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Annual Site Environmental Report for Sandia National Laboratories, New Mexico

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Environmental Report

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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 Sandia Site Office (SSO), Albuquerque, New Mexico. Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, operates SNL/NM. This annual report summarizes data and the compliance status of Sandia Corporation's environmental protection and monitoring programs through December 31, 2002. Major environmental programs include air quality, water quality, groundwater protection, terrestrial surveillance, waste management, pollution prevention (P2), environmental restoration (ER), 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).

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NOTE TO THE READER

The goals for the Annual Site Environmental Report are to present summary environmental data regarding environmental performance, compliance with environmental standards and requirements, and to highlight significant facility programs. In addition, DOE views this document as a valuable tool for maintaining a dialogue with our community about the environmental health of this site.

If you are interested in reading chapter highlights, a one-page summary is provided at the beginning of each chapter.

We are striving to improve the quality of the contents as well as include information that is important to you. Please provide feedback, comments, or questions to:

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ACRONYMS AND ABBREVIATIONS

A	ABC/AQCB	Albuquerque-Bernalillo County/Air Quality Control Board
	ACRR	Annular Core Research Reactor
	ACE	Army Corps of Engineers
	AEA	Atomic Energy Act
	AF	Air Force
	AFV	alternative fuel vehicles
	AHCF	Auxiliary Hot Cell Facility
	AIRFA	American Indian Religious Freedom Act
	ALARA	as low as reasonably achievable
	AMP	Analytical Management Program
	AMPL	Advanced Manufacturing Process Laboratory
	ANOVA	Analysis of Variance
	AOC	area of concern
	APPDL	Advanced Pulse Power Development
	AQC	Air Quality Compliance
	AR	annual review
	ARCOC	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	BMP	Best Management Practice
	BTU	British Thermal Units
C	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
	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
	CINT	Center for Integrated Nanotechnologies
	COA	City of Albuquerque
	CPG	Comprehensive Procurement Guidelines
	CPMS	Criteria Pollutant Monitoring Station
	CRIO	Community Resources Information Office
	CSRL	Compound Semi-Conductor Research Laboratory
	CSS	Sanitary Sewer Line
	CTF	Coyote Test Field
	CWA	Clean Water Act
	CWL	Chemical Waste Landfill
	CY	Calendar Year
D	D&D	decontamination and demolition
	DCG	derived concentration guide
	DLA	Defense Logistics Agency
	DoD	U.S. Department of Defense
	DOE	U.S. Department of Energy
	DQO	data quality objective
	DSS	Drain and Septic Systems

E	EA	Environmental Assessment
	ECF	Explosive Components Facility
	EDE	effective dose equivalent
	EDP	Experiment Development Plan
	EIS	Environmental Impact Statement
	EM	Environmental Management
	EMS	Environmental Management System
	EMSL	Environmental Monitoring Systems Laboratory
	EO	Executive Order
	EOC	Emergency Operations Center
	EPA	U.S. Environmental Protection Agency
	EPCRA	Emergency Planning and Community Right-to-Know Act
	EPP	Environmentally Preferable Purchasing
	ER	Environmental Restoration
	ERT	Electrical Resistivity Tomography
	ES&H	Environment, Safety, and Health
	ESA	Endangered Species Act
F	FFCA	Federal Facilities Compliance Act
	FFCO	Federal Facility Compliance Order
	FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
	FY	Fiscal Year
G	GEL	General Engineering Laboratories
	GIF	Gamma Irradiation Facility
	GSA	General Services Administration
	GWPP	Groundwater Protection Program
H	HAP	hazardous air pollutant
	HBWSF	High-Bay Waste Storage Facility
	HCF	Hot Cell Facility
	HCl	hydrochloric acid
	HE	high explosives
	HERMES-III	High Energy Radiation Megavolt Electron Source-III
	HLW	high-level radioactive waste
	HSWA	Hazardous and Solid Waste Amendments
	HWMF	Hazardous Waste Management Facility
I	IE	De-Ionized Water
	ILMS	Integrated Laboratory Management System
	IRP	Installation Restoration Program
	ISMS	Integrated Safety Management System
	ISS	Interim Status Storage
J	JCEL	Joint Computational Engineering Laboratory
	JIT	Just-In-Time
K	KAFB	Kirtland Air Force Base
	KTF	Kauai Test Facility
L	LANL	Los Alamos National Laboratory
	LCBS	Lurance Canyon Burn Site
	LECS	Liquid Effluent Control System
	LEED	Leadership in Energy and Environmental Design
	LLW	low-level waste
	LMC	Lockheed Martin Corporation
	LMF	Large-scale Melt Facility
	LTES	Long-Term Environmental Stewardship

	LTTD	Low-Temperature Thermal Desorption
	LWDS	Liquid Waste Disposal System
M	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
	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
N	N/A	not available or not applicable
	NAAQS	National Ambient Air Quality Standards
	NAICS	North American Industry Classification System
	ND	not detected
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants
	New Mexico Tech	New Mexico Institute of Mining and Technology
	NFA	No Further Action
	NGF	Neutron Generator Facility
	NGIF	New Gamma Irradiation
	NGPF	Neutron Generator Production 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
	NOD	Notice of Deficiency
	NPDES	National Pollutant Discharge Elimination System
	NPL	National Priorities List
	NPN	nitrate plus nitrite
	NR	non-regulated
	NRC	U.S. National Response Center
	NRC	U.S. Nuclear Regulatory Commission
	NSO	Nevada Site Office
	NTS	Nevada Test Site
O	ODS	Ozone-depleting substance
	ORPS	Occurrence Reporting Processing System
P	P2	Pollution Prevention
	PA/SI	Preliminary Assessment/Site Inspection
	PCB	polychlorinated biphenyl

	PCE	tetrachloroethylene
	PETL	Processing and Environmental Technology Laboratory
	PM	particulate matter
	PM_{10}	respirable particulate matter (diameter equal to or less than 10 microns)
	$PM_{2.5}$	respirable particulate matter (diameter equal to or less than 2.5 microns)
	POTW	Publicly-owned Treatment Works
	PPE	Personnel Protection Equipment
	PPOA	Pollution Prevention Opportunity Assessment
	PQL	Practical quantitation limit
	PSL	Primary Subliner
Q	QA	quality assurance
	QAP	Quality Assurance Program
	QC	quality control
	QNR	Qualified NEPA Reviewers
R	RCRA	Resource Conservation and Recovery Act
	R&D	research and development
	RFP	Request for Proposals
	RHEPP	Repetitive High Energy Pulsed Power (an accelerator facility)
	RITS	Radiographic Integrated Test Stand
	RMP	Risk Management Plan
	RMWMF	Radioactive and Mixed Waste Management Facility
	ROD	Record of Decision
	RQ	reportable quantity
S	SAP	Sampling and Analysis Plan
	SARA	Superfund Amendments and Reauthorization Act
	SD	sustainable design
	SDWA	Safe Drinking Water Act
	SGWS	shallow groundwater system
	SHPO	State Historic Preservation Officer
	SIC	Standard Industrial Classification
	SME	Subject matter experts
	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
	SSO	Sandia Site Operations
	SSWM	Storm Drain, Sanitary Sewer, and Domestic Water System Modernization
	ST	stabilization treatment
	STAR	Shock Thermodynamic Applied Research Facility
	START	Sandia Tomography and Radionuclide Transport Laboratory
	STEL	short-term exposure limit
	STP	Site Treatment Plan
	STVZ	Sandia Corporation/New Mexico Tech Vadose Zone
	SUWCO	Sewer Use and Wastewater Control Ordinance
	SVOC	Semi Volatile Organic Compound
	SWEIS	Site-Wide Environmental Impact Statement
	SWMU	Solid Waste Management Unit
	SWP3	Storm Water Pollution Prevention Plan
	SWTF	Solid Waste Transfer Facility

T	TA	Technical Area
	TAL	Target Analyte List
	TAG	Tijeras Arroyo Groundwater
	TCE	trichloroethylene
	TCLP	toxicity characteristic leaching procedure
	TCR	Test Capabilities Revitalization
	TESLA	Tera-Electron Volt Energy Superconducting Linear Accelerator
	TLD	thermoluminescent dosimeter
	TLV	threshold limit value
	TNMHC	total non-methane hydrocarbon
	TOMP	Toxic Organic Management Plans
	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
	TTF	Thermal Treatment Facility
	TTR	Tonopah Test Range
	TU	Temporary Unit
	TWA	time-weighted average
U	UNM	University of New Mexico
	USAF	U.S. Air Force
	USFS	U.S. Forest Service
	USGS	U.S. Geological Survey
	UST	underground storage tank
V	VCA	Voluntary Corrective Action
	VCM	Voluntary Corrective Measure
	VEP	Vapor Extraction Project
	VOC	volatile organic compound
	VSA	Vertical Sensor Array
	VZMS	Vadose Zone Monitoring System
W	WA	Weapons Assembly
	WIPP	Waste Isolation Pilot Plant
	WQG	Water Quality Group
X	XBGPR	Cross Borehole Ground Penetrative Radar

UNITS OF MEASURE

°C	degree centigrade	m/s	miles per second
cm	centimeter	m^3	cubic meter
°F	degrees Fahrenheit	mg	milligram
ft	feet	mi	mile
ft^3	cubic feet	mL	milliliter
gal	gallon	mph	miles per hour
hr	hour	ppb	parts per billion
in.	inch	ppbv	parts per billion by volume
kg	kilogram	ppm	parts per million
km	kilometer	scf	standard cubic feet
Km^3	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^3	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
uR/hr	microroentgen per hour		

CHEMICAL ABBREVIATIONS

CO	carbon monoxide	NO_x	nitrogen oxides
Eh	redox	O_3	ozone
H^3	tritium	SO_2	sulfur dioxide
${}_1H^1$	hydrogen	TCE	trichloroethylene
HCl	hydrochloric acid	TCA	trichloroethane
NaCl	sodium chloride	U_{tot}	total uranium
NO_2	nitrogen dioxide	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^3)	35.32	Cubic feet (ft^3)
Centimeters (cm)	0.39	Inches (in.)
Meters (m)	3.28	Feet (ft)
Kilometers (km)	0.61	Miles (mi)
Square kilometers (km^2)	0.39	Square miles (mi^2)
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's Mission *S-1*
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Sandia National Laboratories, New Mexico (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 mangaged by Sandia Corporation and overseen by the DOE/NNSA, Sandia Site Office (SSO). 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 for Calendar Year (CY) 2002. 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.

Environmental Programs

Sandia Corporation's strategy for managing and implementing its Environment, Safety, and Health (ES&H) Program is described in the Integrated Safey Managment 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. Further information about ISMS can be found in Chapter 8.

All 2002 program activities are performed continuously, but reported in this ASER on a CY basis, unless otherwise noted. The primary environmental programs in place at SNL/NM are summarized below.

Waste Management and Pollution Prevention (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.

- **HWMF** – Under the authority of the New Mexico Hazardous Waste Act (NMHWA) and under delegated authority from the U.S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA), the New Mexico Environment Department (NMED) administers hazardous waste regulatory programs in New Mexico. All non-radioactive, non-explosive, chemical waste are handled at this facility. A total of 158,396 lbs (71,847 kg) of RCRA-regulated wastes was shipped in 2002.

- **SWTF** – The SWTF collects and processes all of the non-hazardous commercial solid waste generated at SNL/NM. The SWTF also accepts and processes commercial solid waste from Kirtland Air Force Base (KAFB). The SWTF accepts, bales and ships recyclable materials, such as white paper, cardboard, aluminum cans, etc., from SNL/NM, KAFB, and DOE/NNSA. In 2002, a total of 4,643,174 lbs (2,106,108 kg) of SNL/NM and KAFB commercial solid waste and 1,189,528 lbs (539,561 kg) of SNL/NM, KAFB, and DOE/NNSA recyclable materials were processed at the SWTF.

- **RMWMF** – The RMWMF currently administers low-level waste (LLW), mixed waste (MW), and transuranic (TRU) waste. In 2002, a total of 231,575 lbs (105,041 kg) of LLW, MW, and TRU waste was shipped.

Environmental Restoration (ER) Project

The assessment and remediation of 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 2002, four ER sites were being remediated at SNL/NM and three sites were proposed for No Further Action (NFA). At the end of 2002, there were 126 ER sites remaining to be addressed at SNL/NM.

Remediation and waste management activities continued at the Chemical Waste Landfill (CWL) and the Classified Waste Landfill in 2002. Remediation of all SNL/NM ER sites is expected to be complete by 2006.

Terrestrial Surveillance

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 2002, 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 ER Project.

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. 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 2002, one permit violation occurred at permitted outfall 2069I during pre-operational and commissioning of a de-ionized water system upgrade project. 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 15 one-time requests made for individual discharges to the ground surface in 2002. In 2002, 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. The Sandia Corporation/ New Mexico Tech Vadose Zone (STVZ) Infiltration Test Facility in Socorro County is also permitted by the NMED. A renewal application was submitted to NMED in 1999 and was approved in 2001. All permit requirements for both lagoons and the SVTZ were met in 2002.

  In 2002, there were nine surface releases reported as occurrences and reviewed by the Surface Discharge Program. There was no discernible impact to the environment due to any of these surface discharges.

- **Storm Water Runoff** – In 2002, analytical monitoring was required under the National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit for Storm Water discharges. The NPDES Permit requires quarterly analytical sampling to be conducted in the second and fourth year of the five-year permit, weather permitting. However, one monitoring point (MP) was closed for construction and drought conditions persisted for the year. This resulted in the collection of six samples from four MPs. Under ideal conditions, the eight stations would produce 32 samples. FY 04 is the next required analytical sampling period. No visual samples were collected for the first three quarters of the year due to the drought. Visual samples were collected at five MPs in the fourth quarter and no unusual characteristics were noted. The permit is due for renewal again in 2005.

Groundwater Protection

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

- **GWPP** – The GWPP conducts general surveillance of water quality from a network of wells not associated with the ER Project. Annual sampling was conducted in a total of ten wells and one spring in FY02. Analysis was conducted for metals, volatile organic compounds (VOCs), inorganics (including nitrate and cyanide), phenolics, alkalinity, total halogenated organics (TOXs), gross alpha, gross beta, and selected radionuclides. The sample from the EOD Hill well exceeded the gross alpha maximum contaminant level (MCL) of 15 picocuries per liter (pCi/L). The water sample from Coyote Springs exceeded the drinking water standard for beryllium. Uranium-234 from the sample in the TRE-1 exceeded the DOE drinking water guidelines. Although the analysis for isotopic uranium-234 exceeds the DOE drinking water guideline, the total uranium concentration is below the newly promulgated EPA MCL for total uranium of 30 µg/L (40 CFR 141). All of the exceedences are attributed to naturally occurring sources.

- **ER** – The ER Project collects groundwater samples at six general project areas: the CWL, the Mixed Waste Landfill (MWL), Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG), Canyons Area, and Drain and Septic Systems (DSS). Water quality results reported by the ER Project were consistent with past years' results.

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 was one short-term exceedence of the eight hour ozone standard that was recorded in May 2002.

- **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.

- **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 2002, there were 20 SNL/NM facilities reporting NESHAP-regulated emissions. Of these 20 sources, 18 were point sources and two were diffuse sources. In 2002, 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 0.002 millirem per year (mrem/yr). The off-site MEI received an EDE of 0.0009 mrem/yr. Both doses are below the EPA standard of 10 mrem/yr.

National Environmental Policy Act (NEPA) Activities

During 2002, NEPA compliance activities at SNL/NM included support to DOE/NNSA/SSO for the preparation of a Supplement Analysis to the Site-Wide Environmental Impact Statement (SWEIS) that analyzed and approved expanded operations at SNL/NM's Z-Accelerator in TA-IV. The SNL/NM NEPA Team also began work supporting the preparation of two environmental assessments, one for the Test Capabilities Revitalization (TCR) Program, and the other for a proposed Center for Integrated Nanotechnologies (CINT) to be built along Eubank Blvd, north of KAFB. During the year, the NEPA Team published the *SWEIS Annual Review-FY2001*, an annual comparison of SNL/NM operations against the environmental analysis included in the SWEIS (DOE 1999). In 2002, SNL/NM performed a total of 366 NEPA compliance reviews, forwarding 65 NEPA checklists to DOE/NNSA/SSO for review and determination.

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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). This report was prepared in accordance with the requirements set forth for all large U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) facilities and represents a key component of DOE's effort to keep the public informed about environmental conditions at DOE/NNSA sites.

SNL/NM is located 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 Mountains, named for the watermelon color seen on the mountains at sunset, and the Manzanita Mountains both 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.

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

Environmental Snapshot

- *The strongest winds occur in the spring when monthly wind speeds average 10.3 mph. Wind gusts can commonly reach up to 50 mph.*
- *The maximum elevation on KAFB is 7,986 ft.*

View of the Sandia Mountains from SNL/NM

SNL/NM is one of the nation's premier multi-program security laboratories within the DOE/NNSA. SNL/NM is managed by Sandia Corporation and overseen by the DOE/NNSA through its Sandia Site Office (SSO).

General Site Location and Characteristics
KAFB is a 51,559-acre military installation, including 20,486 acres withdrawn from the Cibola National Forest through an agreement with the U.S. Forest Service (USFS) (Figure 1-1) located at the foot of the Manzanita Mountains, with a mean elevation of 5,384 ft and a maximum of 7,986 ft. KAFB and SNL/NM are located adjacent to the City of Albuquerque, which surrounds KAFB on the north, northeast, west, and southwest boundaries.

KAFB is host to over 150 tenant groups at this site. SNL/NM is located on the east side of KAFB. 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, leased from the State of New Mexico and Isleta Pueblo, 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.

Additional information on local geology, hydrology, and ecology is presented at the end of this chapter.

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 seven 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);
- DOE Order 450.1, *Environmental Protection Program* (DOE 2003); and
- DOE Order 5400.2A, *Environmental Compliance Issue Coordination* (DOE 1993a).

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

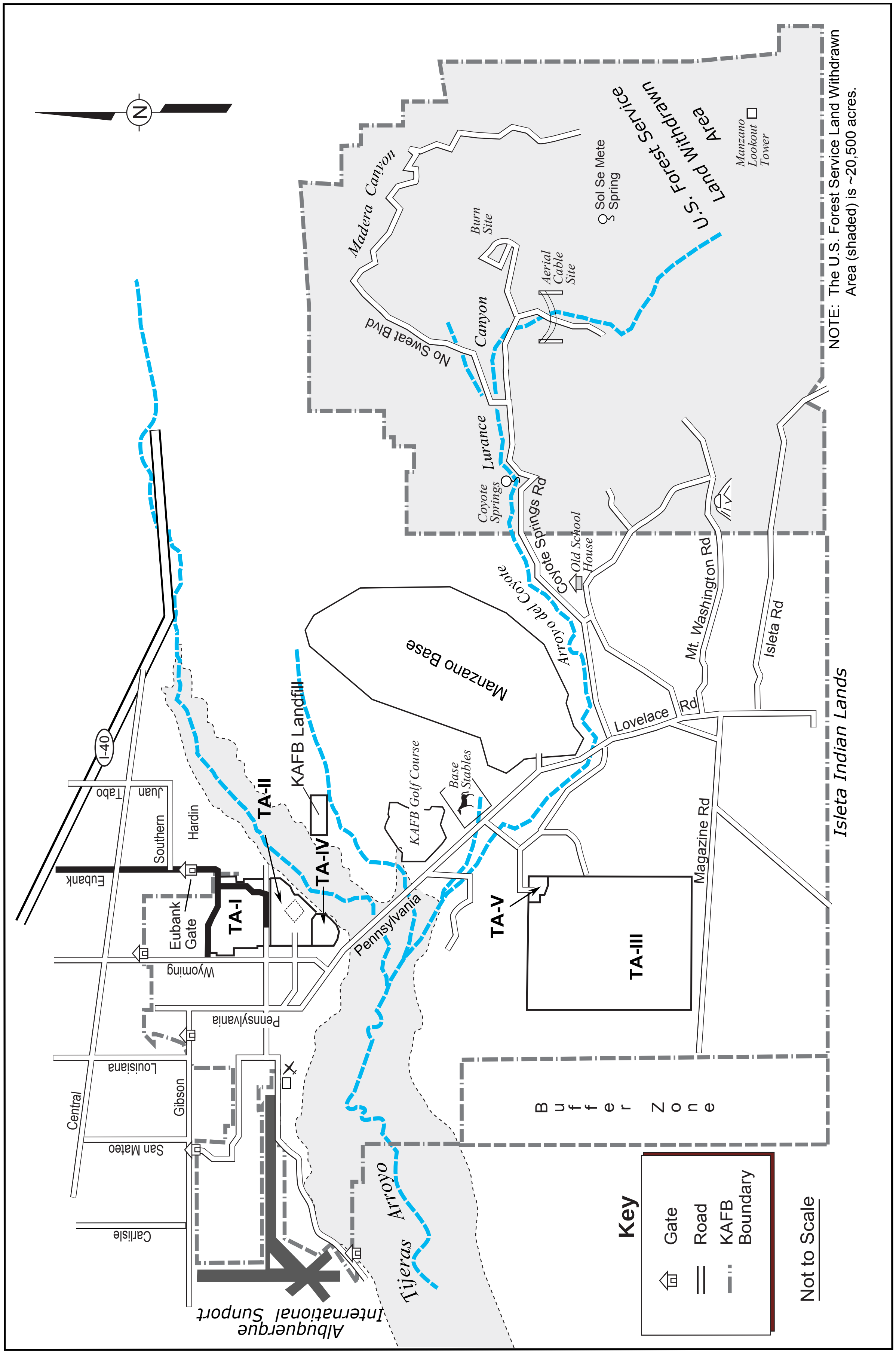

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FIGURE 1-1. SNL/NM Technical Areas and the U.S. Forest Service Land Withdrawn Area

Managing a Legacy of Contamination
In a ranking of DOE sites SNL/NM was one of the least contaminated facilities. The cleanup and remediation of all SNL/NM sites is expected to be complete by 2006. Some sites will require long-term monitoring to ensure that any remaining contamination does not migrate from the site. Detailed information about EM cleanup efforts throughout DOE can be found at DOE's website:

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

A History of Progress
Over the past 11 years, Sandia Corporation has made tremendous progress in building a comprehensive ES&H Program. The ES&H Manual (SNL 2003), a dynamic online resource available to all personnel at SNL/NM, clearly describes ES&H requirements for all levels of work conducted. 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 in recent years by the U.S. Environmental Protection Agency (EPA), various DOE/NNSA offices, the City of Albuquerque, and the State of New Mexico, have been testimony to Sandia Corporation's significant ES&H progress.

