.

### NPDES Permit

The EPA provides regulatory oversight for SNL/NM’s Storm Water Program. SNL/NM facilities are covered under the NPDES “Multi-Sector General Storm Water Permit” issued by the EPA in January 2001 (EPA 2001). Currently, there are eight SNL/NM monitoring stations on the permit. The permit was reissued in 2001 for five years and covers four primary industrial activities at SNL/NM as defined in 40 CFR 122. Key facilities affected by NPDES regulations are listed in Table 6-2. Appendix B and Chapter 9 of this report lists all applicable regulations and program documents, respectively.

Construction activities that disturb over five acres also require permitting under NPDES. Individual construction projects are not listed on the “Multi-Sector General Storm Water Permit” (EPA 2001). A construction permit requires the ground to be stabilized upon completion of the project. In 2001, one storm water construction permit was in effect: the ER Storm Drain, Sanitary Sewer, Domestic Water System Modernization (SSWM) Project. Storm water permits are listed in Appendix B, Table B-1.

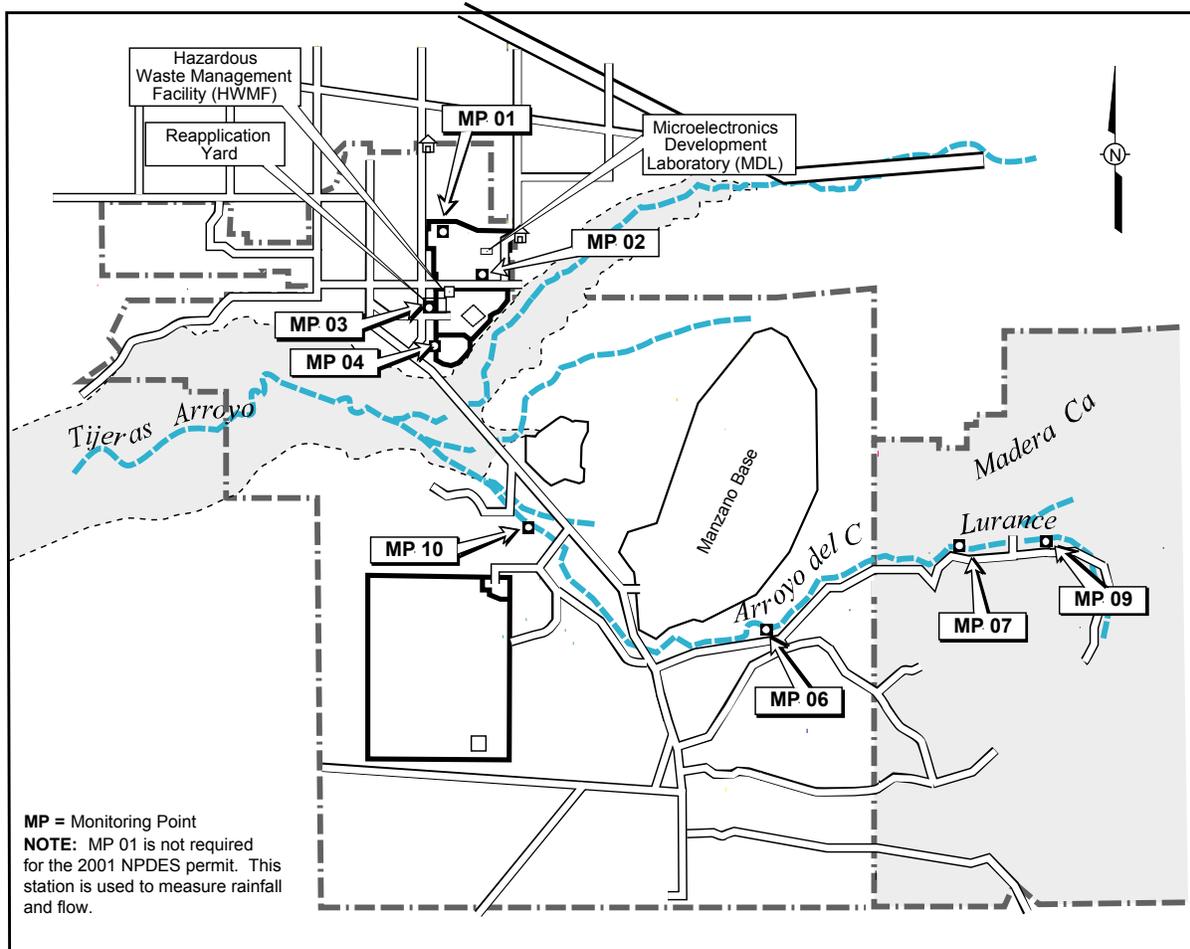
### 6.3.2 Storm Water Monitoring Stations