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. 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.

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.

1.2 SITE OPERATIONS

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. A majority of activities performed in TA-I are dedicated to the design and research and development (R&D) of 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 home of 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 TAs. It contains facilities 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. Other 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), and the Melting and Solidification Laboratory (MSL).

Recent Developments from Sandia National Laboratories

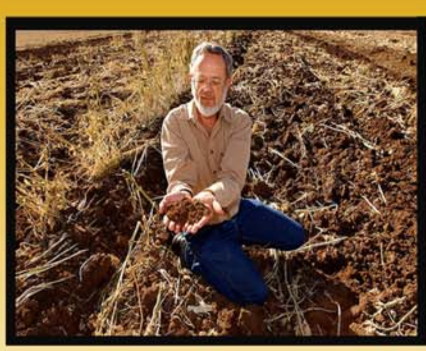
An SNL/NM researcher places power supply fixtures for neutron generators into a drying oven at Sandia's neutron genertor production facility.

Nuclear Weapons The MC4380A Neutron Generator, which was designed and qualified for the W76-0/Mk4 Trident warheads to provide additional margin in radiation environments, was recently developed at SNL/NM. This rigorous project lasted two years and successfully supported the stockpile needs without the advantage of underground test.

Arms Control Technologies and Nonproliferation Programs
Sandia is developing the Advanced Atmospheric Research Equipment (AARE) to provide the USAF with the ability to continue a 50-year-plus mission of monitoring foreign nuclear testing. The equipment will present the capability to do treaty monitoring and sampling against worldwide nuclear testing activities. The AARE will replace the outdated equipment of the 30-to-40 year old technology of the Atmospheric Research Equipment (ARE). This new approach will save considerable operational costs for the USAF compared to maintaining a dedicated aircraft for the mission.

Additionally, the PROTECT program, supported by DOE's Chemical and Biological National Security Program, is collaborating with a major international airport on defense of such facilities from chemical and biological terrorist attacks. A vulnerability assessment, including tracer-gas release testing and chemical and biological detection equipment testing, explored physical security and air handling issues that influence the likelihood and impact of such attacks.

SNL/NM Researchers are developing sensors to provide early warning of chem-bio attacks in airports, subways, and other public spaces where people gather.



SNL/NM Researchers are developing a variety of technical and systems approaches to helping communities deal with water issues.

Technology Partnerships Sandia developed a dynamic simulation model of the hydrology, demography, and economy in the Middle Rio Grande Basin to help stakeholders understand the consequences of trade-off decisions, from installing low-flow toilets to providing water for endangered species. The model, which is already contributing to water sustainability in New Mexico, bridges the technical demands and capabilities of a rigorous, quantitative model and the collaborative social processes required for community-based management. Scientists at SNL/NM have also developed hydroxylated polystyrene film dielectrics that have five times the energy density of commercial polymer film dielectrics at fuel cell vehicle operating tempertures.The breakthrough promises to substantially increase the fuel efficiency of fuel cell and electric hybrids. The new efficiency is a result of the improved high-temperature performance and reduced size of DC Bus capacitors, the largest power inverter components.

Technical Area IV (TA-IV)
TA-IV is 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. Active and inactive accelerators in TA-IV are the Z- Accelerator, the Advanced Pulse Power Development (APPDL), the Radiographic Integrated Test Stand (RITS), the Tera-Electron Volt Energy Superconducting Linear Accelerator (TESLA), the High Energy Radiation Megavolt Electron Source-III (HERMES-III), the Saturn accelerator, 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 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 New Gamma Irradiation Facility (NGIF), the Annular Core Research Reactor (ACRR), and the currently inactive Hot Cell Facility (HCF).

Remote Test Areas
Several remote test areas are located east and southeast of TA-III and within the canyons and foothills of the USFS withdrawn area (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*

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 the Management and Operating Contract [MOC]) and adheres to the principles of line management responsibility for ES&H as described in Sandia Corporation's ISMS.

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.

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.

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 854,211 residents (DOC 2003). The Albuquerque metropolitan area alone has approximately 723,296 residents (DOC 2003). There are nine counties contained in all or part of this radius (Figure 1-2).

1.4 GEOLOGY

1.4.1 Regional Setting

The regional geologic setting in which SNL/NM and KAFB are situated has been subjected to relatively recent episodes of basaltic volcanism and ongoing regional 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 northern New Mexico.

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, manifested by the Sandia, Manzanita, and Manzano Mountains bound 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.

Regional Fault Systems

As shown in Figure 1-3, 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 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 major groundwater regimes at KAFB.

The Sandia fault is thought to be the primary boundary between the Sandia Mountains and the Albuquerque Basin. The Sandia fault converges with the Tijeras fault and the Hubbell Springs fault. Both the Sandia fault and Hubbell 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 1977).

1.5 HYDROLOGICAL SETTING

The hydrogeological system 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.

A shallow groundwater system (SGWS) overlies the regional system in the north portion of KAFB. The SGWS extends southward from TA-1 to the KAFB Golf Course. The western extent of the SGWS is somewhere midway between Wyoming Boulevard and the Albuquerque Sunport east-west runway. The eastern extent is just east of the KAFB landfill and may be bounded by the West Sandia Fault. The groundwater gradient within the SGWS is to the southeast with the depth to water approximately 270 ft below ground level in the western part and 420 ft to groundwater in the east.

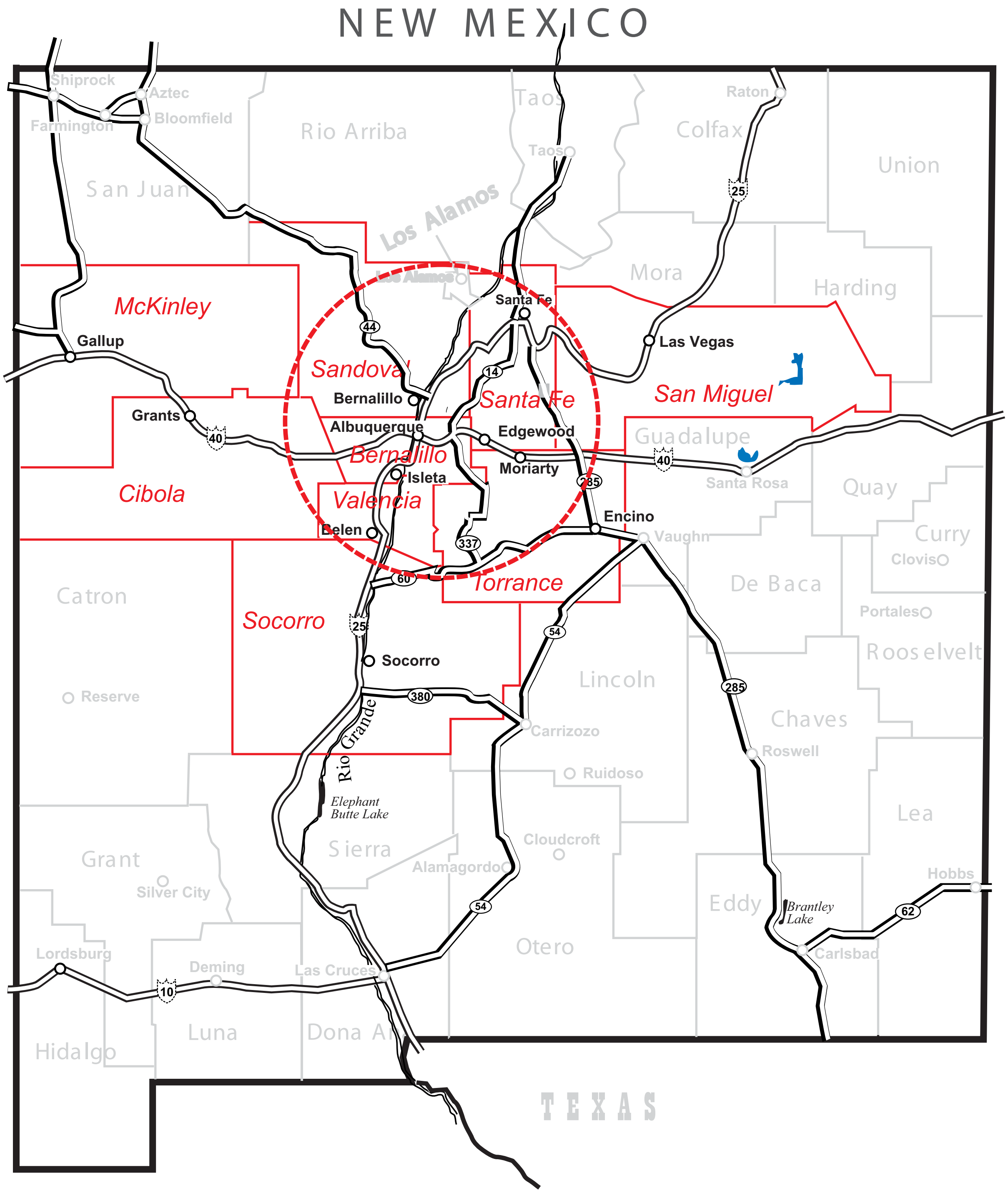


FIGURE 1-2. State of New Mexico Map

The overlay shows major roads, cities, county lines, and the 50-mi radius from SNL/NM facilities (dashed circle).

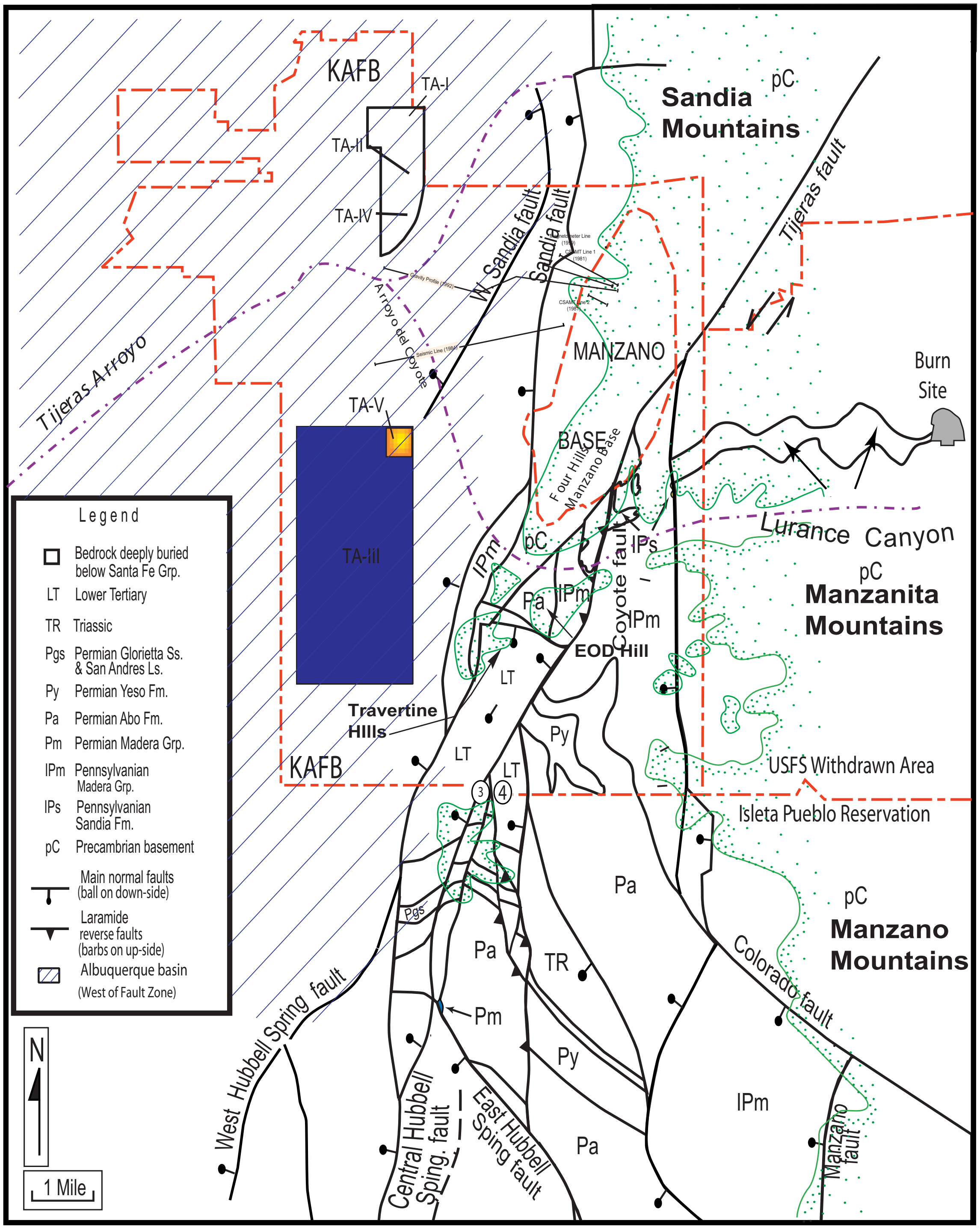


FIGURE 1-3. Generalized Geology in the Vicinity of SNL/KAFB

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. Numerous ephemeral springs occur within the foothills and in the eastern reach of Arroyo del Coyote.

Groundwater Production
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: the monthly average relative humidity varies from a low of 30 percent in early summer to 56 percent in early winter.

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 SNL/NM facilities area is influenced by two major physiographic provinces:

Mesa and Plains – much of central New Mexico, including the middle Rio Grande and much of SNL/NM, is comprised of this physiography. Major landforms are valleys, lowlands, outwash plains, and alluvial fans and terraces. Grama and galleta grasses and four-wing saltbush occur along with sand sage at lower elevations, pinon-juniper at higher elevations, and conifers are in the scattered mountain ranges. Riparian strips along water courses have cottonwood-willow and non-native salt cedar.

Southern Rocky Mountains – the Sandia and Manzano Mountains form the southern extension of the Rocky Mountains. The eastern portion of SNL/NM is located in, and bordered by the Manzanos. Vegetation in these steep, rugged mountains varies greatly on the basis of elevation and aspect. Due to topography, weather, fire, insect outbreaks, and disease, forests in the Southern Rocky Mountains tend to be patchy. The landscape is a complex mosaic of open meadows and forest stands of varying age and species composition.

These physiographic provinces each have an influence on the typical landforms, flora, and fauna predominant within the SNL/NM area. The topography at KAFB ranges from lowland grasslands to high elevation coniferous forests. With much of the area undeveloped, there is great diversity in plant and animal communities living on KAFB. At least 267 plant species and 195 animal species occur on KAFB (DOE 1999). Table 1-1 lists the most common species of birds, mammals, reptiles, amphibians, and plants that have been identified on-site.

1.7.1 Regional Life Zones Occurring on KAFB

Ponderosa Pine Forest or Transition Life Zone (7,000 – 8,000 feet) A closed canopy of ponderosa pines, pinon-pine, juniper, scrub oak, grassy meadows, streams, marshes and canyons are typical of this zone. The Forest Service withdrawn area in the eastern portion of KAFB reaches an elevation of just over 7,900 feet.

Pinon-Juniper Woodland Zone (6,000 – 7,000 feet) A mostly open canopy of pinon-pine and juniper dot this zone of foothills and mesas. Animals typical of this woodland include the pinon mouse and pinon jay. Much of the rolling terrain in the withdrawn area is comprised of this zone.

Upper Sonoran Life Zone (below 6,000 feet) This shortgrass prairie zone occurs on alluvial fans, mesas and gently rolling or sloping plains. Pioneer plants include tumbleweed, goathead, and spurge; intermediate plants include galleta and burro grass, cactus, and mixed weeds; climax vegetation is grama grass. Animals include prairie dogs, burrowing owls, and kangaroo rats. The non-withdrawn area KAFB lands fall within this zone.

Lizard at SNL/NM

TABLE 1-1. Most Common Plants and Animals Identified at KAFB

BIRDS			
American robin	*Turdus migratorius*	Horned lark	*Eremophila alpestris*
American kestrel	*Falco sparverius*	Killdeer	*Charadrius vociferus*
Black-chinned hummingbird	*Archilochus alexandris*	Loggerhead shrike	*Lanius ludovicianus*
Black-headed grosbeak	*Pheucticus melanocephalus*	Mountain bluebird	*Sialia currucoides*
Broad-tailed hummingbird	*Selasphorus platycercus*	Red-tailed hawk	*Buteo jamaicensis*
Dark-eyed junco	*Junco hyemalis*	Rufous-sided towhee	*Pipiloerythro melanocephalus*
MAMMALS			
Black bear	*Ursus americanus*	Desert cottontail	*Sylvilagus audubonii*
Bobcat	*Felis rufus*	Deer mouse	*Peromyscus maniculatus*
Big brown bat	*Eptesicus fuscus*	Gunnison's prairie dog	*Cynomys gunnisoni*
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	Gray fox	*Urocyon cinereoargenteus*
Black-tailed jackrabbit	*Lepus californicus*	Mountain lion	*Felis concolor*
Common porcupine	*Erethizon dorsatum*	Mule deer	*Odocoileus hemionus*
REPTILES AND AMPHIBIANS			
Collared lizard	*Crotaphytus collaris*	Leopard lizard	*Gambelia wislizenii*
Chihuahuan spotted whiptail	*Cnemidophorus exsanguis*	Tiger salamander	*Ambystoma tigrinum*
Desert horned lizard	*Phrynosoma platyrhinos*	Western diamondback rattlesnake	*Crotalus atrox*
Eastern fence lizard	*Sceloporus undulatus*	Side-blotched lizard	*Uta stansburiana*
Gopher snake	*Pituophis melanoleucus*	Striped whip snake	*Masticophus taeniatus*
Great plains skink	*Eumeces obsoletus*	Short-horned lizard	*Phrynosoma douglassi*
Great plains toad	*Bufo cognatus*		
PLANTS			
Apache plume	*Fallugia paradoxa*	Goathead	*Tribulus terrestris*
One-seed juniper	*Juniperus monosperma*	India ricegrass	*Achnatherum hymenoides*
New Mexico porcupine grass	*Stipa neomexicana*	Ring muhly	*Muhlenbergia torreyi*
Purple three-awn	*Aristida purpurea*	Bush muhly	*Muhlenbergia porteri*
Shrub live oak	*Quercus turbinella*	Soapweed yucca	*Yucca glauca*
Spectacle pod	*Ditheryrea wislizenii*	Blue locoweed	*Astragalus lentiginosus*

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Chapter 2

Compliance Summary

In this Chapter ...

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2002 Releases, Compliance Issues, and Environmental Occurrences 2-11
2002 Audits and Appraisals 2-11
Summary of Reporting Requirements 2-11
Summary of Environmental Permits 2-11
Environmental Performance Measures 2-11

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 adheres to strict reporting and permitting requirements.

External audits and appraisals are conducted at SNL/NM to identify issues that may arise from operations. SNL/NM also conducts internal audits and appraisals as a part of quality assurance (QA). In 2002, four external audits and one inspection were conducted.

Eleven environmental occurrences (i.e., problems, concerns, failures, malfunctions or deficiency in a process, procedure, or program) were reported in 2002 (see Section 2.2.2).

Environmental Snapshot

Return of the Energy Nag:

"The Nag," who has been tracking energy consumption in the CNSAC building and nagging fellow building residents to do more to conserve, says that compared to the period of August 2000-July 2001, the August 2001-July 2002 time period (the year of nagging), has resulted in 856,623 kilowatt-hours saved. That's enough to power 100 Albuquerque homes over the same period of time. Total energy consumption for the building dropped by 17.8 percent and has saved about $50,000 in electricity costs.

Gunnison's prairie dog (*Cynomys gunnisoni*) waving hello.

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 2-4 and Section 2.1.16). Ongoing compliance issues and corrective actions, environmental occurrences, and environmental audits and appraisals are also discussed in this chapter.

Current permits held by Sandia Corporation and DOE, National Nuclear Security Administration (NNSA), Sandia Site Office (SSO) for air, water, and waste are listed in Chapter 9.

2.1 COMPLIANCE STATUS WITH FEDERAL REGULATIONS

Most environmental regulations and statutes applicable to Sandia Corporation along with their websites are discussed on page 2-4.

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

CERCLA, commonly known as "Superfund," provides cleanup funds and/or assessment requirements for inactive waste sites at all federal facilities.

A Preliminary Assessment/Site Inspection (PA/SI), as required by CERCLA, was performed at SNL/NM in 1988 (DOE 1995). 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 may be invoked in the case of a reportable quantity (RQ) release. Sandia Corporation was in full compliance with CERCLA and Superfund Amendments and Reauthorization Act (SARA) in 2002.

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 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 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.

There were no reportable releases at SNL/NM under EPCRA or CERCLA in 2002. Information on EPCRA can be found at the following EPA website:

http://yosemite.epa.gov/oswer/CeppoWeb.nsf/content/epcra_law.htm

Toxic Release Inventory (TRI) Reporting

EPCRA regulations 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 *Greening the Government Through Leadership in Environmental Management*. The threshold value for listed chemicals for which a TRI report is required is 10,000 lb/yr, unless otherwise specified.

The EPA is proposing to include in the regulations the North American Industry Classification System (NAICS) codes that correspond to the SIC codes that are currently subject to the TRI reporting requirements. The EPA is also proposing that facilities that are subject to TRI reporting requirements report both SIC and NAICS codes on EPCRA section 313 reporting forms for the first full reporting period after the effective date of the final rule. Thereafter, facilities that are subject to TRI reporting requirements would be required to report their NAICS codes only.

In Calendar Year (CY) 2002, chemical use at SNL/NM was below the reporting thresholds for submitting a TRI report. However, Sandia Corporation continues to document its toxic chemical use in the *Chemical Inventory Report, Calendar Year 2002* (SNL/Outrider 2003), which lists all purchases of chemicals (even though the quantities are below the threshold quantities).

TABLE 2-1. 2002 SARA Title III (or EPCRA) Reporting Requirements Applicable to SNL/NM

Section	SARA Title III Section Title	Requires Reporting? Yes	Requires Reporting? No	Description
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/SSO, which distributes it to the required entities.
304	Emergency Notification		✓	No RQ releases of an EHS, or as defined under CERCLA, occurred in 2002.
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 2002 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
EPA = U.S. Environmental Protection Agency NNSA = National Nuclear Security Administration
SNL/NM = Sandia National Laboratories, New Mexico SSO = Sandia Site Office

This chemical inventory supports compliance with SARA Title III as well as Title V of the Clean Air Act Amendments (CAAA) of 1990.

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) and under delegated authority from EPA under RCRA, the New Mexico Environment Department (NMED) administers hazardous waste regulatory programs in New Mexico. 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 Chapter 9.

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 (MW) is regulated under the Atomic Energy Act (AEA) of 1946.

Sandia Corporation generates hazardous and MW through normal operations. Sandia Corporation also generates hazardous and MW 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 MW through product substitutions, process changes, material re-use, and recycling. See section 3.3 for more details.

The following summarizes Sandia Corporation's hazardous waste management activities during 2002:

- **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 1992 (active permits are listed in Chapter 9). Sandia Corporation and DOE reapplied for a Part B Operating Permit renewal in June 2002, and

Major Environmental Regulations & 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 **http://tis.eh.doe.gov/oepa/guidance/aea.htm**

Clean Air Act (CAA) and CAA Amendments (CAAA)
Provides standards to protect the nation's air quality **http://www.epa.gov/oar/oaq_caa.html**

Clean Water Act (CWA)
Provides general water quality standards to protect the nation's water sources and byways
www.epa.gov/region5/water/cwa.htm

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
www.epa.gov/region5/defs/html/cercla.htm

Cultural resources acts
Includes various acts that protect archeological, historical, religious sites, and resources
http://water.usgs.gov/eap/env_guide/cultural.html

Endangered Species Act (ESA)
Provides special protection status for federally-listed endangered or threatened species
www.epa.gov/region5/defs/html/esa.htm

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
www.whitehouse.gov/news/orders

Federal Facility Compliance Act (FFCA)
Directs federal agencies regarding environmental compliance
http://tis.eh.doe.gov/oepa/law_sum/ffca.htm

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
Controls the distribution and use of various pesticides **www.epa.gov/region5/defs/html/fifra.htm**

Migratory Bird Treaty Act (MBTA) of 1918
Prevents the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts, and nests **http://tis.eh.doe.gov/oepa/law_sum/mbta.html**

National Emission Standards for Hazardous Air Pollutants (NESHAP)
Specifies standards for radionuclide air emissions and other hazardous air releases
www.epa.gov/radiation/neshaps/

National Environmental Policy Act (NEPA)
Ensures that federal agencies review all proposed activities and include environmental consideration in agency decision-making **http://tis.eh.doe.gov/NEPA/**

Resource Conservation and Recovery Act (RCRA)
Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks (USTs) **www.epa.gov/region5/defs/html/rcra.htm**

Safe Drinking Water Act (SDWA)
Provides specific standards used for drinking water sources **www.epa.gov/safewater/sdwa/sdwa.html**

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*
www.epa.gov/region5/defs/html/sara.htm

Toxic Substance Control Act (TSCA)
Specifies rules for the manufacture, distribution, and disposal of specific toxic materials such as asbestos and polychlorinated biphenyls (PCBs) **www.epa.gov/compliance/civil/federal/tsca.html**

the old permit remains in force until a new one is issued. Details related to the HWMF operations are contained in Chapter 3, (Section 3.2.1).

- **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. Details related to explosive waste are contained in Chapter 3 (Section 3.2.1).

  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 Chapter 9). During 2002, Sandia Corporation did not use the TTF for waste treatment.

- **Mixed Waste** – Much of the 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 received final operating permits. Sandia Corporation and DOE applied for a Part B Operating Permit most recently in 2002. Details related to these facilities are in Chapter 3 (Section 3.2.3).

- **ER Project** – Sandia Corporation and DOE continued ER activities in 2002, 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 2002, 126 sites and areas of concern (AOC) remained to be addressed at SNL/NM. During 2002, Sandia Corporation and DOE submitted three No Further Action (NFA) proposals to the NMED and received NFA approval for an additional 30 sites.

  The Corrective Action Management Unit (CAMU) is permitted under RCRA for the management of remediation waste (primarily contaminated soil) generated during the excavation of the Chemical Waste Landfill (CWL). Storage, treatment, and containment activities are authorized under the CAMU permit (SNL/NM, September 1997). Details related to the CAMU are in Chapter 3 (Section 3.1.2).

- **USTs** – USTs and above-ground storage tanks (ASTs) are regulated under the New Mexico Administrative Code (NMAC) as indicated in Chapter 9. USTs are also regulated by 40 CFR part 280 of RCRA. The NMAC regulations are more stringent than the RCRA requirements. Sandia Corporation currently has three registered USTs and 20 ASTs at SNL/NM. ASTs must also meet 40 CFR 110. Sandia Corporation complied with all regulatory requirements in 2002.

- **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. Details about the SWTF are in Chapter 3 (Section 3.2.4).

- **Permits –** On February 6, 2002, Sandia Corporation and DOE submitted a comprehensive RCRA Part B (final) permit request for operating nine units used for hazardous waste management. The permit request included: requests for renewal of the existing permits for the HWMF and the TTF; updated applications for operating permits for the RMWMF, the HBWSF, and the MSB; a new application for operation of the Auxiliary Hot Cell Facility (AHCF); and requests for renewal of existing permits and authorizations for the CAMU, the temporary unit (TU), and the Low-Temperature Thermal Desorption (LTTD) system. NMED granted Sandia/DOE's application for use of the AHCF and determined that the existing authorization for use of the LTTD was not valid. Sandia Corporation submitted a permit modification request to operate the LTTD, and NMED granted the request in August 2002. Active permits are listed in Chapter 9.

- **Closures** – During 2002, Sandia Corporation continued closure activities for hazardous waste management units that were operated under interim status and are no longer used as follows:

  <u>*CWL*</u> - 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 2002, 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. In 2002, SNL/NM submitted a report to NMED, who accepted the completion of closure.

2.1.4 Federal Facility Compliance Act (FFCA)

The FFCA requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste. On October 4, 1995, the NMED, DOE, and Sandia Corporation entered into a Federal Facility Compliance Order (FFCO) for management of MW at SNL/NM. A general Site Treatment Plan (STP) and a schedule for processing the waste was developed.

In 2002, 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 STP.

2.1.5 Atomic Energy Act (AEA)

In 1946, the AEA was created 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 U.S. Nuclear Regulatory Commission (NRC), and the EPA. Federal regulations control radioactive emissions and the transport of nuclear materials. The authority for controlling radioactive waste is retained by the DOE and is governed by DOE Orders.

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 has direct delegation from EPA to locally administer these standards as well as specific air emission permits and registrations as shown in Chapter 9, Table 9-1.

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 2002, the MEI was located at a KAFB facility just north of Technical Area V (TA-V). The dose at this location was 0.00211 mrem/yr. The off-site MEI was located at Tijeras Arroyo (West). The dose at this location was 0.000872 mrem/yr. Both doses are below the EPA standard. Sandia Corporation met all NESHAP compliance requirements in 2002.

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 oil storage and 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 exceedance of permit limits in 2002. Details related to this exceedance are discussed in Sections 2.2 and 6.1.5.

Surface 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 15 one-time surface discharge permits in 2002. Additionally, two evaporation lagoons in TA-IV and the joint Sandia Corporation/New Mexico Tech Vadose Zone (STVZ) Infiltration Test Facility located in Socorro County are permitted by the NMED. The TA-IV 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. The STVZ is used to study the effects of contaminant flow and transport through a heterogeneous vadose zone using sodium chloride tracer solutions. All permit conditions for the permitted sites were met in 2002.

In 2002, there were nine reportable surface releases that were reported as occurrences and reviewed by the Surface Discharge Program (Section 2.2 and 6.2.2).

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.

Albuquerque experienced a severe drought during the Fiscal Year (FY) 2002 monitoring period, which prevented consistent sample collection.

Due to the drought, no discharge samples were collected at any of the monitoring points (MPs) for the first two quarters of the monitoring period and for three locations, no samples were collected for the entire year. These three MPs are located in remote natural drainages where the low rainfall coupled with highly permeable soil resulted in little to no runoff.

Section 6.3 discusses Sandia Corporation's 2002 storm water results. As stated in SNL/NM's storm water discharge permit, the next analytical samples will be collected in FY 04.

2.1.8 Safe Drinking Water Act (SDWA)

The SDWA 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.

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 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 TSCA in 2002. Details related to TSCA are in Chapter 3 (Section 3.2.1).

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 compiles information on pesticide use at SNL/NM, as discussed in Section 3.4. Sandia Corporation was in full compliance with FIFRA in 2002.

2.1.11 National Environmental Policy Act (NEPA)

NEPA requires federal agencies and private entities that perform federally-sponsored projects to include environmental aspects in early project planning and decision-making. A major intent 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. An important component of NEPA is that it mandates that the agency's decision process be open for public review. If a proposed action is determined to have environmentally "significant" impacts, the agency must prepare an environmental assessment (EA) or an environmental impact statement (EIS) before an irretrievable commitment of resources or funding occurs. Although a major objective of NEPA is to preserve the environment for future generations, the law does not require an agency to select the proposed action alternative with the least environmental impacts.

2002 NEPA Documentation

During 2002, NEPA compliance activities at SNL/NM included support to DOE/NNSA/SSO for the preparation of a Supplement Analysis to the Site-Wide Environmental Impact Statement (SWEIS) that analyzed and approved expanded operations at SNL/NM's Z-Accelerator in TA-IV. The SNL/NM NEPA Team also began work to support the preparation of two EAs, one for the Test Capabilities Revitalization (TCP) Program, and the other for a proposed Center for Integrated Nanotechnologies (CINT) to be built along Eubank Blvd, north of KAFB. During the year, the NEPA Team published the *SWEIS Annual Review-FY2001*, an annual comparison of SNL/NM operations against the environmental analysis included in the SWEIS (DOE 1999). In 2002, SNL/NM performed a total of 366 NEPA compliance reviews, forwarding 65 NEPA checklists to DOE/NNSA/SSO for review and determination. Table 2-2 provides a summary of these review activities.

2.1.12 Endangered Species Act (ESA)

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. At SNL/NM, ESA compliance is coordinated with NEPA compliance reviews. Table 2-3 lists threatened and endangered species potentially occurring in Bernalillo County.

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. 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 the Facilities Management and Operations Center.

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 U.S. Air Force (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.

TABLE 2-2. Summary Data for SNL/NM NEPA Reviews Performed in Calendar Year 2002

NEPA Reviews	Review Breakouts	Quantity
NEPA Module Reviews[1]	Total Reviewed by NEPA Team	**235**
	DOE Checklist Submittals[2]	64
EDP Reviews[3]	Total Reviewed by NEPA Team	**112**
	DOE Checklist Submittals[2]	1
	SNL/NM Reviews (Total)	**347**
Air Force (AF) NEPA Reviews[4]	Land Use Permit Renewals	4
	Land Use Permit Terminations	0
	Land Use Permit Modifications	15
	AF-813 Submittals (Total)	**19**
GRAND TOTAL of ALL NEPA REVIEWS		**366**
PERCENTAGE of TOTAL REVIEWS REQUIRING SUBMITTAL to DOE		**18%**

NOTE: [1]SNL reviews cite existing NEPA documents; where existing documents are not available, NEPA checklists are prepared and submitted to DOE. Environmental Restoration (ER) reviews are now included in the Total Reviewed by NEPA Team.

[2]Projects after initial reviews that needed to be forwarded to DOE for review.

[3]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.

[4]All Air Force NEPA documents are prepared by the NEPA Team in cooperation with the project originator.

TABLE 2-3. Threatened and Endangered Species Potentially Occurring in Bernalillo County, New Mexico

Species		Federal Status	State Status	Observed at KAFB
MAMMALS				
Spotted bat	*Euderma maculatum*	--	Threatened	
New Mexican jumping mouse	*Zapus hudsonius luteus*	--	Threatened	
FISH				
Rio Grande silvery minnow	*Hybognathus amarus*	Endangered	Endangered	
BIRDS				
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened	
Common black-hawk	*Buteogallus anthracinus anthracinus*	--	Threatened	
American peregrine falcon	*Falco peregrinus anatum*	--	Threatened	✓
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	--	
White-eared hummingbird	*Hylocharis leucotis borealis*	--	Threatened	
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	Endangered	
Whooping crane	*Grus americana*	Endangered	Endangered	
Bell's vireo	*Vireo bellii*	--	Threatened	✓
Gray vireo	*Vireo vicinior*	--	Threatened	✓
Baird's sparrow	*Ammodramus bairdii*	--	Threatened	✓
Neotropic cormorant	*Phalacrocorax brasilianus*	--	Threatened	

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

Historical Building Assessment

There are 81 buildings in TA-I of greater than 1,000 ft^2 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 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/SSO toward compliance with this EO.

> **SWEIS Maintenance**
>
> *The SWEIS analyzed SNL/NM's operations, processes, site characteristics, and potential operational impacts using 1996 and 1997 baseline conditions. The analysis included expanded operations of selected facilities projected through 2008. In 2002, the SWEIS Annual Review (AR) - FY2001 (SNL 2002k) was published to provide an updated summary of SNL/NM operational activities compared to the environmental analysis in the SWEIS. Continued preparation of an annual SWEIS AR will support both ongoing NEPA compliance at SNL/NM and DOE's assessment of the SWEIS in 2005. DOE's preparation of a supplement analysis is the regulatory 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.*

2.1.16 DOE Orders

The seven primary DOE Orders that pertain to environmental protection and management are discussed in Chapter 1, "Operations Contract." In 2002, Sandia Corporation met all requirements stated in these DOE Orders. In January 2003, DOE Order 450.1 was issued, which will supersede and cancel DOE Order 5400.1 when incorporated into the Sandia management and operating contract. Incorporation of Order 450.1 into the contract is pending.

2.1.17 Summary of Radiological Releases

A summary of radiological releases and public dose resulting from Sandia Corporation operations is provided in Table 2-4. More detailed information is found in Chapters 5 and 6 of this report.

2.2 2002 RELEASES, COMPLIANCE ISSUES, 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. There are three categories of occurrences, determined by the severity of the event. These occurrences are: "off-normal," "unusual," or "emergency." Environmental occurrences in 2002 are described in Section 2.2.2.

2.2.1 Occurrence Tracking

Occurrence reporting is tracked by the Integrated Safety and Security Reporting, Feedback, and Information Management Department. All Sandia occurrences are entered into the DOE Occurrence Reporting and Processing System (ORPS) database, which also tracks corrective actions and closure of the occurrence report. Information on the ORPS can also be found at the following website:

http://tis.eh.doe.gov/paa/orps.html

2.2.2 2002 Environmental Occurrences

Environmental occurrences for five years (1998 through 2002) are shown in Figure 2-1. This figure shows all occurrences for which "nature of occurrence" included "environmental." (The graph also shows subcategories within the environmental category.) In 2002, two events were categorized as being "value basis reporting," but also involved the release to the environment of water from broken drinking water pipes. In 2002, there were 11 reportable environmental occurrences, plus the two "value basis" occurrences that also involved release of water. All these events were categorized as "off-normal:" Table 2-5 summarizes environmental occurrences in 2002.

2.3 2002 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. Environmental audits and appraisals conducted by external agencies in 2002 are listed in Table 2-6.

2.4 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 2-7 summarizes the three primary reporting requirements for releases applicable to SNL/NM.

2.5 SUMMARY OF ENVIRONMENTAL PERMITS

Table 9-1 in Chapter 9 lists all environmental permits and registrations that were in effect in 2002. This includes permit applications that are pending and are under review by various agencies. There was one pH excursion resulting in a permit standard exceedance in 2002 (Table 2-5).

2.6 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 *Fiscal Year 2002 DOE/NNSA and SNL Appraisal Agreement* (DOE/NNSA/SNL 2001), the *Sandia National Laboratories FY02 Appraisal Laboratory Self-Assessment*, (Hanks 2002) and the *National Nuclear Security Administration FY2002 Multi-Program Laboratory Appraisal of Sandia National Laboratories* (NNSA 2002). 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 Environmental Management (EM):

E-85 Fueling Station Installed

An E-85 fueling station was recently installed in the Motor Pool Complex. E-85 is an alternative fuel that is comprised of 85% Ethanol (alcohol from corn) and 15% unleaded gasoline. SNL/NM has about 100 vehicles that can use the fuel in the current fleet inventory. By using E-85, we lower pollution and decrease the amount of foreign oil we consume, which is important to SNL/NM as we attempt to meet the requirements of the Energy Policy Act of 1992 and support the efforts of EO 13149.

TABLE 2-4. SNL/NM Radiological Dose Reporting for Calendar Year 2002

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	2E-3	2E-5	0.002%	6.8E-2	6.8E-4	793,740	-	-
Water	0	0	0	0	0	0	-	-
Other Pathways	0	0	0	0	0	0	-	-
All Pathways	2E-3	2E-5	0.002%	6.8E-2	6.8E-4	793,740	2.9E5	2.9E3

Radiological Atmospheric Releases for 2002 (in Curies)										
Tritium	Kr^{85}	Noble Gases ($t_{1/2}$ <40 days)	Fission and Activation Products ($t_{1/2}$ <3 hr)	Fission & Activation Products ($t_{1/2}$ >3 hr)	Total Radio-iodine	Total Radio-strontium	Total U	Pu	Other Actinides	Other
15.4	0	10.6	9.1E-4	7.3E-3	0	3.9E-7	1.4E-6	1E-13	4.4E-7	3.5E-5

Liquid Effluent Releases of Radioactive Material for 2002						
Tritium	Fission and Activation Products ($t_{1/2}$ <3 hr)	Fission & Activation Products ($t_{1/2}$ >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

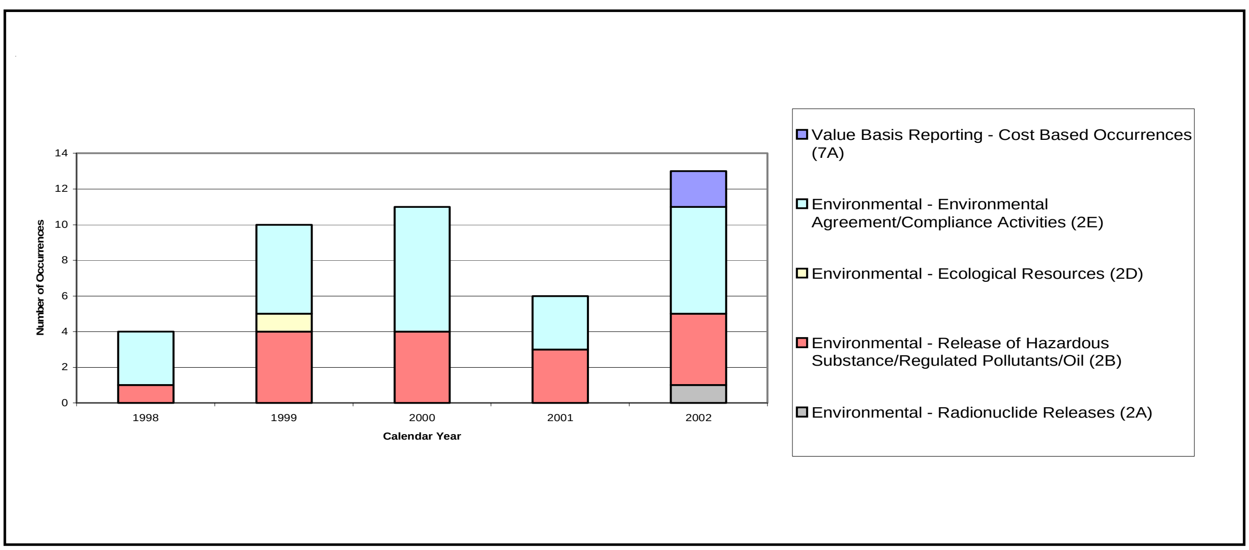

FIGURE 2-1. Environmental Occurrences for Five Years (1998 through 2002)

- 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
- NEPA Compliance
- Emergency Management

The FY 2002 DOE/NNSA Multi-Program Laboratory Appraisal report indicated that operations and administration support performance was excellent (NNSA 2002).