Sandia Corporation currently collects storm water samples from eight monitoring points (Figure 6-2). Monitoring Points 2 through 5 monitor runoff from the majority of industrial activities in TA-I, TA-II, and TA-IV. Monitoring Points 6, 7, 9, and 10 monitor discharges in Arroyo del Coyote.

### EPA Appraisal

On June 4, 2001, an EPA enforcement officer conducted an assessment of the Storm Water Program at SNL/NM. As a result of this inspection and at the request of EPA, the Storm Water Pollution Prevention Plan (SWP3) for SNL/NM was revised (SNL 2001d). Specific improvements to the SWP3 included clarifications of non-storm water discharges, records of preventive maintenance, and the relationship between SWP3 “industrial” and “construction” permits. The SNL/NM site maps have been revised to include information regarding storage areas.

References to detailed site maps and files maintained by the Project Leader have also been added as well as explanations of the relationship of SNL/NM’s Environment, Safety, and Health (ES&H) Manual to storm water training and BMPs.



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**FIGURE 6-2.** Storm Water Monitoring Point Locations at Eight Sites

**TABLE 6-2.** SNL/NM Facilities Subject to Storm Water Permitting

*These facilities are in areas where storm water can potentially drain to Tijeras Arroyo.*

Description of SIC Code*	Potential Pollutants and Impacts	Applicable SNL/NM Facilities **
<i>NPDES Multi-Sector Storm Water Permit</i>		
Scrap and Waste Recycling	- Various solid objects with potential residual surface contamination	- Reapplication and Storage Yard
Hazardous Waste Treatment, Storage, or Disposal Facilities	- Regulated hazardous chemical and radioactive waste	- HWMF - Manzano Storage Complex - SWMUs (including those in Lurance and Madera Canyons)
Electronic and Electrical Equipment Manufacturing	- Raw chemical storage such as acid and sodium hydroxide - Electroplating processes	- MDL - AMPL - CSRL
<i>Short-Term Construction Permits</i>		
Construction Activities in 2001	- Building material pollutants - Disturbed soil	- PETL - Storm Drain Modernization Project

**NOTE:** \*The EPA requires a National Pollution Discharge Elimination System (NPDES) Storm Water Permit for all industrial facilities that have processes defined in the Standard Industrial Classification (SIC) codes listed in Appendix A of 40 CFR 122. \*\*Applicable facilities are monitored under the expanded Storm Water Program, which was in effect in October 2001. The expanded program is documented in the revised Storm Water Pollution Prevention Plan (SWP3) (SNL 2001d).  
 AMPL = Advanced Manufacturing Process Laboratory      MDL = Microelectronics Development Laboratory  
 CSRL = Compound Semi-Conductor Research Laboratory      PETL = Processing and Environmental Technology Laboratory  
 HWMF = Hazardous Waste Management Facility  
 SWMU = Solid Waste Management Unit

**TABLE 6-3.** 1999 and 1998 Storm Water Sampling Results  
(Results in bold are above benchmark values given in the EPA permit.)