TABLE 2-5. Summary of Environmental Occurrences in 2002

Date	Occurrence Category	Description
March 2002	Off-normal	A release of 200-300 gallons of untreated/dilute sanitary wastewater into the storm sewer during construction activities. NMED was notified.
March 2002	Off-normal	A water line break at 9th Street occurred with the release of approximately 330,000 gallons of potable water. NMED was notified.
April 2002	Off-normal	An irradiated stainless steel particle found in the trap of a sink. Work was done to identify and control any further contamination. The sinks and piping were removed.
May 2002	Off-normal	Small release of mercury during equipment dismantlement at the Reapplication Yard.
May 2002	Off-normal	Suspected discharge of 30-50 gallons of 50% hydrogen peroxide in sanitary sewer after inventory review came up short.
May 2002	Off-normal	It was discovered that the Greystone Well Site, an identified cultural resources site, had been disturbed.
May 2002	Off-normal	A water line break at TA3 occurred with the release of between 750,000-1,100,000 gallons of potable water. NMED was notified.
July 2002	Off-normal	A water line ruptured at a construction site in TA1. Approximately 293,000 gallons of water was released.
August 2002	Off-normal	Release of approximately 30,000 gallons of domestic water as a result of incorrect plug installation into potable water line. Water flow was stopped, topsoil was excavated, and cap was replaced.
September 2002	Off-normal	Comments and Notice of Deficiency (NOD) received from NMED regarding RCRA Part B Permit Application. (Note: A NOD is a normal process for transmitting comments back to the permit applicant.)
October 2002	Off-normal	Unplanned discharge of ½ gallon cutting fluid containing mineral oil to storm sewer at building 840 after a rain event.
December 2002	Off-normal	A pH excursion occurred at wastewater station WW008.
December 2002	Off-normal	A chilled water line was damaged during grading operations. Approximately 33,000 gallons of water was released and entered the storm drain system.

NOTE: Occurrences did not present any environment, safety or health issues.
NMED = New Mexico Environment Department
RCRA = Resource Conservation and Recovery Act
TA = Technical Area

TABLE 2-6. Environmental Program Audits and Appraisals Conducted In 2002

Appraising Agency	Title	Date	Summary
External Audits and Appraisals			
NNSA/Nevada Test Site (NTS)	Radioactive Waste Management Program Waste Certification Audit	April 2002	Audit for compliance with NTS Radioactive Waste Acceptance Criteria.
EPA	Ozone Depleting Substances (ODS)	June - August 2002	Follow-up to Multi-media environmental assessment from June 2001 but focused on ODS.
DOE/NNSA/ SSO	Contractor Performance Assessment Program	August 2002	Appraisals of a variety of programs at SNL/NM. There were no environmental findings.
Lockheed Martin Corporation (LMC)	ES&H Self-Assessment	May 2002	Self-assessment. No environmental corrective actions.
DOE OA	ES&H and Emergency Management Scoping Visit	October 2002	Office of Independent Oversight and Performance Assurance Personnel conducted a scoping visit in preparation for an audit in 2003.
Inspections and Observations			
COA	Air Quality Inspection	June 2002	Baseline inspection of six facilities against their city air quality permits.
COA	Wastewater Inspection	March 2002	COA inspection and tour of facilities within the Permit 2069K flow basin. There were no findings.
COA	Wastewater Inspection	April 2002	COA inspection and tour of 2069G flow basin. There were no findings.
COA	Wastewater Inspection	September 2002	COA inspection of flow basins 2069A and 2069I. There were no findings.
COA	Wastewater Inspection	October 2002	COA inspection and tour of facilities in flow basin 2069F. There were no findings.

NOTE: DOE = U.S. Department of Energy
SSO = Sandia Site Office
QA = quality assurance
NTS = Nevada Test Site
COA = City of Albuquerque
NNSA = National Nuclear Security Administration
EPA = U.S. Environmental Protection Agency
ODS = Ozone depleting substance
LMC = Lockheed Martin Corporation

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 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 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/NNSA, 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 Media Relations staff.

TABLE 2-7. Summary of Sandia Corporation's Reporting Requirements to Outside Agencies (Other than 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.	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 NMED. 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

In this Chapter ...

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Waste Management 3-6
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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 2002. In anticipation of the closure of the ER Program in 2006, Sandia Corporation and the U.S. Department of Energy (DOE) published a draft Long-Term Environmental Stewardship (LTES) Plan that was made available to the public to address future environmental responsibilities. The final LTES Plan is scheduled for completion in 2006.

Environmental Snapshot

- *The Environmental Education Outreach Program participated in five events in 2002.*
- *Students from James Monroe Middle School participated in environmental education by creating environmentally themed art, which is featured on* *page 3-16**.*

Sandia Corporation has been recognized for various P2 awards including the EPA "2002 Waste-Wise Federal Partner Award."

In 2002, Sandia received the following awards:

- The "White House Closing the Circle Award" for success in "Dedicated Green Contracts"
- The New Mexico Green Zia Award
- Two DOE P2 Awards

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 (EM) 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.

Commitment to Health and the Environment
It is the DOE, National Nuclear Security Administration (NNSA), Sandia Site Office (SSO) 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 when the main 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 Office of EM to identify, assess, and remediate sites potentially contaminated by past spill, release, and disposal activities.

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.

3.1.1 Cleanup and Site Closures

Waste generated from SNL/NM ER sites includes RCRA-hazardous waste, radioactive low-level waste (LLW), Mixed RCRA, mixed low-level waste (MLLW), Toxic Substances Control Act (TSCA) waste (primarily polychlorinated biphenyls [PCBs] with some asbestos), and industrial solid waste. The waste management section in this chapter shows the waste volumes generated by the ER Project.

No Further Action (NFA) Status
ER sites are proposed for NFA based on insignificant contamination present or after remediation has been completed. At SNL/NM, remediation is accomplished through voluntary corrective measure (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 majority of ER sites are granted NFA status under a risk based scenario. Risks to human health and the ecosystem are calculated according to guidance from the EPA and the NMED. Risk is calculated for sites with residual contamination, the level of contamination remaining, and the appropriate land-use category (i.e., industrial use, residential use, or recreational) are used as input to determine any remaining risk to human health and the ecosystem. This method is used to ensure these calculated risks are small enough to warrant NFA status.

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 verification for a successful determination.

ER Project Awards and Commendations

All performance measures were completed on or ahead of schedule. In addition, the ER Project received the "Green Zia Environmental Excellence Award" from the NMED for the third time in as many years.

TABLE 3-1. Summary of ER Project Status

	A	B	C	D	E*	F **
Year	Total ER Sites at Start of FY	ER Sites Proposed for NFA in FY	Sites Approved for NFA in FY	Corrective Actions Completed by End of FY	New ER Sites Identified During FY	Total ER Sites at End of FY
2002	**158**	**3**	**30**	**2**	**-2**	**126**
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 2002.
** 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.

3.1.2 2002 Status and Activities

At the close of 2002, there were 126 regulated ER sites remaining on Sandia Corporation’s RCRA Part B Operating Permit and four sites were being actively remediated at SNL/NM. In 2002, a Class III Permit modification request was approved by NMED to remove 30 sites from the HSWA permit. The ER Project expects to propose 12 more sites (including 11 areas of concern [AOC]). It is our understanding that there are only 5 AOCs (and these are specific to groundwater). All NFA proposals and Class III Permit modifications are available for review at the University of New Mexico (UNM) Zimmerman Library and Community Resources Information Office (CRIO).

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).

Since then, 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 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 2006 with LTES to follow. This date is subject to change based on available funding.

Corrective Action Management Unit (CAMU)

The CAMU is permitted under RCRA for the management of remediation waste (primarily contaminated soil) generated during the excavation of the Chemical Waste Landfill (CWL). Storage, treatment, and containment activities are authorized under the CAMU permit (Table 9-1). The CAMU is located in Technical Area III (TA-

Project Highlights

Of the four sites undergoing remediation in 2002, 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^3 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 soil sampling, backfill, and revegetation. Final closure is expected in FY 2003.

CWL (ER Site 74) – Excavation of the CWL was completed in February 2002 to a maximum depth of 30 feet below ground surface. A total of over 52,000 cubic yards of soil and waste debris were excavated, segregated, and managed as part of the Landfill Excavation VCM project. Approximately 89% of the excavated material was moved to the adjacent CAMU for treatment and/or final disposal. Approximately 11% of the excavated soil was returned to the excavation as backfill material based on risk screening criteria. Less than 1% of the excavated waste will require off-site disposal at a permitted disposal facility. Completion of backfilling operations are planned for 2003. Final activities associated with waste management and closure of the site operational boundary are ongoing.

III) next to the CWL and Radioactive and Mixed Waste Management Facility (RMWMF). Construction of the CAMU began in December 1997 and was completed in March 1999. The CAMU began accepting waste from the CWL for storage in January 1999.

The CAMU containment cell design consists of engineered barriers and incorporates a bottom liner system, a final cover system, and a vadose zone monitoring system (VZMS). The VZMS provides information on soil conditions under the cell for early detection of leaks. The VZMS consists of three subsystems that include the primary subliner (PSL), vertical sensor array (VSA), and CWL and sanitary sewer line (CSS) monitoring subsystems.

VZMS monitoring of the containment cell continued throughout 2002. The PSL, VSA, and CSS monitoring subsystems were monitored for the composition of soil gasses and soil moisture content. From January to July 2002, VZMS monitoring was performed on a quarterly basis. The monitoring frequency was increased to monthly in September 2002, in anticipation of waste placement activities in the containment cell, which began in September 2002. Monitoring results for 2002 were generally consistent with baseline data established between January 1999 and December 2000.

Soil treatment operations were conducted at the CAMU during the late summer and fall of 2002. Two treatment processes, Low Temperature Thermal Desorption (LTTD) and stabilization treatment (ST), were used as needed to treat soil wastes before they were placed in the containment cell. The LTTD system was used to treat soil contaminated with organic compounds. The LTTD treatment technology heats the remediation waste and volatilizes the organic compounds out of the waste stream. The ST system was used to stabilize soil contaminated with metals. The soil was stabilized in a pug mill using a mixture of Portland cement and water, effectively immobilizing the metals contamination within the soil matrix. Soil wastes that contained both organic and inorganic (e.g., metals) contaminants at levels requiring treatment were treated first by the LTTD system to remove organic contaminants, followed by the ST system to immobilize metals.

In May 2002, the NMED approved comprehensive update to the Temporary Unit (TU) permit, authorizing ST treatment operations (Table 9-1). In September 2002, the NMED issued a permit

A front view of the HWMF

TABLE 3-2. CAMU Waste Streams Processed During 2002

Waste Stream	Original Volume (yd^3)	Volume Treated To Date (yd^3)	Volume Placed To Date (yd^3)
No Treat	18,400	NA	10,000
LTTD	2,800	2,800	2,800
ST	15,500	14,300	14,300
LTTD/ST	6,200	6,200	6,200
PCB (No Treat)	1,400	NA	1,400
PCB/ST	3,900	3,800	3,800
Totals	48,200	27,100	38,500

authorizing LTTD treatment operations (Table 9-1). In June 2002, the EPA issued final approval for placement of PCB contaminated soil into the containment cell (Table 9-1).

The majority of waste treatment and placement activities were completed during the late summer and fall of 2002. Table 3-2 provides the field-estimated, non-compacted treatment and placement volumes for the various CAMU waste streams processed during CY02.

A total of 10,000 yd^3 of soil not requiring treatment was placed in the containment cell. In addition, a total of 5,200 yd^3 of PCBs contaminated soil was placed in the containment cell in accordance with permit requirements. Of that amount, 3,800 yd^3 also contained metals contamination and was stabilized prior to placement. LTTD treatment operations were completed in December 2002. The LTTD treated a total of 9,000 yd^3 of soil contaminated with organic compounds. Of that amount, 6,200 yd^3 also contained metals contamination and was stabilized following LTTD treatment. All LTTD treated soil was placed in the containment cell. Soil stabilization treatment operations are still ongoing and are 95% completed. By the end of CY02, a total of 24,300 yd^3 of soil had been stabilized using the ST unit and placed in the containment cell. All LTTD-treated and stabilized soil placed in the containment cell met permit-specific treatment criteria.

A total of 48,200 yd^3 of contaminated soil was removed from the CWL and stored at the CAMU. Of that amount, a total of 27,100 yd^3 was treated with the LTTD and ST units and a total of 38,500 yd^3 was placed and compacted in the CAMU containment cell. By the end of CY02, the containment cell held a total of 22,900 yd^3 of compacted soil. Table 3-2 summarizes waste streams processed by the CAMU during 2002.

LTES Plan

Following the submittal of the draft LTES Plan to DOE Headquarters in late 2001, the Stewardship Group changed its focus to planning for public interactions and making changes to the plan as it became appropriate. Three task groups were formed: Planning/Timeline, Public Outreach/Education, and Websites.

The Planning/Timeline Task Group reviewed all 17 areas of the original plan that had been identified as areas that needed further information or resolution. They ensured that each area was being appropriately addressed so that these areas would be resolved in a way that would support project completion by 2006. The group anticipates updating each of these 17 areas by the end of FY03.

The Public Outreach/Education Task Group worked in a variety of areas. In the area of outreach, the group identified a variety of materials that would be helpful in informing the public. For education, the group proposed and received funding for a summer program involving high school students and teachers, in a partnership between WERC (a consortium for environmental education and technology development) and SNL/NM. This program will help the students and teachers learn about LTES.

Treatment process for contaminated soil

The Website Task Group evaluated existing websites related to LTES at other DOE facilities, and reviewed stakeholder reports about those websites. The group agreed with the findings of the reports, and decided to recommend that SNL/NM's LTES website contain similar information and format. A set of recommendations for web site management, maintenance, and Sandia-specific contents was drafted. Members met with SNL/NM's internal web development contractor to initiate bringing ER information to a publicly available LTES site. SNL/NM's LTES can be accessed at the following website:

http://www.sandia.gov/ltscenter

The group kept track of the progress of SNL/NM's cooperation with Bernalillo County Environmental Health Department's LandTrek pilot project. They hosted a LandTrek demonstration for other public participants and obtained feedback on important features that the SNL/NM site should include.

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 Hazardous and Chemical Waste

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.

Hazardous waste is tracked from the point of generation to final disposal through meticulous "cradle to grave" documentation at each waste-handling step. Each waste item received at the HWMF is labeled with a unique bar code, linking the item to the original disposal request. 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 temporary storage. 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 Chapter 9.

2002 Activities at the HWMF

In 2002, a total of 9,722 package items were handled by the HWMF. The HWMF shipped a total of 71,847 kg (158,396 lb) of RCRA-regulated hazardous waste (including recyclable waste). Specific waste categories handled and shipped in 2002 are shown in Table 3-3.

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 1,181 kg (2,604 lb) of RCRA hazardous waste and 4,383 kg (9,663 lb) 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 34,584 kg (76,245 lb) of material was recycled in this category.

Asbestos Waste Handling

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. In 2002, a total of 115,476 kg (254,581 lb) of asbestos waste was generated and disposed.

PCB Handling

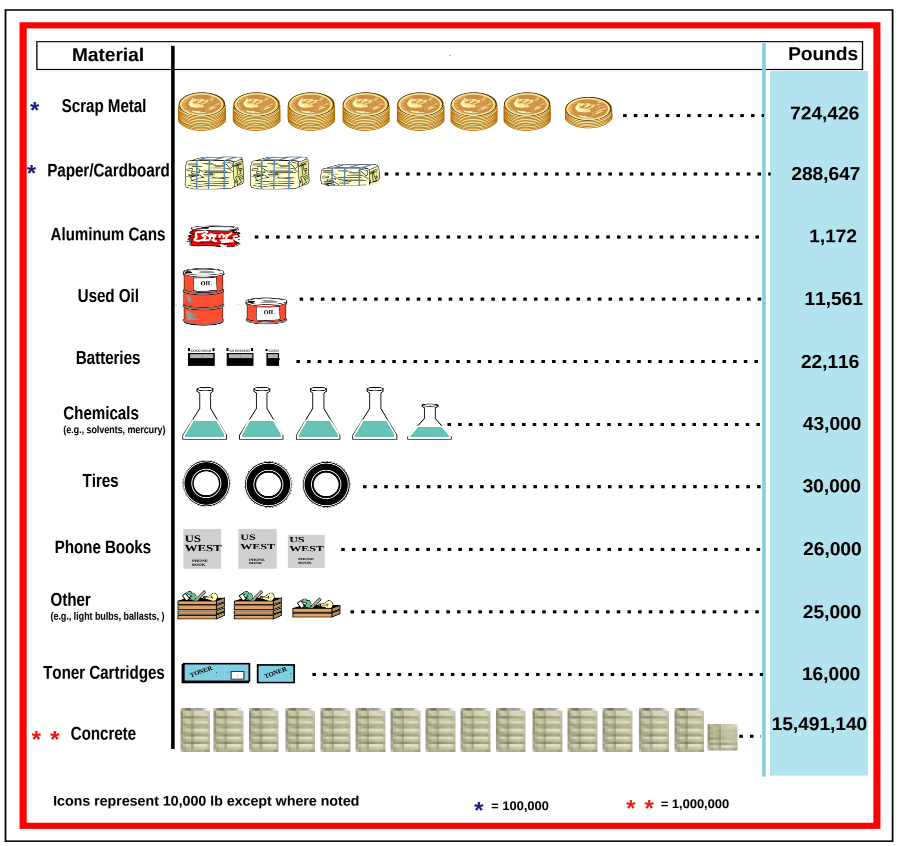
PCBs are a class of organic chemicals that were widely used in industrial applications due to their practical physical and chemical properties. Use of PCBs included dielectric fluids (used in

TABLE 3-3. Waste Shipped By The HWMF in 2002

Waste Categories Handled at the HWMF	2002 Waste Shipped	
RCRA Waste	**(kg)**	**(lbs)**
Hazardous Waste	29,064	64,075
Hazardous Waste (Generated by ER Project)	7,018	15,472
Hazardous Waste (recycled)	1,181	2,604
Total	**37,263**	**82,151**
TSCA		
Asbestos	115,476	254,581
PCB (recycled NR)	2,607	5748
PCB (recycled RCRA)	0	0
PCB (incin NR)	140	309
PCB (incin RCRA)	19,694	43,418
Total	**137,917**	**304,056**
BIOHAZARDOUS		
Infectious Waste	**338**	**745**
OTHER		
NR Waste (minus asbestos, PCB, subtitle D, ER, recycled)	26,239	57,847
Non-hazardous Solid Waste (RCRA Subtitle D)	838	1848
Non-RCRA (Generated by ER Project)	184	406
Used Oil	4,383	9663
Lead (recycled)	28,527	62,891
Other (recycled) – various batteries, fluorescent lamps, and non-PCB (ballasts, capacitors, and oils)	34,584	76,245
Total	**94,755**	**208,900**
Total Waste and Recyclables Shipped	**270,273**	**595,852**

NOTE: RCRA = Resource Conservation and Recovery Act
TSCA = Toxic Substances Control Act (primarily regulates asbestos and PCBs)
PCB = Polychlorinated Biphenyl
NR = non-regulated

TABLE 3-4. Categories of Waste Recycled at SNL/NM in 2002



transformers, capacitors, etc.), hydraulic fluids, and other applications requiring stable, fire-retardant materials. The domestic production and distribution of PCBs was banned in 1979 and their use continues to be phased out.

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 2002 as a result of the ER Project at the CWL.

In 2002, a total of 44,443 lbs (20,177 kg) of PCB waste was shipped from the HWMF; 37,555 lbs (17,050 kg) of ER-generated PCB-contaminated soil and 1,145 lbs (520 kg) of other PCB waste was shipped for disposal; and 5,742 lbs (2,607 kg) of PCB waste was shipped for recycling.

Explosive Waste

Explosive waste generated at SNL/NM is generally managed at the point of generation until it can be shipped to a treatment facility. SNL/NM has a permitted facility for the treatment of limited quantities of certain explosive waste streams; however, this facility was not used in 2002. In 2002, 13,975 lbs (6,3441 kg) of explosive waste was transferred to KAFB for treatment and six large rocket motors totaling 44,729 lbs (20,307 kg) were shipped to Hill Air Force Base for treatment. The large increase over previous years is the result of an effort to decrease the inventory of excess explosives at SNL/NM.

3.2.2 Radioactive and Mixed Waste

The RMWMF manages LLW, MLLW, transuranic (TRU), and TRU/MLLW. No high-level radioactive waste (HLW) is generated at SNL/NM. The waste processing functions at the RMWMF include waste characterization, segregation, treatment, packaging, storage, and shipment to permitted off-site facilities. 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.

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, personnel protection equipment (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.*

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. Normally, 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. Some LLW may remain on-site greater than one year. Generally, this is due to fully utilizing transport vehicles to ensure that the vehicles are full prior to leaving the site.

Applicable DOE Orders and regulations for radioactive waste and MLLW management are listed in Chapter 9.

Radioactive Waste Storage

Presently, radioactive waste generated from SNL/NM is temporarily stored at the RMWMF and Manzano Storage Bunkers. TRU and TRU/MW will be routed through Los Alamos National

SNL/NM met the 2002 milestone deadline set forth in the Federal Facility Compliance Order (FFCO) and Site Treatment Plan (STP) regarding the treatment and shipment of specific MW stored at SNL/NM (SNL 2002i). Sandia Corporation submitted an annual update for the STP covering FY 2001 activities by the March 2002 deadline (SNL 2002).

Laboratory (LANL) or directly to the Waste Isolation Pilot Plant (WIPP) for final disposal.

2002 Activities at the RMWMF
In 2002, 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 2002, the RMWMF shipped 196,169 lbs (89,168 kg) of LLW, 35,406 lbs (16,094 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 2002 is shown in Figure 3-1. Production facilities make up the bulk of LLW managed at the RMWMF.

3.2.3 MW Regulatory Status

As discussed in Section 2.1.4, Sandia manages MW in compliance with the Federal Facility Compliance Order (FFCO) (NMED 1995). 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.

SNL/NM's compliance history regarding MW management is shown in Table 9-3.

MW Treatment
Table 3-5 lists the current MW categories (TG-1 to TG-27 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: chemical deactivation (including pH neutralization), thermal deactivation, stabilization, macroencapsulation, and physical treatment (volume reduction). These are described in the current RCRA Part B Operating Permit application (submitted to NMED in 2002).

Status of MW Management in 2002
The majority of MW now being stored on-site consists of low-level radioactive oils and absorbed oils, and radioactive metallic objects with RCRA metals. No off-site MW was received from other DOE sites in 2002.

In 2002, SNL/NM shipped 38,462 lbs (17,443 kg) of MW to off-site facilities. An additional 511 lbs (232 kg) of MW was treated at the RMWMF and rendered non-hazardous.

3.2.4 Solid Waste

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.

Applicable DOE Orders and regulations are listed in Chapter 9.

SWTF Operations
All solid waste accepted at the SWTF must be sanitary non-hazardous waste. The SWTF does not accept food service waste, construction debris, radioactive, explosive, or other hazardous waste streams. Construction debris and food service

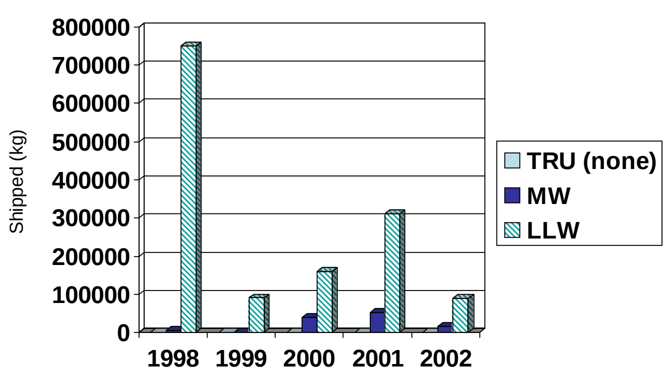


FIGURE 3-1. Five-Year Summary of Total Radioactive Waste Shipped at SNL/NM

TABLE 3-5. Mixed Waste Treatment and Disposal Status

Waste Category	Volume (m^3)	Preferred Treatment Technology	Description	Status and Plans
TG 1	0.18	Deactivation	Inorganic Debris with Explosive Component	Utilizing on-site treatment and investigating off-site treatment and disposal options.[a]
TG 2	0.036	Deactivation	Inorganic Debris with a Water Reactive Component	Utilizing on-site treatment.
TG 3	0.01	Deactivation	Reactive Metals	Utilizing on-site treatment and investigating off-site treatment and disposal options.
TG 4	0.01	Macro-encapsulation	Elemental Lead	Utilizing off-site treatment and disposal options.[a]
TG 5	0.004	Neutralization followed by Stabilization	Aqueous Liquids (Corrosive)	Utilizing on-site treatment.
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	2.0	Thermal Desorption	Organic Debris with Organic Contaminants	Utilizing off-site treatment and disposal options.[a]
TG 9	12.2	Macro-encapsulation	Inorganic Debris with TCLP Metals	Performing on-site treatment in compliance with interim status requirements for MW management or shipping to off-site treatment and disposal facilities.[a]
TG 10	0.5	Sort followed by Reclassification	Heterogeneous Debris	Sort waste as needed to determine more suitable treatability groups.
TG 11	0.15	Hydrothermal Processing	Organic Liquids II	Utilizing off-site treatment and disposal options.[a]
TG 12	0.3	Macro-encapsulation	Organic Debris with TCLP Metals	Performing on-site treatment in compliance with interim status requirements for MW management or shipping to off-site treatment and disposal facilities.[a]
TG 13	0.01	Deactivation followed by Stabilization	Oxidizers	Utilizing on-site treatment.
TG 14	0	Evaporative Oxidation	Aqueous Liquids with Organic Contaminants	No waste currently in inventory.
TG 15	0.17	Stabilization	Soils <50% Debris & Particulates with TCLP Metals	Performing on-site treatment in compliance with interim status requirements for MW management or shipping to off-site treatment and disposal facilities.[a]
TG 16	0	Oxidation	Cyanide Waste	No waste currently in inventory.
TG 17	6.35	Incineration followed by Stabilization	Liquid/Solid with Organic and/or Metal Contaminants	Utilizing off-site treatment and disposal options.[a]
TG 18	1.7	Incineration	Particulates with Organic Contaminants	Utilizing off-site treatment and disposal options.[a]
TG 19	0	Stabilization	Liquids with Metals	No waste currently in inventory.
TG 20	0.36	Deactivation followed by Stabilization	Propellant with TCLP Metals	Currently investigating on-site treatment and off-site commercial facilities for treatment.
TG 21	1	Off-Site Shipment / Macroencapsulation	Sealed Sources with TCLP Metals	Currently investigating on-site treatment and off-site commercial facilities for treatment.
TG 22	0	*Not Applicable*	Reserved	Not Applicable
TG 23	0	Off-Site Shipment / Size Reduction followed by Stabilization	Thermal Batteries	Utilizing off-site treatment and disposal options.[a]
TG 24	2.23	Off-Site Shipment / Macro-encapsulation	Spark Gap Tubes with TCLP Metals	Currently investigating on-site treatment and off-site commercial facilities for treatment.
TG 25	7.4	Sort followed by Reclassification	Classified Items with TCLP Metals	Sort waste as needed to determine more suitable treatability groups.
TG 26	0.4	Off-Site Shipment / Macro-encapsulation	Debris Items with Reactive Compounds & TCLP Metals	Currently investigating on-site treatment and off-site commercial facilities for treatment.
TG 27	0.13	Stabilization	High Mercury Solids & Liquids	Investigating off-site treatment and disposal options.
TRU/MW	0.83	To be determined	MTRU	Investigating off-site treatment and disposal options.

NOTE: [a]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 2002i)
and the *Site Treatment Plan for MW, FY02 Update* (SNL 2002).
TCLP = toxicity characteristic leaching procedure
m^3 = cubic meters
TRU/MW = transuranic/mixed waste

waste is collected and transported directly to local landfills.

The SWTF also serves as SNL/NM's central recycling center. In 2002, the SWTF processed 4,643,174 lbs (2,106,108 kg) of SNL/NM and KAFB commercial solid waste and 1,189,528 lbs (539,561 kg) of SNL/NM, KAFB, and DOE recyclable materials.

Recyclables
The SWTF is the central processing point for recyclable white paper, cardboard, mixed paper (junk mail), aluminum cans, toner cartridges, and computers generated at SNL/NM. The SWTF serves as the central processing point for the DOE and outside cooperating agencies, such as KAFB.

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

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 SNL/NM. 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 researches waste reduction technologies and products applicable to Sandia work processes, performs cost-benefit analyses, and locates funding for new waste reduction processes. Waste minimization and P2 requirements are promulgated by federal EOs as listed in Chapter 9.

P2 Awards
In 2002, SNL/NM received several awards for P2 accomplishments:

Green Zia
SNL/NM received recognition by the NMED for participating in NMED's prestigious Green Zia Environmental Excellence Program. Green Zia is a voluntary program, which encourages participating organizations to develop a system to improve their overall efficiency. Program criteria includes environmental leadership, employee involvement, community involvement, energy conservation, P2 and continuous environmental improvement. Companies that have shown significant efforts can qualify for one of three award levels: Commitment, Achievement, and Environmental Excellence. This is the third year SNL/NM organizations have won recognition for their efforts toward excellence. However, this is the first year the Achievement level was attempted. In September 2002, former Governor Gary Johnson presented Green Zia Awards to these SNL/NM organizations:

Commitment level
Neutron Generator Facility (NGF)

Achievement Level
Custodial Services, ER Project, Fleet Services, and Manufacturing Science and Technology

EPA WasteWise Program Champion
The U.S. Environmental Protection Agency (EPA) selected SNL/NM as a "2002 Program Champion" 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 specifically recognized SNL/NM for its efforts in purchasing environmentally preferable products, continuing to collect large amounts of recycling every year, and making great efforts to reuse materials.

DOE Awards for P2 Accomplishments
SNL/NM received two awards in 2002 from the national P2 program. The awards allow SNL/NM to be considered for the prestigious "White House Closing the Circle Award" to be presented in 2003.

- **Sowing the Seeds for Change Category:** Energy Nag. SNL/NM reinvigorated an energy strategy that could reduce SNL/NM's energy consumption by 3% a year.

- **Green Buildings Category:** Sustainability in SNL Buildings. SNL/NM implemented a systematic approach to incorporating sustainability in major construction projects by working with project managers, architects and engineers within SNL/NM's Facilities' division.

White House Closing the Circle Award:
As a result of receiving a DOE Award for P2 Accomplishment in 2002, SNL/NM was awarded a "White House Closing the Circle Award" for

successes in "Dedicated Green Contracts" through the Green Purchasing Program. Out of 245 nominations from Federal agencies in seven categories, only 26 individuals or teams received awards.

3.3.2 Environmentally Preferable Purchasing (EPP) Program

SNL/NM seeks to purchase environmentally preferable products and employ the most environmentally aware companies. SNL/NM communicates these requirements through its contracts. Just in Time (JIT) contracts are based on the ability to provide products that meet EPA's Comprehensive Procurement Guidelines (CPG) for recycled content. SNL/NM Procurement employees work towards preventing products from being purchased that do not meet these guidelines.

SNL/NM also issues dedicated contracts to supply certain CPG products. Environmentally preferable purchasing requirements are included in Request for Proposals (RFPs) and used to evaluate the award of a contract. Remanufactured toner cartridges, paper and re-refined motor oil are all purchased using dedicated contracts. The toner cartridge and motor oil contracts also require the vendor to collect and recycle their used product.

Thanks to efforts by SNL/NM's Green Procurement team, contract language was revised to ensure that building construction completed at SNL/NM now requires contractors to report their purchases of recycled-content materials. Construction specifications will soon require construction contractors to purchase recycled-content materials for many applications.

In 2002, 87% of the construction materials, vehicle products, landscape products, paper products, and non-paper office products purchased by SNL/NM met the EPA's recommendations for recycled content and environmentally preferable purchases.

SNL/NM's Fleet management worked diligently with fuel suppliers in neighboring states to expand an on-site alternative fuels fueling station and make two additional alternative fuels available at SNL/NM. Prior to the expansion of SNL/NM's alternative fuels station, the station only offered compressed natural gas. The two new fuels are B20, a bio-diesel 20 percent blend, and E85, a blend of 85 percent ethanol and 15 percent gasoline. B20 was not previously available in New Mexico and E85 was carried by only one station in the state. Fleets that use alternative fuels and alternative fuel vehicles (AFVs) help reduce the country's dependence on imported oil and the release of

A new tank at Fleet's expanded alternative fueling station

criteria pollutants and greenhouse gases into the atmosphere. After the expansion of the fueling station in 2002, SNL/NM's fleet is now 74 percent fueled by alternative fuels.

3.3.3 Sustainable Design (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 efficiency, reducing overall energy use and using alternative energy such as photovoltaics, choosing building materials that reduce waste, and providing a healthy indoor environment.

The goal is to minimize overall resource consumption by using building 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 SNL/NM personnel.

Integrating SD into construction projects at SNL/NM involves the collaborative effort of the Energy Manager, the Water Conservation Officer, the P2 Program, Project Managers, 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

Based on successful implementation of SD into several recent construction projects, SNL/NM has taken steps to ensure that all construction projects institutionalize SD principles as part of the basic design requirements. SNL/NM implemented a systematic program for review and revision of its Standard Construction Specifications and Design Manual to ensure that SD principles are fully integrated into all aspects of construction projects. All 106 standard construction specifications and each of the discipline chapters in the design manual were reviewed. Thirty-two construction specifications and each chapter of the design manual were revised to include SD requirements. Each revision went through a stringent review by all stakeholders including Facilities System Engineering and Architecture, ES&H, Fire Protection, and Operations and Maintenance so that complete, site-wide support was obtained.

SNL/NM has implemented SD into many recent projects using the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system. For example, SD was integrated into the following construction projects at SNL/NM:

- **Building 806 Green Conference Room -** A conference room in Building 806 was remodeled to contain recycled materials and be more energy efficient.

- **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 incorporated water harvesting, use of recovered materials, and a "built-in" recycling center. The design also required construction contractors to recycle construction debris. The use of native plants in landscaping provides a water-conserving, pleasing, southwestern look to the exterior of the recently completed facility.

- **The Joint Computational Engineering Laboratory (JCEL) and the Microsystems and Engineering Sciences Application (MESA) -** The JCEL and MESA facilities total over 400,000 ft^2. The JCEL is currently under construction and the MESA's design is complete. 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 all four facilities are expected to receive U.S. Green Building's LEED certifications.

3.3.4 Waste Reduction and Recycling

SNL/NM continues to reduce volumes of generated waste and to improve recycling programs. Through an analysis known as P2 Opportunity Assessments (PPOA), processes generating wastes are routinely assessed and waste stream methods are established. In 2002, a PPOA was conducted at Fleet Services. Recommendations were made for reducing the generation of hazardous and solid wastes and increasing the purchase of environmentally friendly products.

PPOAs were also conducted at the NGPF and Sandia National Laboratories/California (SNL/CA). The primary purpose of the NGPF assessment was to provide recommendations for waste reduction measures of hazardous and low-level radioactive waste streams.

As described under the Waste Management sections of this chapter, SNL/NM routinely recycles paper products, oil, metals, and office products. However, not all items that are sent for recycling are handled by the waste management facilities. Fleet Services sends tires to be retreaded. The Facilities Department sends construction materials and demolished building components, such as concrete, for recycling. Additionally, SNL/NM looks for opportunities to reuse materials rather than recycle. Computers that are still usable are donated to local schools and toner cartridges are sent for remanufacturing. Table 3-4 summarizes the quantities of materials that SNL/NM recycled during 2002 in all categories. In 2002, 42% of the materials that could have been disposed of in a landfill were instead diverted for recycling.

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., Hantavirus) 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 2002, DOE/NNSA/SSO-owned 98 regulated containers, including oil-containing equipment, transformers, underground storage tanks (USTs), and above-ground 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 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.

Sandia Corporation’s SPCC Plan describes oil storage facilities and the mitigation controls in place to prevent inadvertent discharges of oil (SNL 1999e). 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 and applicable regulations are listed in Chapter 9.

ASTs
In 2002, New Mexico passed oil storage regulations that required the registration of all oil storage tanks with a storage capacity greater than 1,320 gallons. SNL/NM registered 20 ASTs to comply with the regulations. The list of ASTs can be found in Table 9-1.

3.6 NEPA COMPLIANCE ACTIVITIES

NEPA Program
Sandia Corporation’s NEPA Compliance Program provides DOE/NNSA/SSO 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. 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 Site-Wide Environmental Impact Statement [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. 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 and regulations are listed in Chapter 9.

Part of the self-managed NEPA program at SNL/NM includes the training and employing of Qualified NEPA Reviewers (QNRs). Once qualification requirements are met, QNRs are able to use the ISMS NEPA Module software (under the initial supervision of NEPA Subject Matter Experts [SMEs]) to review pending project activities against existing NEPA assessments and reviews, potentially saving time and effort, by reviewing those activities that are essentially continuing operations at SNL/NM.

SNL/NM 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.

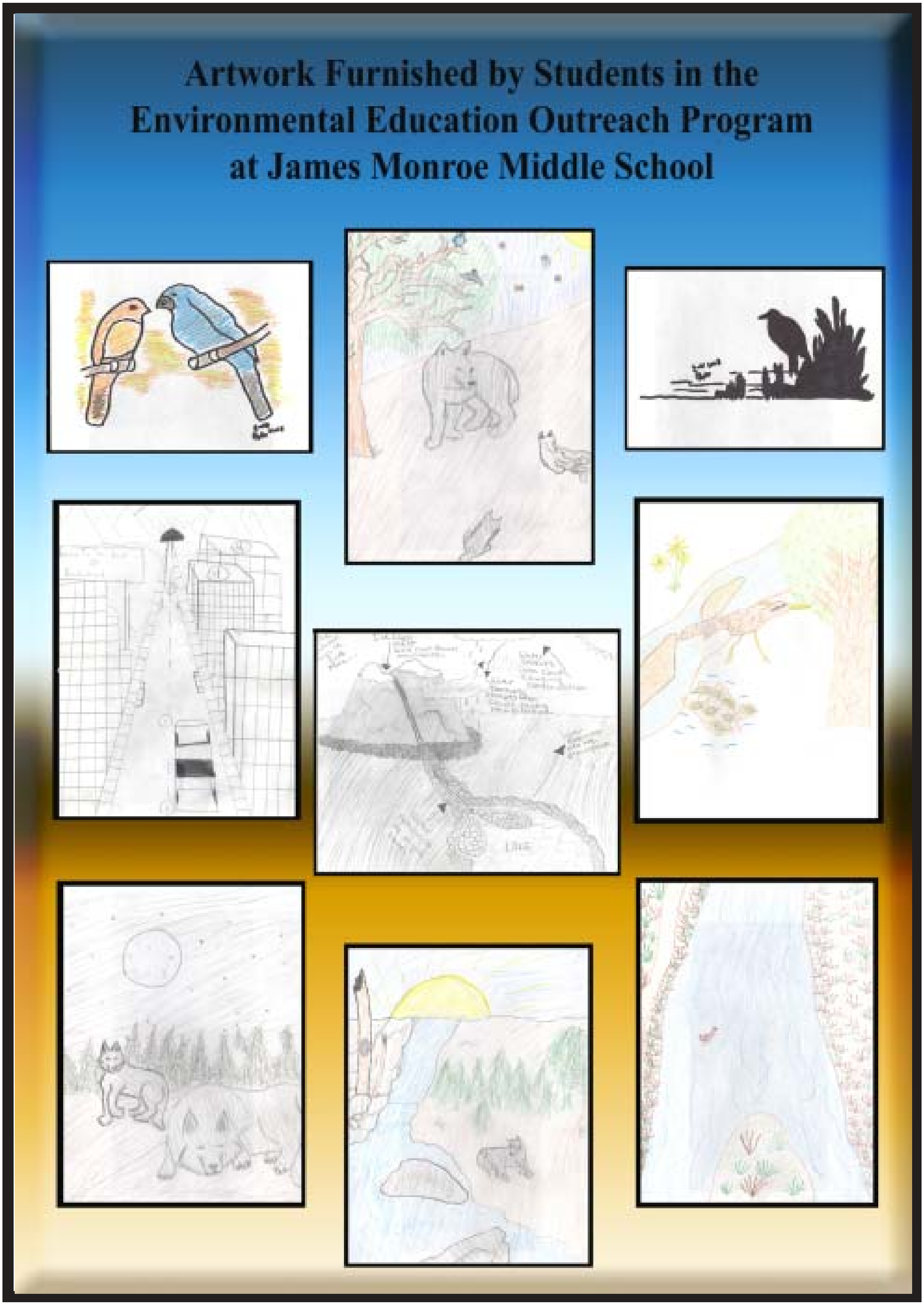
The SWEIS allows DOE to "tier" subsequent NEPA documents to the larger analysis and reduce the need to revisit the same impact analysis for each new project proposed. By doing so, DOE can focus on project-specific issues in its NEPA determinations. In accordance with 10 CFR 1021, DOE will examine the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

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 2002, Sandia Corporation participated in the following events:

2002 Dia del Rio Groundwater Demonstration

- The 5th Annual Youth Conference on the Environment
- The School to World Conference
- National Atomic Museum Clean Earth Club
- Dia del Rio at the Albuquerque Aquarium
- School presentations throughout Albuquerque


Artwork Furnished by Students in the
Environmental Education Outreach Program
at James Monroe Middle School

Chapter 4

Terrestrial and Ecological Surveillance

In this Chapter ...

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Sample Media 4-3
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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, 18 perimeter, and 16 off-site fixed locations that SNL/NM typically samples each year.

Environmental Snapshot

- *In 2002, 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.

Yucca baccata 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 and are documented in this chapter.

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

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

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.

To date, 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 1998). The reason for the change was that SNL/NM changed analytical laboratories in CY00, 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 (g) of sample is collected from the top two inches of soil in accordance with local procedures. In 2002, soil samples were collected from a total of 50 locations (31 on-site, 13 perimeter, and six off-site locations). A soil sample was not collected at one perimeter location (19) 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 g of sample is collected from the top two inches of soil in accordance with local procedures. In 2002, sediment samples were collected from all ten locations (four on-site, three perimeter, and three off-site locations).

Vegetation

Vegetation is sampled to monitor for potential uptake of pollutants, which could provide an exposure pathway to foraging 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 g of sample is collected, preferably from perennial grass, by cutting back several inches of growth from the plant. If grass is not available, samples from small leafy plants may be collected. In 2002, vegetation was collected at a total of five locations (three on-site, zero perimeter, and two off-site locations). Due to a lack of vegetation, samples were not collected at 23 locations in 2002. Because of recurring difficulties in collected vegetation samples, an investigation is underway by project staff to determine if recovery can be improved by changing sample locations and/or changing the time of year that vegetation sampling is conducted for CY03.

Gamma Radiation Levels

Gamma Radiation Levels are measured using Thermoluminescent dosimeters (TLDs) to determine the impact, if any, of SNL/NM's operations on ambient radiation levels. The TLDs are changed out on a quarterly basis and processed at an on-site laboratory. TLDs were collected from all 36 locations (14 on-site, two operational, eight perimeter, and 12 off-site) every quarter for 2002.

4.1.3 Sampling Locations

To the extent practical, sampling locations are consistent from year to year in order to establish trends. Occasionally, sampling locations are added or dropped for different reasons, including start-up of a new facility or operation; closure of an existing facility or operation; additional characterization of areas with elevated concentrations or increasing trends; or other technical or budgetary reasons. In CY02, a perimeter TLD soil sampling location was added

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.

(loc. 81) at the KAFB boundary fence, approximately due west of the Mixed Waste Landfill (MWL) in Technical Area III (TA-III). The new location was added in preparation for a proposed environmental research park, La Semilla, in the DOE buffer area west of KAFB. Since only one sample has been collected at location 81, no statistical analyses were performed on the analytical results for CY02. In addition, one perimeter soil sample was inadvertently missed (loc. 19) due to human error, and insufficient vegetation was present for sampling at 23 locations as shown on Tables 4-2 through 4-4.

On-site

On-site locations (Table 4-2 and Figure 4-1) are selected within or near areas of past or present SNL/NM operations. 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.