Analytes	Units	1999 *					1998 **	Benchmark Values
		MP 03 1 <sup>st</sup> Qtr	MP 03 2 <sup>nd</sup> Qtr	MP 04 1 <sup>st</sup> Qtr	MP 04 3 <sup>rd</sup> Qtr	MP 04 4 <sup>th</sup> Qtr	MP 04	
TSS	mg/L	<b>150</b>	27	<b>113</b>	<b>131</b>	<b>233</b>	--	100
pH	--	8.1	8.4	8.5	8.3	8.1	--	N/A
Oil & Grease	mg/L	(ND)	6	(ND)	6	11	--	15
COD	mg/L	48	22	72	<b>413</b>	61	--	120
Nitrate + Nitrite	mg/L	<b>1.60</b>	<b>2.05</b>	0.58	0.45	0.65	<b>0.75</b>	0.68
Total Kjeldahl N	mg/L	1.4	(ND)	1.3	8.8	1.1	(ND)	--
Cyanide	--	(ND)	(ND)	(ND)	(ND)	(ND)	(ND)	0.0636
Ammonia	mg/L	(ND)	(ND)	(ND)	1.2	(ND)	(ND)	19
Aluminum	mg/L	<b>13.2</b>	<b>1.37</b>	<b>7.47</b>	<b>1.19</b>	<b>18.2</b>	<b>9</b>	0.75
Arsenic	mg/L	0.006	0.00201	0.0049	(ND)	0.00613	0.005	0.16854
Cadmium	mg/L	0.00796	(ND)	(ND)	(ND)	(ND)	0.007	0.05
Copper	mg/L	0.057	(ND)	0.0152	(ND)	0.0152	0.0108	0.0636
Iron	mg/L	<b>10.8</b>	<b>1.07</b>	<b>5.45</b>	<b>18.5</b>	<b>13.4</b>	<b>6.05</b>	1.0
Lead	mg/L	0.0534	(ND)	0.0239	(ND)	0.0352	0.009J	0.0816
Magnesium	mg/L	<b>5.01</b>	<b>1.65</b>	<b>3.73</b>	<b>2.16</b>	<b>8.82</b>	<b>5.27</b>	0.0636
Mercury	µg/L	(ND)	(ND)	(ND)	(ND)	(ND)	(ND)	0.0024
Selenium	mg/L	(ND)	(ND)	(ND)	(ND)	(ND)	(ND)	0.2385
Silver	mg/L	(ND)	(ND)	(ND)	(ND)	(ND)	(ND)	0.0318
Zinc	mg/L	<b>0.210</b>	0.0191	<b>0.0861</b>	0.033	<b>0.114</b>	0.053	0.065

**NOTE:** Source: SNL 2000g

Analytical samples were not collected in 2001 since sampling is only required in the 2<sup>nd</sup> and 4<sup>th</sup> year of the permit.

\*In 1999, rainfall throughout the year was sufficient to produce five good samples: two from Monitoring Point (MP) 03 and three from MP 04.

\*\*Only one sampling event was collected in 1998 from MP 04, which was not adequate to produce meaningful results.

TSS = total suspended solids (The benchmark value is 100 mg/L.)

J = Detected below the reporting limit or is an estimated concentration

Qtr = quarter

mg/L = milligram per liter

ND = not detected

N/A = not available

COD = chemical oxygen demand

µg/L = microgram per liter

### 6.3.3 Routine Inspections

All routine inspection results are attached to the SWP3. The following routine inspections are conducted:

- **Monitoring station inspections** are conducted monthly to ensure that samplers and other equipment are functioning properly.
- **Material storage area inspections** are conducted quarterly. All waste handling areas, vehicle and equipment cleaning areas, and loading and unloading areas are inspected for uncovered and unprotected potential contaminant sources and spills. These inspections increase personnel awareness and responsibility for storm water P2.
- **Wet weather inspections** are conducted quarterly during a storm event, if possible, but generally during the rainy season from April through September. Samples are collected and visually inspected for foaminess, clarity, and the presence of oil. These inspections also provide an opportunity to check for broken levees and floating debris.
- **Dry weather inspections** are conducted quarterly when storm drains and ditches are dry primarily to detect illicit discharges. In general, only storm water is allowed in the storm drain system; however, with approval from the Surface Discharge Program, water that meets NPDES permit conditions can be discharged to storm drains. An example of NPDES permit-approved discharges would be water used during fire training exercises or