Perimeter

Perimeter locations (Table 4-3 and Figure 4-1) 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.

Off-site

Off-site locations (Table 4-4 and Figure 4-2) 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.

4.1.4 Radiological Parameters and Results

Radiological analyses are performed on all soil, sediment, and vegetation samples and are summarized in this section. The CY02 radiological parameters and analytical results are found in Appendix C of this report. The detailed statistical analyses are documented in *2002 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2003a).

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). No locations were identified Priority-3 (increasing trend). Several locations were identified as Priority-2 (higher than off-site). The Priority-2 locations and parameters are listed in Tables 4-5 through 4-7.

Cs-137

One on-site location (55) was identified as Priority-2 (higher than off-site) this year for the first time. Two perimeter locations (12 and 64) continue to be identified as Priority-2 for Cs-137 in surface soils. Location 55 is located off of Lovelace Road outside of TA-III. Location 12 is 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 as a result of historical nuclear weapons testing. Over the past five years, the values for Cs-137 at location 55 ranged from 0.502 to 1.10 pCi/g, while the perimeter locations ranged from 0.43 to 1.54 pCi/g.

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

Tritium

On-site location (2NE) continues to be identified as Priority-2 (higher than off-site) for tritium in soils. This location has been identified in past years, and is located just outside the MWL in TA-III (ER Site 76). Although elevated, the concentration of tritium at this location does not present a hazard to workers in these areas. This location has shown a significant decrease in the amount of tritium present over time. Location 2NE had a maximum concentration of 9.50 pCi/mL in 1998 with a minimum concentration of 0.216 pCi/mL in 2002 (no sample was collected in 2001 due to human error).

Location 2NE has previously been identified as Priority-2 for tritium in vegetation (this location was not sampled during CY01 or CY02 due to a lack of vegetation). Although elevated, the concentration of tritium at these locations does not present a hazard to workers in these areas. The maximum concentration of 9.30 pCi/mL was observed in 1998 with decreased concentrations observed during 1999 and 2000.

All locations were identified as Priority-4 for tritium in sediment.

Total Uranium (U_{tot})

All locations were identified as Priority-4 for U_{tot} in soil, sediments, and vegetation. (No locations were noted to be higher than community or have an increasing trend.)

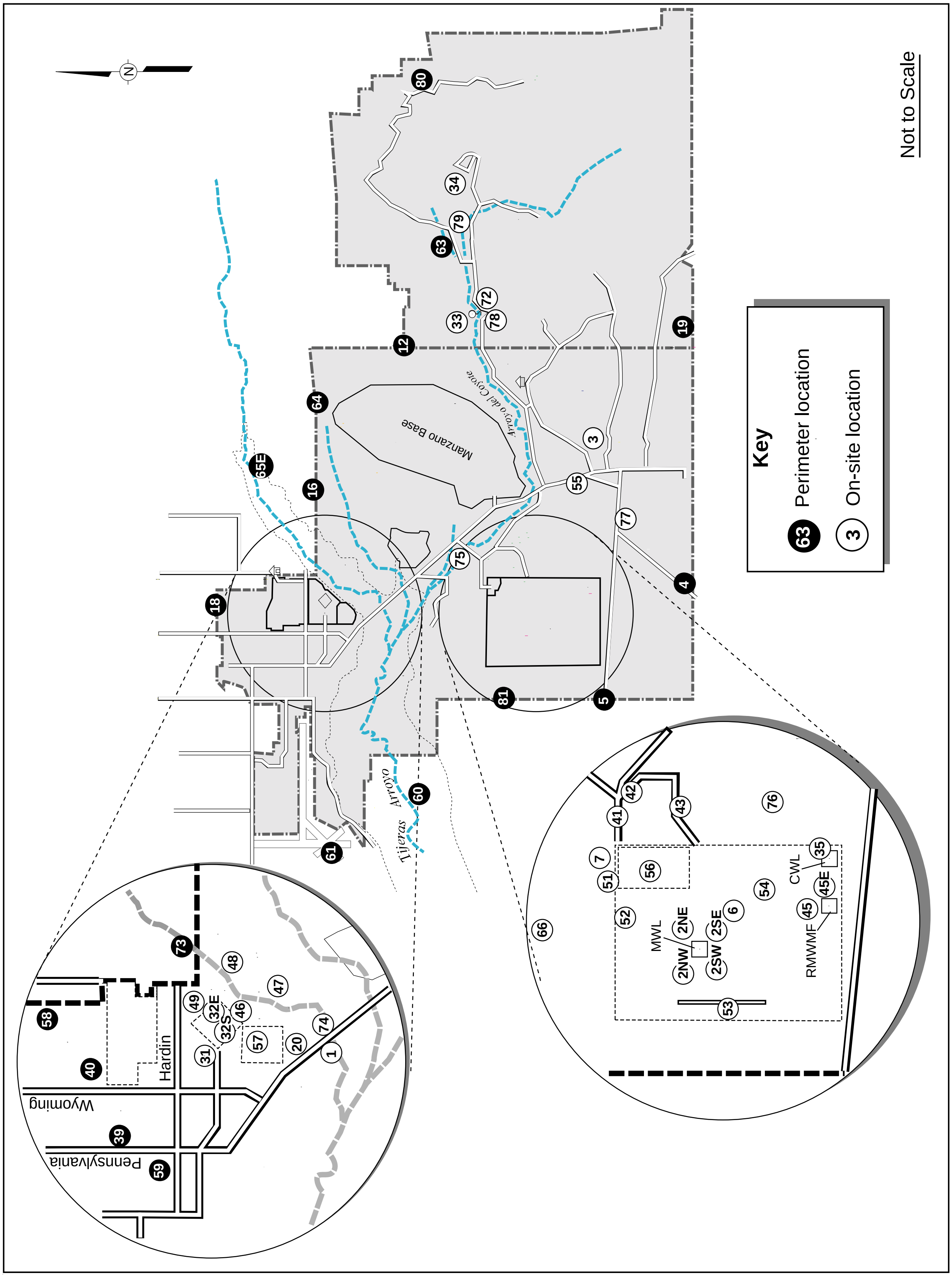

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FIGURE 4-1. Terrestrial Surveillance Program On-site and Perimeter Sampling Locations
On-site locations are within areas of SNL/NM operations. Perimeter locations are located both on and off KAFB property.

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

Location Number	Sampling Location	Vegetation	Soil	Sediment	TLD
1	Pennsylvania Ave.		X		X
2NW	Mixed Waste Landfill (MWL) (northwest)	--	X		X
2NE *	MWL (northeast)	--	X		
2SE	MWL (southeast)		X		
2SW	MWL (southwest)		X		
3	Coyote Canyon Control		X		X
6	Tech Area (TA) III (east of water tower)	--	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)		X		
32E	TA-II, Bldg. 935 (east personnel door)		X		
33	Coyote Springs	X	X		
34	Lurance Canyon Burn Site	--	X		
35	Chemical Waste Landfill (CWL)	--	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		
53 *	TA-III south of long sled track		X		
54	TA-III, Bldg. 6630		X		
55	Large Melt Facility (LMF), Bldg. 9939	--	X		
56	TA-V, Bldg. 6588 (west corner)		X		
57	TA-IV, Bldg. 970 (northeast corner)		X		
66	KAFB Facility	--	X		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)			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 and analysis.
TLD = thermoluminescent dosimeter
-- indicates that no sample was collected during the 2002 sampling period.

TABLE 4-3. Perimeter Terrestrial Surveillance Locations and Sample Types

There are 18 perimeter sampling locations.

Location Number	Sampling Location	Vegetation	Soil	Sediment	TLD
4	Isleta Reservation Gate	--	X		X
5	McCormick Gate	--	X		X
12	Northeast Perimeter	--	X		
16	Four Hills		X		X
18	North Perimeter Road				X
19	USGS Seismic Center Gate		--		X
39	Northwest DOE Complex				X
40	Tech Area I, northeast (by Bldg. 852)				X
58	North KAFB Housing	--	X		
59	Zia Park (southeast)		X		
60	Tijeras Arroyo (down-gradient)	--	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		
81	KAFB West Fence		X		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 that no sample was collected during the 2002 sampling period.

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	Vegetation	Soil	Sediments	TLD
8	Rio Grande, Corrales Bridge (up-gradient)	X	X	X	
9	Sedillo Hill, I-40 (east of Albuquerque)	--	X		
10	Oak Flats	--	X		X
11 *	Rio Grande, Isleta Pueblo (down-gradient)	--	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		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 that no sample was collected during the 2002 sampling period.

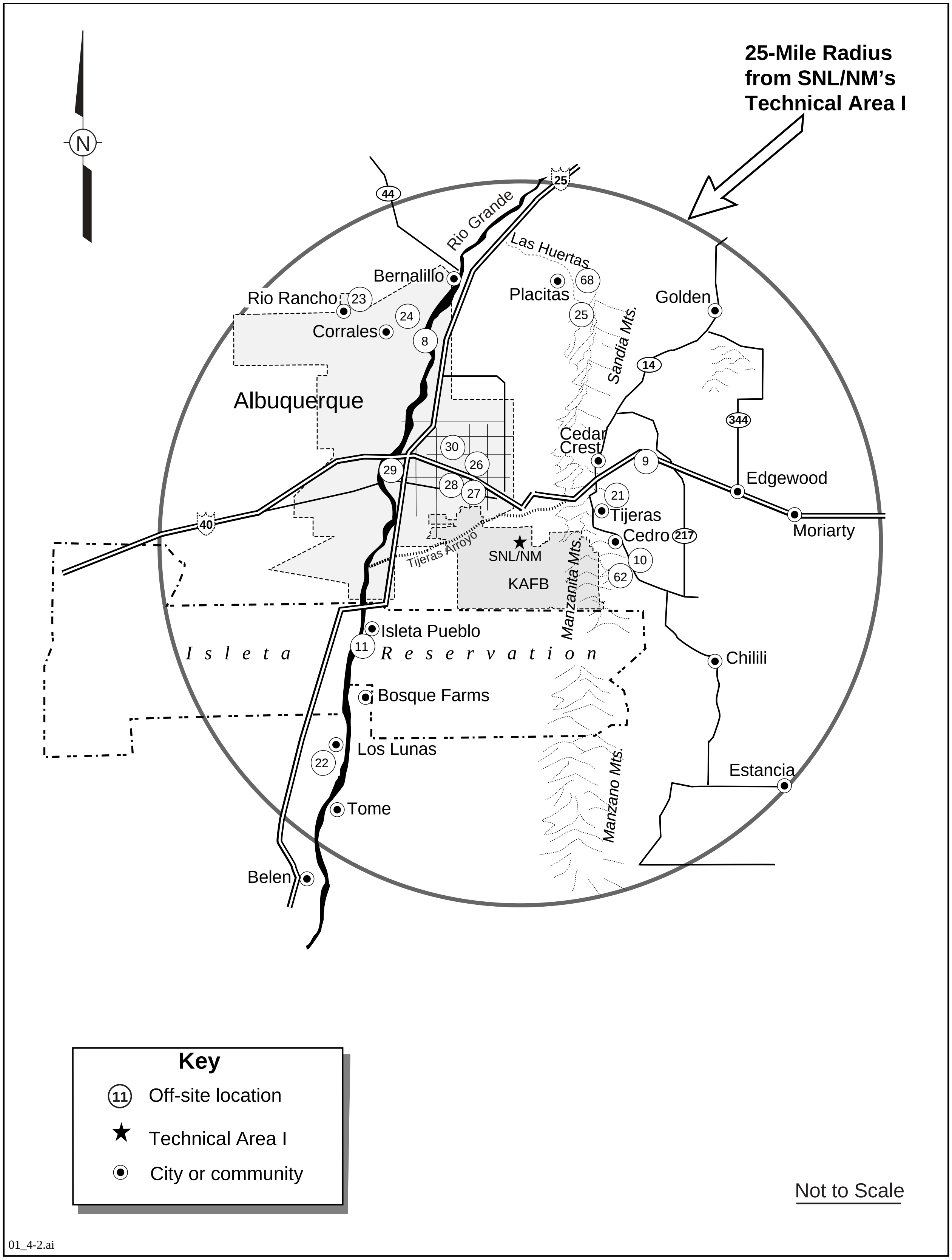

FIGURE 4-2. Terrestrial Surveillance Program Off-site Sampling Locations

TLDs

TLD exposure by quarter and exposure rate for each location class for 2002 is shown in Appendix C, Table C-19. Operational locations are excluded from the statistical analysis, but are reported in Table C-19 for informational purposes. The exposure rate summary statistics for each location class are presented in Appendix C, Table C-18.

Data for 1998 through 2002 was analyzed to determine if any statistical differences were observed for either location class (on-site, perimeter, or community) or year. The statistical analysis showed that TLD exposure for 1999 was higher than any other year. As a group, TLD exposure for community locations were statistically lower than on-site or perimeter locations. (Note: There was no statistical difference between on-site or perimeter locations.) Table 4-7 shows the overall exposure rate summary statistics for 1998 - 2002. Figure 4-3 shows the TLD exposure rates by year and location class. All TLDs were recovered in 2002.

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 4-5. Radiological Results Summary Statistics for Soil Locations (1998-2002) Noted as PRIORITY-2 During CY02

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Cesium-137	pCi/g	55	5	0.787	0.760	0.220	0.502	1.10
		12	5	1.134	1.120	0.435	0.430	1.54
		64	5	0.791	0.710	0.372	0.435	1.40
Tritium	pCi/mL	2NE	3	4.36	2.10	4.46	1.48	9.5

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

TABLE 4-6. Radiological Results Summary Statistics for Vegetation Locations (1998-2002) Noted as PRIORITY-2 During CY02

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Tritium	pCi/mL	2NE	3	3.88	1.65	4.72	0.68	9.30

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

TABLE 4-7. Summary Statistics for TLD Exposure Rates, 1998 - 2002

Location Class	No. of Obs	Units	Mean	Median	Std Dev	Minimum	Maximum
Community	60	uR/hr	10.3	9.6	0.5	8.3	13.0
On-Site	35	uR/hr	10.8	10.4	0.8	9.0	14.1
Perimeter	70	uR/hr	10.9	10.8	0.7	9.3	13.6

NOTE: uR/hr = microroentgen per hour (10^{-6} roentgen per hour)
Std Dev = Standard deviation

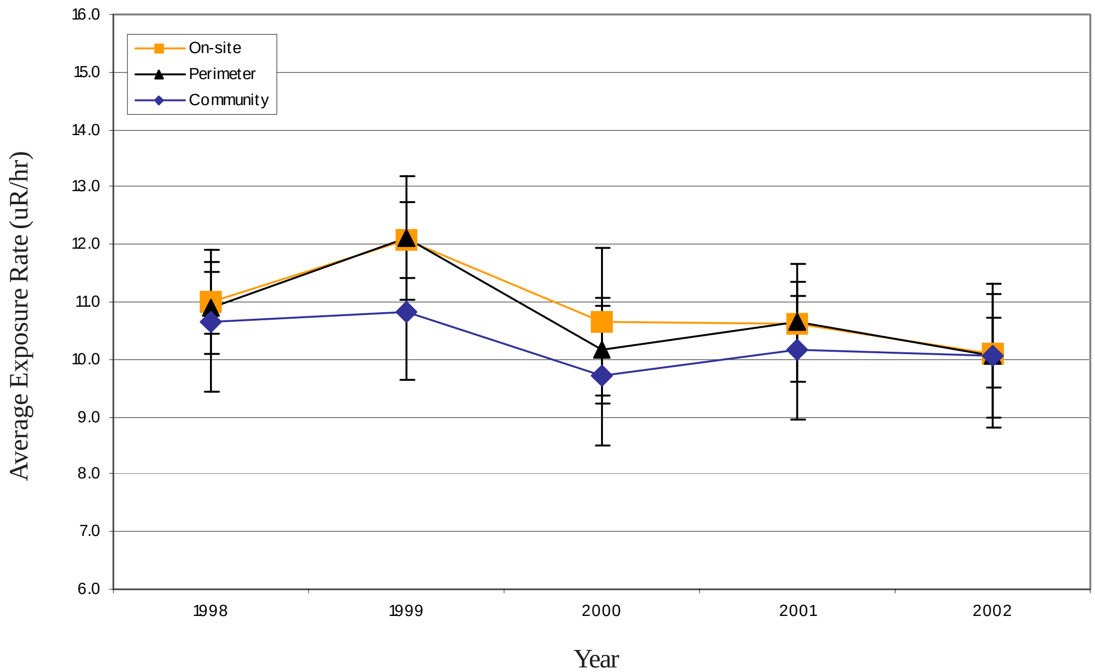

FIGURE 4-3. TLD Results By Year and Location Class

The CY02 analytical results are found in Appendix C of this report. The detailed statistical analyses are documented in *2002 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2003a).

Non-Radiological Results

No sampling location was noted to be Priority-1 (both higher than off-site and with an increasing trend). 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 4-8 and 4-9.

The following metals were listed as Priority-4 for all soil, sediment, and vegetation samples: antimony, arsenic, chromium, mercury, selenium, silver, and thallium. Sixteen of the 21 metals analyzed in the samples for sediment were considered Priority-4. Twenty of the 21 metals analyzed in the vegetation samples were considered Priority-4.

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) continues to be identified as Priority-2 (higher than off-site) and two on-site locations (2SW and 32S) were newly 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 vegetation samples and the remaining soil sample locations were identified as Priority-4 for barium.

TABLE 4-8. Summary Statistics for All Locations (1998-2002) Identified as PRIORITY-2 for Metals During CY02 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	**Aluminum**	On-site	52	5	16680	4969	11700	24600
		Perimeter	65E	5	17420	3910	14000	24000
	Barium	On-site	3	5	261.8	127.7	79	400
	Beryllium	On-site	33	5	0.90	0.27	0.70	1.37
	Cadmium	On-site	2SE	4	1.63	1.34	0.429	2.80
		On-site	20	5	2.28	0.54	1.60	2.89
	Cobalt	Perimeter	64	5	8.16	0.79	7.30	9.07
		Perimeter	65E	5	9.92	1.71	7.91	12.00
	Copper	On-site	32E	4	26.0	29.2	11.0	69.9
	Iron	Perimeter	64	5	20100	2105	18000	22700
		Perimeter	65E	5	24060	2949	19800	28000
	Magnesium	On-site	3	5	5426	1122	4130	6600
		On-site	52	5	5086	1370	3430	7160
		Perimeter	64	5	6728	851	5800	7770
		Perimeter	65E	5	8832	1577	6800	11000
	Manganese	Perimeter	64	5	573	62	510	638
		Perimeter	65E	5	623	96	527	750
	Potassium	Perimeter	60	5	3858	355	3380	4330
		Perimeter	65E	5	5478	848	4510	6800
	Vanadium	Perimeter	65E	5	42.0	5.4	34.9	50.0
	Zinc	On-site	52	5	65.9	18.4	42.3	92.9
		On-site	56	5	66.7	14.2	48.7	82.1
		Perimeter	64	5	75.3	5.3	66.0	78.9
		Perimeter	65E	5	86.3	16.5	67.8	110.0
Sediment	**Copper**	On-site	72	5	13.5	1.7	12.0	15.7
	Magnesium	On-site	72	5	5528	1125	4100	7200
	Vanadium	On-site	72	5	37.24	5.12	20	32
	Zinc	On-site	72	5	44.8	8.6	34	58
Vegetation	**Magnesium**	Perimeter	60	3	4766	1622	3000	6300

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

TABLE 4-9. Summary Statistics for Soil Locations (1998-2002) Identified as PRIORITY-3 for Metals During CY02 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	**Barium**	On-site	2SW	4	63.7	5.4	56.0	68.8
		On-site	32S	4	101.1	9.4	94.0	115.0
	Copper	On-site	6	5	16.3	9.3	8.3	26.8
	Lead	Perimeter	12	5	15.5	5.0	8.0	20.7
	Manganese	Perimeter	80	5	300	24	280	331
	Nickel	On-site	6	5	9.5	2.3	7.0	12.0
	Potassium	Perimeter	12	5	2412	942	1400	3600
	Vanadium	On-site	6	5	18.8	1.3	17.0	20.3
	Zinc	On-site	32S	4	63.9	11.4	55.0	80.5
Sediment	**Barium**	Perimeter	60	5	106	22	89	143

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

Beryllium

One on-site location (33) was identified as Priority-2 (higher than off-site) for beryllium in surface soils. The concentration of beryllium at this location was 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 beryllium.

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 the site, the concentration is within the range of background for New Mexico surface soils, and well below the NMED's residential soil screening level (SSL's) of 70 mg/kg (NMED 2000). One other on-site soil location (32S) was identified as Priority-2 for cadmium. Concentrations at this location are also within the range of background for New Mexico surface soils.

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) for cobalt in surface soils. The concentration at location 64 is within the range of background for cobalt in New Mexico surface soils, and is expected to be naturally occurring. The concentration at location 65E (12 mg/kg) is slightly greater than the published range for NM surface soils (2.1–11 mg/kg), but well below the NMED's residential SSL of 4,500 mg/kg (NMED 2000). The average result over the past five years is 9.9 mg/kg. There is no immediate cause for concern, however, sampling will continue at this location to monitor for trends.

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

Copper

One on-site location (32E) was identified as Priority-2 (higher than off-site) and one on-site location (6) was identified as Priority-3 (increasing trend) for copper in surface soils. One on-site location (72) was identified as Priority-2 (higher than off-site) for copper in sediment. Except for location 32E, the concentration of copper at these locations was well within the range of background identified for New Mexico surface soils, and is expected to be naturally occurring. The concentration at location 32E (69.9 mg/kg) is greater than the published range in NM surface soils (2.1-30 mg/kg), but well below the NMED's residential SSL of 2,800 mg/kg (NMED 2000). The average result over the past five years is 26 mg/kg. There is no immediate cause for concern, however, sampling will continue at this location to monitor for trends.

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

Iron

Two perimeter locations (64 and 65E) continue to be identified as Priority-2 (higher than off-site) for iron in surface soils. The concentration at both these locations is well within the range of background for iron in Western U.S. 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 iron.

Lead

One perimeter location (12) was identified as Priority-3 (increasing trend) for lead in surface soils. The concentration at this location is well within the 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

Two on-site locations (3 and 52) 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-2 (higher than off-site). 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 identified for magnesium in New Mexico surface soils.

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

Manganese
In 2001, on-site soil sampling location (64) with manganese was identified as Priority-1. In 2002, it is identified as Priority-2 (higher than off-site). One other soil perimeter location (65E) was identified as Priority-2 (higher than off-site). One perimeter location (80) was identified Priority-3 (increasing trend) for manganese in surface soils.

Perimeter location 64 has routinely been identified as higher than off-site, but last year was the first (and only) time that an increasing trend has been identified. It is suspected that the change in analytical laboratories that occurred in CY00 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. Figure 4-4 shows the concentrations of manganese at location 64 over the past five years (1998-2002). As reflected in Figure 4-4, the sample result recorded for 2002 is less than the previous two years and almost in line with what was reported prior to the change in analytical laboratory.

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

Nickel
One on-site location (6) was identified as Priority-3 (increasing trend) for nickel in surface soils. The concentration at this location is well within the range of background for nickel 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 nickel.

Potassium
Two perimeter locations (60 and 65E) continue to be identified as Priority-2 (higher than off-site) for potassium in surface soils. One perimeter soil location (12) 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 (6) was identified for the first time as Priority-3 (increasing trend) for vanadium in surface soils. One on-site location (72) as 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 on-site locations (52 and 56) and two perimeter locations (64 and 65E) were identified as Priority-2 (higher than off-site) for zinc in surface soils. One on-site location (32S) was identified as Priority-3 (increasing trend) for zinc in surface soils. The concentration at locations 32S, 56 and 64 were within the range background for zinc in New Mexico surface soils (18-84 mg/kg). 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. Location 56 has a value that exceeded the upper range for New Mexico surface soil concentrations that occurred in 2002; all previous values were well within the range for New Mexico surface soil concentrations. All zinc results were well below the NMED's residential soil screening level (55L) of 23,000 mg/kg (NMED 2000).

All vegetation locations, and the remaining soil and sediment 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 objectives of the Ecological Surveillance Program are to:

- Collect ecological resource inventory data to support site activities, while preserving ecological resources, and to maintain regulatory compliance;
- Collect information on plant and animal species present to further the understanding of ecological resources on site;
- Collect biota contaminant data on an as needed basis in support of site projects and regulatory compliance;
- Assist SNL/NM organizations in complying with regulations and laws;

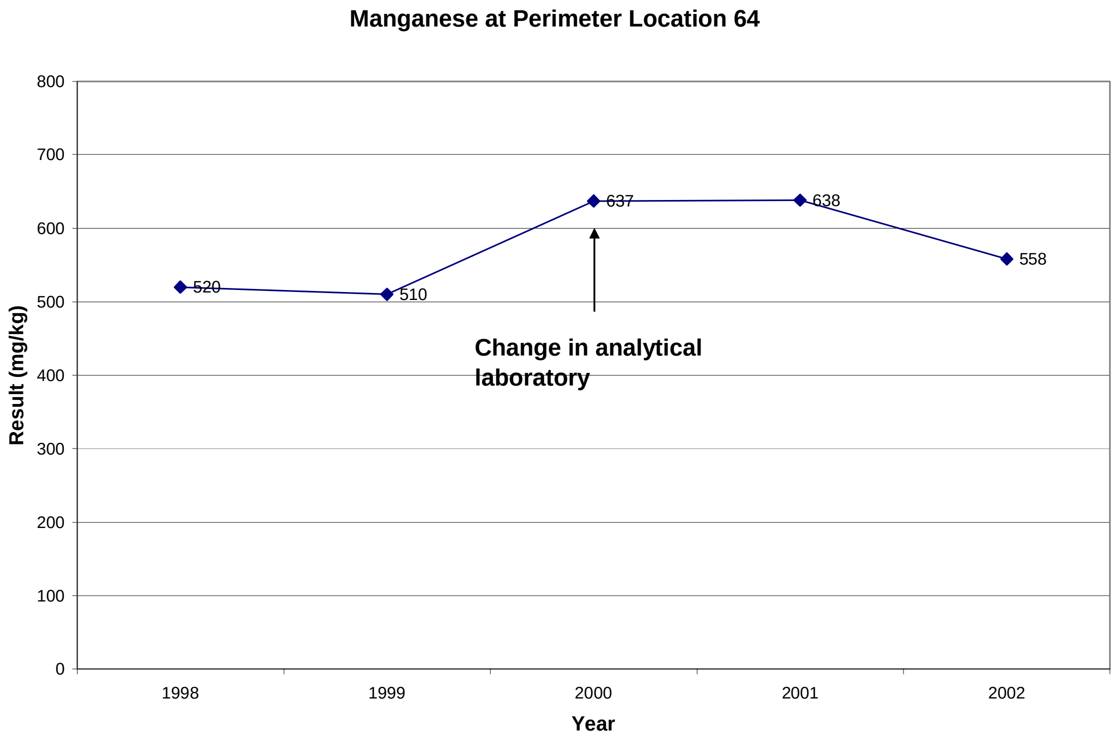

FIGURE 4-4. Observed Concentration of Manganese Within Western U.S. Surface Soil Limits (30-500 mg/kg)

- Educate the SNL/NM community regarding ecological resource conservation; and

- Support line organizations with biological surveys in support of site activities.

The biota data collected are a part of the suggested requirements under DOE Order 5400.1 (DOE 1990). Data are collected on mammal, reptile, amphibian, bird, and plant species currently inhabiting SNL/NM. Data collected includes information on abundance, species diversity, and land use patterns. No contaminant analysis of radionuclides and metals on wildlife were performed in 2002. Table 1-1 represents common species identified at KAFB.

Chapter 5

Air Quality Compliance and Meteorological Monitoring

In this Chapter ...

Meteorological Monitoring Program *5-2*
Ambient Air Surveillance Program *5-4*
Radiological Air Emissions *5-12*
Assessment of Potential Dose to the Public *5-16*
Air Quality Requirements and Compliance Strategies *5-19*

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.

In 2002, data was collected from eight meteorological towers located throughout Kirtland Air Force Base (KAFB). The data collected from the meteorological towers provided 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 20 facilities (18 point and two diffuse emission sources). As required by the U.S. Environmental Protection Agency (EPA), the NESHAP Program must assess the dose to the maximally exposed individual (MEI) for radionuclide air emissions.

In 2002, the New Mexico Small Business Assistance (NMSBA) Program, which is managed by SNL/NM, continued assisting a Las Cruces, New Mexico cotton gin cooperative in reaching compliance with Title V.

Environmental Snapshot

- *In 2002, Property Management partnered with Facilities, Waste Management, and Pollution Prevention (P2) organizations to try to broker a transfer of 2,000 lbs of excess refrigerants and 96 accumulators with Halon 2402 to the Defense Logistics Agency (DLA) Supply Center.*

SNL/NM employee at PM10 Station

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 main objective of the Meteorological Monitoring Program is to provide site-specific representative data for 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 supporting 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 Chapter 9.

Tower Instrumentation
SNL/NM conducts meteorological monitoring through a network of eight meteorological towers located throughout 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. 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 2002 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).*

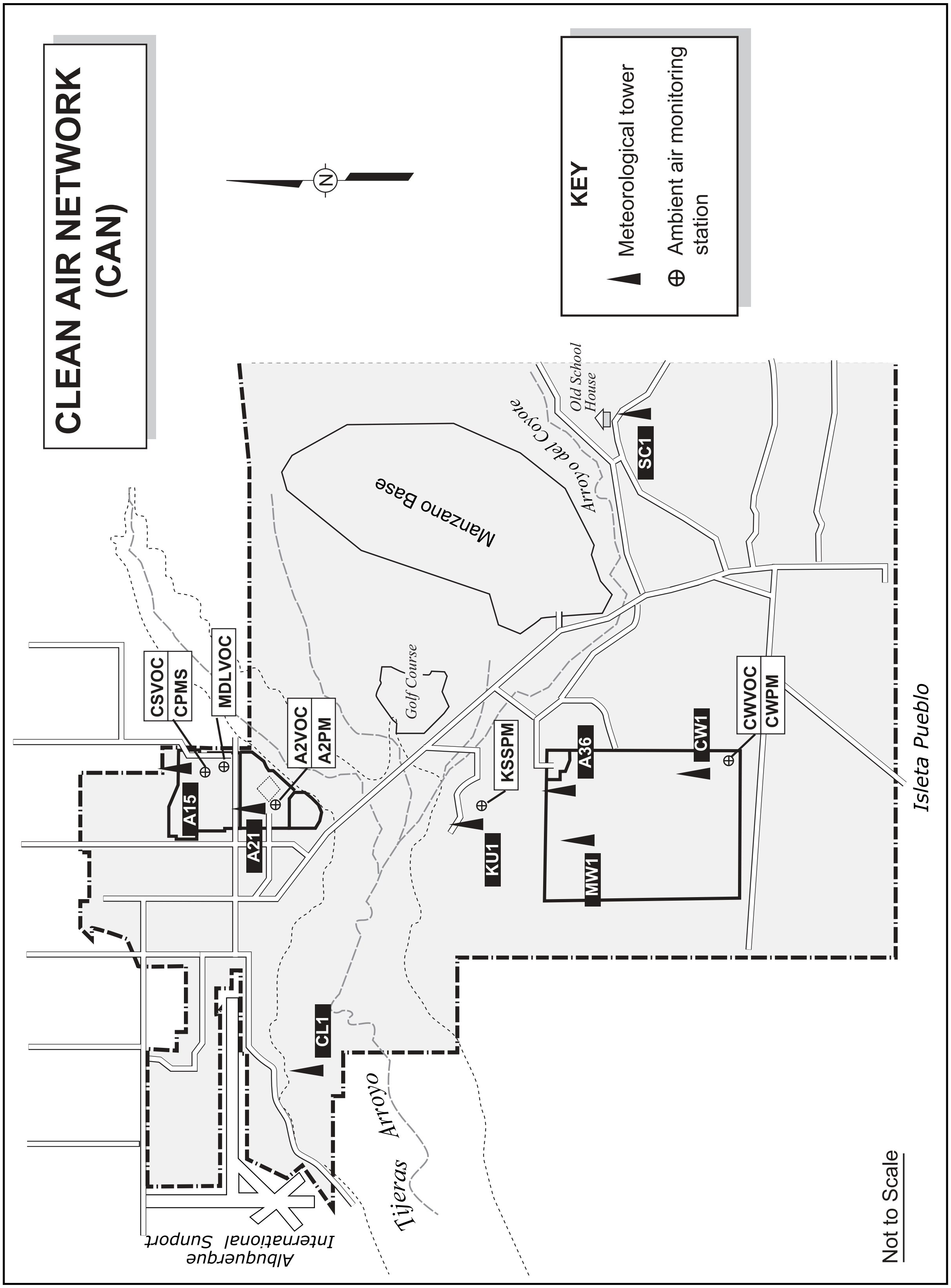

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FIGURE 5-1. The Clean Air Network (CAN) of Meteorological Towers and Ambient Air Monitoring Stations

TABLE 5-1. 2002 Annual Climatic Summary from Tower A36

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Totals
Temperature (°C)													
Daily Max	8.5	11.6	16.4	20.2	28.6	28.8	29.1	28.3	25.9	18.9	12.5	7.8	19.7
Daily Min	-5.6	-4.5	-4.7	7.6	14.0	20.0	20.6	20.5	13.2	7.3	0.6	-3.2	7.1
Average	2.9	4.4	8.5	16.4	19.8	25.8	24.4	24.6	19.8	13.2	6.8	2.3	14.1
Extremes													
High	14.5	18.9	25.9	28.8	35.7	36.7	37.6	35.2	32.9	25.7	18.9	12.7	37.6
Low	-10.4	-11.6	-10.6	1.8	5.2	13.4	13.5	13.3	8.4	0.4	-6.4	-8.7	-11.6
Relative Humidity (%)													
	50.0	36.2	21.9	23.1	17.4	20.4	41.2	36.1	48.8	49.7	49.0	60.8	37.9
Precipitation (cm)													
Monthly	0.79	0.25	0.00	1.30	0.03	0.64	1.04	3.68	3.61	1.98	1.37	0.28	15.96
24 Hour Max	0.48	0.25	0.00	1.02	0.03	0.56	0.76	1.50	1.14	0.81	1.04	0.23	1.50
Wind (m/s)													
Monthly	3.2	3.3	4.2	4.4	4.5	4.4	3.9	3.8	3.6	3.5	3.3	2.9	3.8
24 Hour Max	5.8	5.6	8.7	7.7	8.2	7.3	6.0	6.4	6.4	6.7	7.5	9.6	9.6
Max Gust	15.7	20.5	25.3	25.3	22.9	26.9	25.3	26.1	22.9	21.3	22.1	21.4	26.9
Barometric Pressure (mb)													
	835.1	837.4	832.5	832.4	832.4	833.6	837.1	836.6	835.9	834.2	837.6	834.9	835.0

NOTE: Conversions to English Units: Temperature …. °F = (1.8)(°C) + 32 °C = degree centigrade
Wind Speed ….. mph = (2.2369)(m/s) cm = centimeter
Rainfall ………. in. = (2.54)(cm) 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 at 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, and channel into the canyons, or up the Rio Grande Valley.

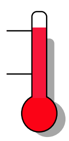
5.2 AMBIENT AIR SURVEILLANCE PROGRAM

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 important to establish background concentration levels for pollutants of concern and evaluate the 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.

Wind Speed

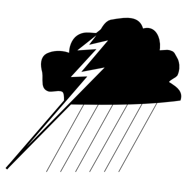
	Minimum (m/sec)	Maximum (m/sec)	Spread (m/sec)
Average Annual Wind Speed	2.84 tower A15	3.99 tower CW1	1.15
Greatest Difference in Wind Speed over 24 hours	6.01 tower A15	9.40 tower KU1	3.39
Greatest Difference in Daily Maximum Wind Speed	8.45 CLL	22.85 SCI	14.4
Average Difference in Daily Wind Speed	1.41 (all towers)		

Temperature



	Minimum (°C)	Maximum (°C)	Spread (°C)
Average Annual Temperature	13.76 tower SC1	14.39 tower KU1	0.63
Network Annual Temperature Extremes	-13.8 tower MW1	37.9 Multille	51.7
Greatest Difference in Daily Minimum Temperature	13.6 tower A36	20.8 tower A15	7.2
Greatest Difference in Average Daily Temperature	2.7 tower SC1	5.4 tower A15	2.7
Greatest Difference in Daily Maximum Temperature	0.4 tower A36	3.4 tower CWL	3.0

Precipitation



	Minimum (cm)	Maximum (cm)	Spread (cm)
Annual Precipitation (Extremes)	14.78 tower A21	19.96 tower SC1	5.18
Daily Rainfall Variation	0	1.96 tower SC1	1.96
Greatest Monthly Precipitation Difference	1.96 tower A21	5.92 tower SC1	3.96
Greatest in Monthly Rainfall		5.98 tower SC1	

NOTE: Winter precipitation that falls as snow is underestimated (mostly at the SC1 tower)

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FIGURE 5-2. Variations and Extremes in Meteorological Measurements Across the Meteorological Tower Network During Calendar Year 2002

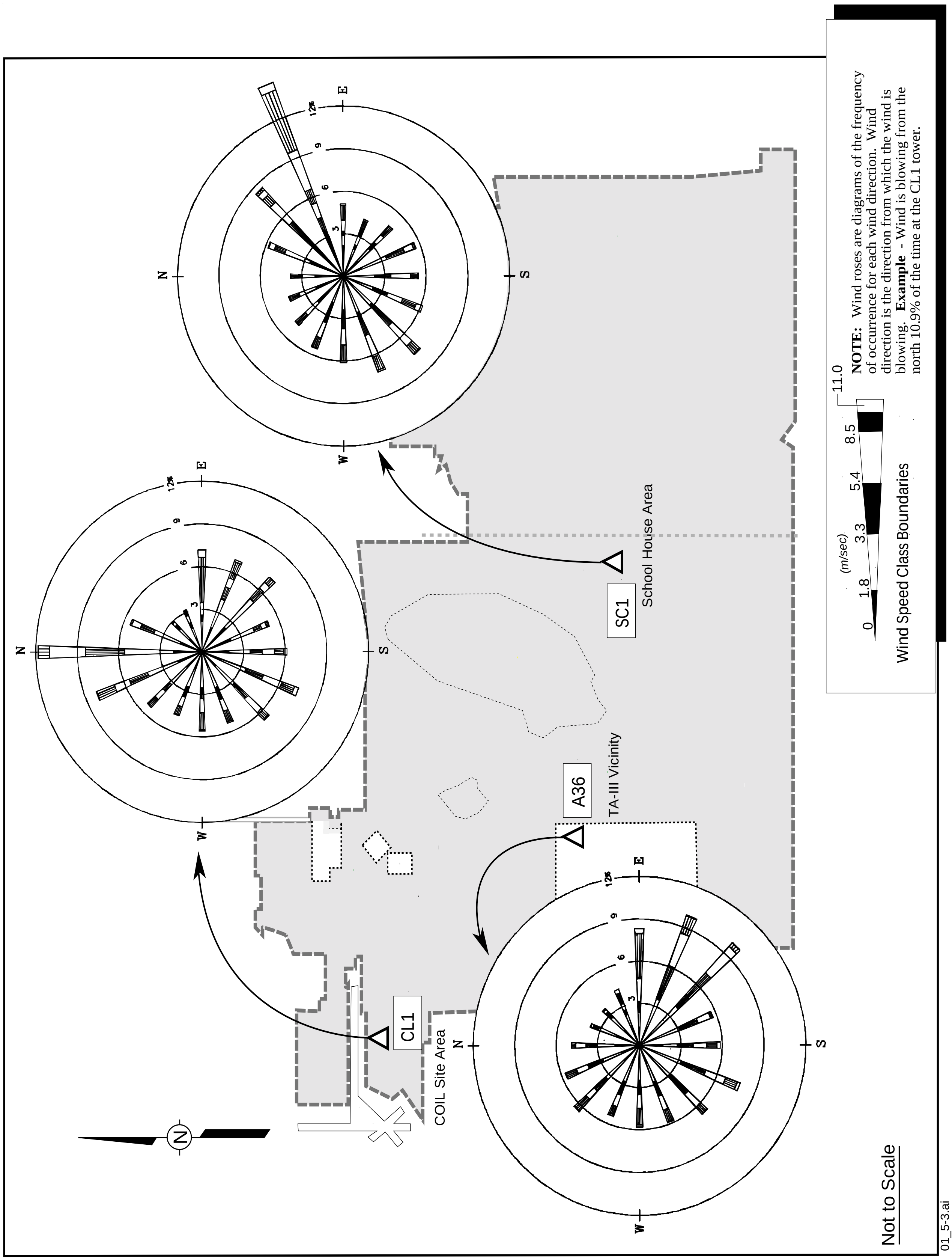


FIGURE 5-3. 2002 Annual Wind Roses for Towers CL1, A36, and SC1

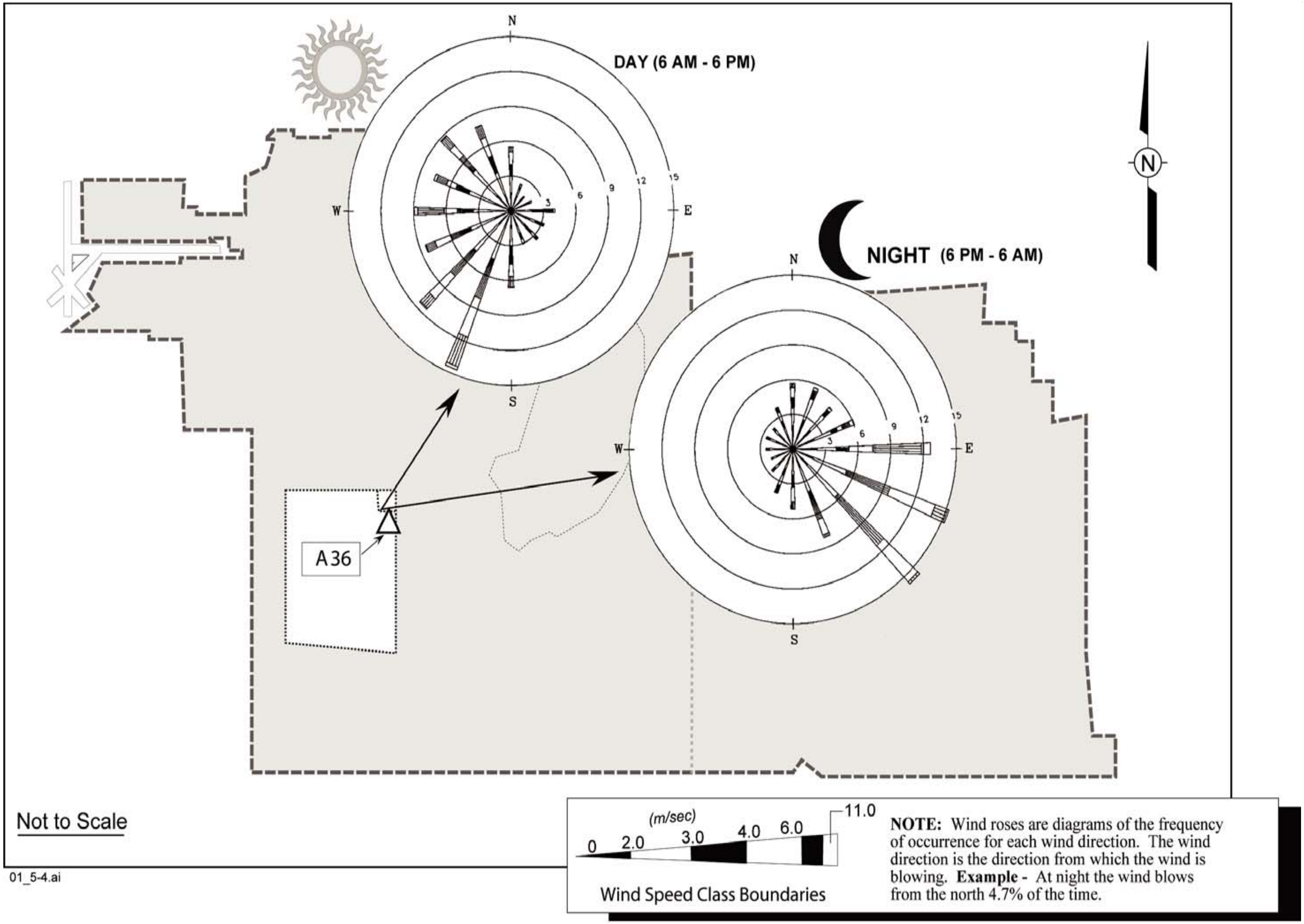


FIGURE 5-4. 2002 Annual Wind Roses for Daytime and Nighttime Wind Frequency at the A36 Tower

Ambient air surveillance is performed at five locations (illustrated in Figure 5-1).