### Construction Site Monitoring

*Sandia Corporation mitigates potential storm water pollution from all construction sites (or disturbed areas) by adhering to strict guidelines to prevent contaminant migration from various construction materials and processes. If the construction site is greater than five acres, the activity must be permitted under NPDES regulations. All permitted construction activities must develop a site-specific storm water P2 plan.*

*Once a construction project is completed, disturbed areas must be stabilized before the permit is terminated. Stabilization techniques include:*

- (1) Constructing drainages/diversions;*
- (2) Reseeding open areas;*
- (3) Xeriscaping (landscaping method that employs using drought-resistant plants in order to conserve resources, especially water) and other landscaping; and*
- (4) Asphaltting to prevent the transport of residual pollutants and erosion.*

fire hydrant testing. Dry weather inspections also provide an opportunity to inspect ditches for excess vegetation, accumulated sediment, and debris. Storm channels are cleaned out annually, or as necessary.

- **Annual Inspections** of all permitted facilities and the entire storm water system are conducted. After the inspections have been completed, a report is generated indicating the extent of the inspections and certifying that SNL/NM is in compliance with NPDES permit. Any inconsistency between the SWP3 and conditions at the facilities is noted in the report. If changes to the SWP3 are required as a result of these inspections, revisions to the SWP3 are initiated. If potential pollution problems are uncovered at the facilities, this is also noted in the report along with a schedule for addressing the problem areas.

### Sampling Protocols

The NPDES permit requires quarterly analytical sampling to be conducted in the second and fourth year of the five-year permit, weather permitting. Due to Albuquerque's semi-arid climate and high infiltration rates, precipitation rarely produces



*Storm Water Station 5 (the roofline shown just to the right of this channel) samples storm water at a discharge point to Tijeras Arroyo.*

adequate runoff for monitoring in the months of October through March. In general, the most consistent storm water sampling occurs during the rainy season from April through September. After a rainfall of sufficient intensity and duration (as defined in the regulation), storm water runoff flowing through monitoring each station is collected as a grab sample by the automatic sampler. The discharge is collected within the first 30 minutes of the runoff event to allow for the sampling of any residues picked up in the soil upstream of the station. All samples are sent to off-site laboratories and analyzed according to protocols established by the EPA.

### 6.3.4 2001 Activities

#### 2001 Sampling Results

No analytical monitoring was required under NPDES in fiscal year (FY) 2001. The next required analytical sampling began in October 2001 (FY 2002). However, quarterly visual samples were collected at five monitoring points (MPs) and inspected as described under "wet weather inspections." No unusual characteristics were noted.

**Past Sampling Results**

Past sampling results from 1998 and 1999 analysis have shown a presence of metals such as zinc, magnesium, and iron elevated above benchmark values (Table 6-3). However, since the collection of storm water samples at SNL/NM did not begin until 1997, there is not yet enough data to draw meaningful conclusions. The presence of these metals may be due to natural conditions associated with rocks and soils derived from the igneous/metamorphic complex of the Manzanita Mountains.

**SSWM Project**

In 1999, construction began on the SSWM Project. Phases 1, 2, and 3, completed in 2000, consisted of the realignment of 20<sup>th</sup> Street near KAFB's Eubank Gate and replacement of existing earth ditches in TA-I with concrete channels up to MP 04. Phase 4 received funding in FY 2001 and included the replacement of underground storm sewer pipes in the northwest section of TA-I. Completion of this project is scheduled to be completed in FY 2002.

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