- ***Criteria Pollutant Monitoring Station (CPMS)*** There is one CPMS in the CAN network. The CPMS station is located in the NE corner of TA-I. Criteria pollutants are the set of six principal pollutants for which the EPA must set national ambient standards according to the Clean Air Act (CAA). For more information on air pollutants go to the following website:

  http://www.epa.gov/ebtpages/air.html

  The CPMS is used to perform continuous monitoring for sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), and ozone (O_3). Data are then compiled into hourly averages. A particulate matter (PM) monitor 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, KSSPM, 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.

New air quality standards for $PM_{2.5}$ (with a diameter equal to or less than 2.5 microns) were finalized in 2002. The annual $PM_{2.5}$ standard is 15 µg/m^3 and the 24-hour standard is 65 µg/m^3. SNL/NM plans to monitor for $PM_{2.5}$ during 2003.

5.2.1 Ambient Air Monitoring Results

Criteria Pollutants

In 2002, the automated data recovery for criteria pollutants was 92 percent for SO_2, 91 percent for NO_x, 93 percent for CO, and 92 percent for O_3. Table 5-2 lists the results from the CPMS and compares them to NAAQS and NMAAQS for criteria pollutants.

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

Although violations of annual federal standards for criteria pollutants are not allowed, exceedances for short-term standards are allowable once a year. State standards also allow short-term exceedances due to meteorological conditions such as in the case of an atmospheric inversion where air mixing may be extremely restricted. There was one short-term exceedance of the 8 hour ozone standard. An 8 hour concentration of 83 ppb was recorded in May 2002.

PM

Data recovery for PM_{10} (with a diameter equal to or less than 10 microns) was 91 percent complete based on an every-sixth-day sampling schedule. The highest daily particulate loading occurred at the KSSPM site. A PM_{10} concentration of 702 ug/m^3 occurred in April of 2002. This concentration is greater than the NAAQS. High concentrations of PM were caused by strong and gusty winds in several locations that were left barren by the multi-year drought. Smoke from wildfires impacted the PM_{10} concentrations in the early summer. A concentration of 232 ug/m3 was recorded at the A2PM site in March when strong winds occurred during activities associated with construction of the TA-I storm water drainage system. The conditions that caused the dust storms in March and April meet the criteria of exceptional events as identified in the EPA document *Guidelines on the Identification and Use of Air Quality Data Affected by Exceptional Events* (EPA 1986). The monthly and annual averages for PM_{10} are listed in Table 5-3.

All filters collected from the PM_{10} 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 2002, monthly composites varied from one to six filters per month, depending on the sampling schedule and sampler power problems. A change in the methodology of reporting PM_{10} analytical results was established in 2002. In an attempt to provide better analytical information, results are included in averages only when they are actually higher that the radiological decision levels or instrument detection limits. Table 5-4 lists the averaged results of the PM analysis. It should be noted that the radionuclides are naturally occurring and not emitted from sources at the laboratories.

An Analysis of Variance (ANOVA) was performed to determine if statistical differences existed between stations. The results of the ANOVA indicated that chromium and nickel were statistically higher at the KSSPM site, while copper was higher at A2PM, and silver was highest at the CPMS site. A review of the details showed that for the KSSPM site, the highest concentrations were generally associated with the highest dust loading (Table 5-4). The copper at A2PM seemed to be related to the filter composite size, with the higher concentrations associated with a smaller monthly sample. The silver at the CPMS site may be associated with photovoltaic activities in TA-1.

VOCs

The VOCs generally observed at SNL/NM are products or by-products of fossil fuels or are found in solvents. In 2002, the data recovery for VOC monitoring was 96 percent. Monthly VOC samples were analyzed for 26 VOC species plus total non-methane hydrocarbon (TNMHC). Table 5-5 shows the compiled results for compounds detected.

The concentrations in Table 5-5 show that there is no one site that has the highest concentration for all

TABLE 5-2. 2002 Criteria Pollutant Results as Compared to Regulatory Standards

Criteria Pollutant	Averaging Time	Unit	NMAAQS Standard	NAAQS Standard	Yearly Summary of Measured Concentrations
Carbon Monoxide	1 hour	ppm	13.1	35	2.70
	8 hours	ppm	8.7	9	1.81
Nitrogen Dioxide	24 hours	ppm	0.10	-	0.038
	Annual	ppm	0.05	0.053	0.0
Sulfur Dioxide[§]	3 hours	ppm	-	0.50	0.011
	24 hours	ppm	0.10	0.14	0.006
	Annual	ppm	0.02	0.03	<0.001
Ozone	1 hour	ppm	0.12	0.12	0.090
	8 hour	ppm	-	0.080	0.072[a]
PM_{10}	24 hours	μg/m^3	-	150	584[b]
	Annual	μg/m^3	-	50	41.8
$PM_{2.5}$	24 hours	μg/m^3	-	65	-
	Annual	μg/m^3	-	15	-
Total Suspended Particulates	7 days	μg/m^3	110	-	-
	30 days	μg/m^3	90	-	-
Lead	30 days	μg/m^3	-	-	0.0163
	Any quarter	μg/m^3	-	1.5	0.0059

NOTE: ppm = parts per million
μg/m^3 = micrograms per cubic meter
NMAAQS = New Mexico Ambient Air Quality Standards
NAAQS = National Ambient Air Quality Standards
PM_{10} = particulate matter (diameter equal to or less than 10 microns)
$PM_{2.5}$ = respirable particulate matter (diameter equal to or less than 2.5 microns)
[§]Standards are defined in μg/m^3 and have been converted to ppm.
[a] Reported as the fourth highest average of the year
[b] Reported as the 2nd highest average during the year

TABLE 5-3. Monthly and Annual Averages for Particulate Matter

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
A2PM	6.0	11.2	66.8	58.3	20.0	50.4	24.3	18.8	11.0	11.6	6.6	13.0	24.8
CPMS	7.3	10.8	24.8	33.8	13.8	29.8	15.2	17.0	10.4	10.8	8.0	11.2	16.1
CWPM	8.7	5.3	11.3	11.3	15.8	23.8	14.5	11.4	9.8	10.3	7.8	10.6	11.7
KSSPM	5.4	25.0	19.5	267.2	40.8	63.0	19.2	24.6	7.7	8.2	9.2	11.6	41.8

TABLE 5-4. Averaged Results of PM_{10} Analysis

Analyte	Units	A2PM	CPMS	CWPM	KSSPM	TLV
METALS						
Aluminum	ug/m^3	0.33387	0.19540	0.14460	1.07187	2000
Antimony	ug/m^3	0.00006	0.00014	0.00009	0.00029	500
Arsenic	ug/m^3	0.00033	0.00014	0.00013	0.00064	10
Barium	ug/m^3	0.00285	0.01869	0.01603	0.03067	50
Beryllium	ug/m^3	0.00004			0.00018	2
Cadmium	ug/m^3	0.00008	0.00004	0.00004	0.00006	10
Calcium	ug/m^3	1.09744	0.65796	0.52240	2.72456	2000
Chromium	ug/m^3	0.00054	0.00077	0.00030	0.00126	10
Cobalt	ug/m^3	0.00013	0.00008	0.00022	0.00045	20
Copper	ug/m^3	0.02011	0.01814	0.00670	0.00708	1000
Iron	ug/m^3	0.35407	0.22494	0.17085	0.81573	5000
Lead	ug/m^3	0.00181	0.00125	0.00260	0.00197	150
Magnesium	ug/m^3	0.14016	0.13222	0.12294	0.42347	10000
Manganese	ug/m^3	0.00923	0.00540	0.00462	0.01852	200
Mercury	ug/m^3	0.00002	0.00001	0.00001	0.00001	25
Nickel	ug/m^3	0.00045	0.00041	0.00029	0.00104	50
Potassium	ug/m^3	0.16144	0.13718	0.15647	0.35385	2000
Selenium	ug/m^3	0.00004	0.00018	0.00015	0.00015	200
Silver	ug/m^3	0.00023	0.00027	0.00003	0.00018	10
Sodium	ug/m^3	3.33073	4.35233	4.30504	13.62920	5000
Vanadium	ug/m^3	0.00110	0.00066	0.00047	0.00198	50
Zinc	ug/m^3	0.00381	0.00804	0.00268	0.00838	10
RADIONUCLIDES						
Uranium	ug/m^3	0.00002	0.00003	0.00001	0.00006	200
Gross Alpha	pCi/m^3	0.00453	0.00568	0.00446	0.00452	NA
Gross Beta	pCi/m^3	0.01289	0.01679	0.02011	0.01052	NA
Potassium-40	pCi/m^3	0.01033	0.00838	0.00400	0.00809	0.0270
Beryllium-7	pCi/m^3	0.10899	0.09856	0.08204	0.09672	23
Bismuth-214	pCi/m^3	0.00139	0.00324	0.00097	0.00298	140
Cesium-137	pCi/m^3			0.01113	0.00053	0.019
Lead-214	pCi/m^3	0.00109	0.00131		0.00147	120
Radium-224	pCi/m^3	0.00029		0.00165	0.00696	0.150
Radium-226	pCi/m^3	0.00142	0.00158	0.00055	0.00155	0.0033
Thallium-208	pCi/m^3	0.00128	0.00090	0.00089	0.00079	NA

NOTE: ug/m^3 = micrograms per cubic meter
pCi/m^3 = picocuries per cubic meter
TLV= threshold limit value. (TLVs are guidelines and not legal standards. TLV guidelines assist in the control of health hazards.) (ACGIH 2002)

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

Compound	CSVOC (ppbv)	CWVOC (ppbv)	MDLVOC (ppbv)	A2VOC (ppbv)	TLV* (ppbv)
1,1,1-Trichloroethane **	5.53	3.70	39.01	0.05	350000
1,1,2-Trichlorotrifluoroethane **	0.09	0.09	0.09	0.08	1000000
1,2-Dichlorobenzene	ND	0.04	ND	ND	10000
1-Butene/Isobutene	0.23	0.23	0.25	0.26	NA
2,2,4-Trimethylpentane	0.19	0.06	0.19	0.09	NA
2-Butanone (MEK)	0.33	0.55	1.19	0.27	200000
2-Methylbutane	0.94	1.13	1.67	0.63	1770000
3-Methylpentane	0.12	0.09	0.13	0.07	500000
4-Methyl-2-pentanone (MIBK)	ND	0.09	ND	ND	50000
Acetone	3.86	2.81	3.38	2.70	500000
Benzene	0.28	0.14	0.21	0.16	500
Carbon tetrachloride **	0.08	0.09	0.09	0.09	5000
Chlorobenzene	ND	0.05	0.04	ND	10000
Chloromethane	0.55	0.55	0.55	0.54	50000
Dichlorodifluoromethane **	0.61	0.59	0.61	0.60	1000000
Ethylbenzene	0.08	0.10	0.12	0.05	100000
Isohexane	0.18	0.10	0.14	0.10	100000
Methylene chloride	0.44	0.31	0.44	0.37	50000
n-Butane	1.01	1.04	0.83	0.61	800000
n-Hexane	0.15	0.19	0.23	0.23	50000
n-Pentane	0.45	0.73	0.69	0.47	600000
o-Xylene	0.10	0.15	0.13	0.09	100000
p-Xylene/m-Xylene	0.22	0.45	0.30	0.23	100000
Tetrachloroethene	ND	ND	ND	ND	25000
Toluene	0.63	0.28	0.65	0.40	50000
Trichloroethene	0.43	ND	0.21	ND	50000
Trichlorofluoromethane **	0.33	0.32	0.32	0.32	1000000*
TNMHC	13.30	11.25	28.80	8.48	NA

NOTE: ppbv = parts per billion by volume
ND = not detected
NA = not available
VOC = volatile organic compounds. VOCs may be shown 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.

analytes, though the MDLVOC location has a greater share of the network annual concentration maximums. There are a few monthly concentrations worth noting: in June 2002, the concentration of 1,1,1–Trichloroethane was 283 ppb and the TNMHC concentration was 118 ppb. These concentrations are orders of magnitude below concentrations of concern.

An ANOVA was performed to determine if statistical differences existed between locations for each VOC. The ANOVA revealed that two compounds associated with fossil fuels were statistically slightly higher at the CPMS site, which is the site closest to a main road. The 111-TCA at the MDLVOC did not pass the statistical difference test because there were not enough detections of the compound at the A2VOC or CPMS sites to compare the results of the MDLVOC site.

5.3 RADIOLOGICAL AIR EMISSIONS

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 DOE, National Nuclear Security Administration (NNSA), Sandia Site Office (SSO) 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 2002 include the *NESHAP Annual Report for CY02, Sandia National Laboratories, New Mexico* (SNL 2003b) and the *Radiological Dose Calculations and Supplemental Dose Assessment Data for NESHAP Compliance, Sandia National Laboratories, New Mexico 2002* (SNL 2003c).

5.3.2 SNL/NM NESHAP Facilities

SNL/NM currently has 20 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 5-6 lists the radionuclides and the total reported emissions (in curies) from each SNL/NM NESHAP source in 2002. Of the 20 sources, 18 were point sources and two were diffuse sources (landfills). Three of the 20 facilities reported zero emissions in 2002. Calculations were used to estimate the emissions from the Chemical Waste Landfill (CWL), which is another non-routine source.

The 20 SNL/NM NESHAP facilities are illustrated in Figure 5-5 and are described below.

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 2002.

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 2002, 15 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 2002, the facility reported emissions of plutonium-239 and uranium-236.

TABLE 5-6. Summary of Radionuclide Releases from the 20 NESHAP Sources in 2002

TA	Facility Name	Monitoring Method *	Used in Dose Calculation?	Radionuclide	Reported Release (Ci/yr)
I	Sandia Tomography and Radionuclide Transport (START) Laboratory	Calculation	no	^{239}Pu ^{236}U	1.0E-13 1.0E-13
I	Radiation Laboratory	Calculation	no	^{3}H ^{16}N ^{13}N ^{41}AR	1.0E-05 2.0E-07 1.0E-06 1.0E-09
I	Calibration Laboratory	Calculation	no	^{3}H	6.6E-05
I	Neutron Generator (NGF)	Continuous	**yes**	^{3}H	15
I	TANDEM Accelerator	Calculation	no	^{3}H	1.0E-05
I	Metal Tritide Shelf-Life Laboratory	Calculation	no	^{3}H	5.0E-09
I	Cleaning and Contamination Control Laboratory (CCCL)	Calculation	no	^{14}C	3.5E-05
II	Explosive Components Facility (ECF)	Calculation	no	^{3}H	1.13E-03
III	Mixed Waste Landfill (MWL)	Periodic	yes	^{3}H	0.294
III	Radioactive & Mixed Waste Management Facility (RMWMF)	Continuous	yes	^{3}H ^{241}Am ^{90}Sr ^{137}Cs	2.496E-02 2.53E-07 3.89E-07 3.05E-08
III	Chemical Waste Landfill (CWL)	Calculation	yes (not routine)	^{60}Co ^{3}H ^{232}Th ^{235}U ^{238}U ^{137}Cs	1.69E-05 9.85E-02 1.91E-07 1.42E-07 1.29E-06 5.24E-09
III	Corrective Action Management Unit (CAMU), TA III	Point	no	^{3}H	8E-04
CTF	Shock Thermodynamic Applied Research Facility (STAR), CTF	Periodic	no	^{238}U ^{235}U ^{234}U	1.2E-09 2.4E-11 1.2E-10

NOTE: See notes at end of table.

TABLE 5-6. Summary of Radionuclide Releases from the 20 NESHAP Sources in 2002 (Concluded)

TA	Facility Name	Monitoring Method *	Used in Dose Calculation ?	Radionuclide	Release (Ci/yr)
IV	HERMES III	Periodic	no	^{13}N ^{15}O	8.275E-04 8.275E-05
IV	Saturn Facility	Calculation	no	N/A	N/A
IV	SPHINX	Periodic	no	N/A	NA
IV	Z-Facility (Accelerator)	Calculation	no	^{234}U ^{235}U ^{238}U ^{3}H ^{60}Co ^{54}Mn ^{63}Ni ^{55}Fe	2.05E-10 9.19E-12 1.99E-10 9.7E-09 1.3E-03 6E-06 3.4E-06 6E-03
V	Hot Cell Facility (HCF)	Periodic	yes	N/A	N/A
V	Annular Core Research Reactor (ACRR)	Periodic	yes	^{41}Ar	10.6
V	Sandia Pulsed Reactor (SPR)	Periodic	no	^{41}Ar	4.64E-05

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 2002)
SPHINX = Short Pulse High Intensity Nanosecond X-Radiator
CTF=Coyote Test Field
Ci/yr = curies per year
TA= Technical Area

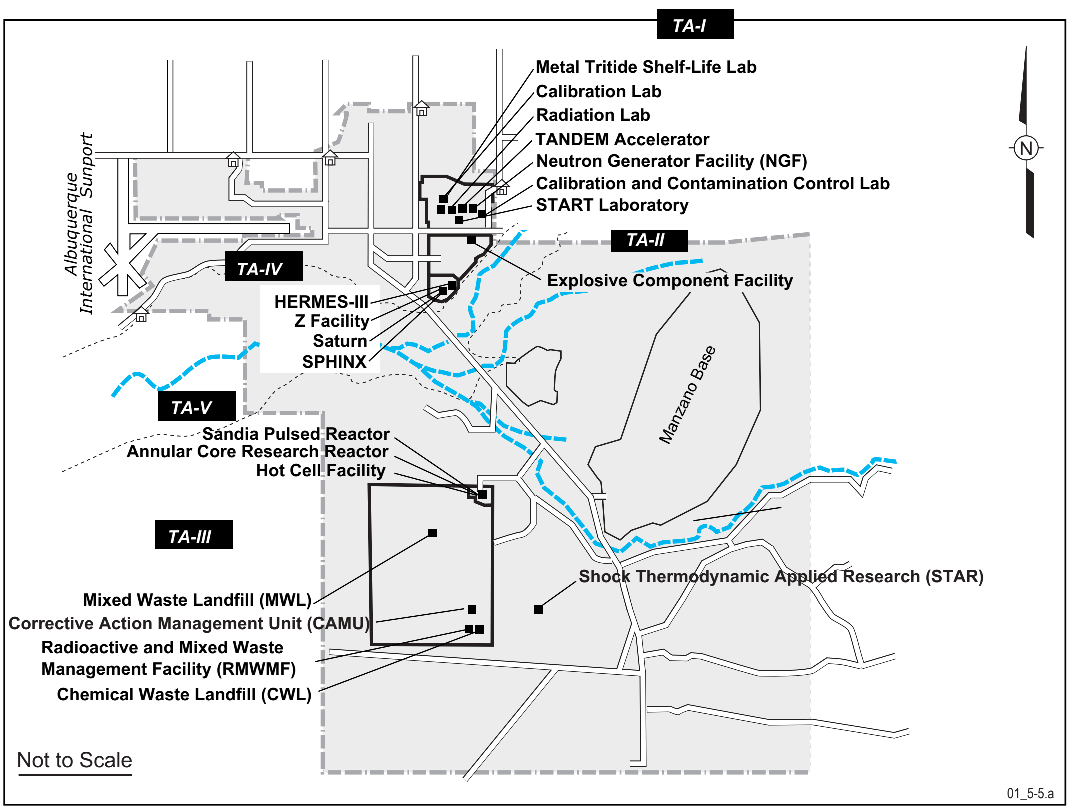


FIGURE 5-5. Locations of the 20 Facilities at SNL/NM that Provided Radionuclide Release Inventories in 2002

TANDEM Accelerator – This is an ion solid interaction and defect physics accelerator facility. Although the TANDEM did not operate in 2002, the facility reported emissions of tritium that was being housed in the facility.

TA-II Sources

Explosive Components Facility (ECF) – The ECF conducts destructive testing on neutron generators. The only release in 2002 was tritium.

TA-III Sources

Corrective Action Management Unit (CAMU) – The CAMU is a non-routine Rad NESHAP source. The only contaminant identified through the Low Temperature Thermal Desorption (LTTD) process is tritium. The LTTD treatment process began at the CAMU in the fall of CY02 and was completed in the winter of CY02. Approximately 9,000 cubic yards of contaminated soils from the remediation of the CWL were treated by the LTTD process. A worst case analysis was performed, which assumed that all radioactivity present in the soil treated by the LTTD was emitted into the air.

CWL – The CWL is a non-routine Rad 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 2002. A worst case analysis was performed, which assumed that all radioactivity present was emitted 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 2002, 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 2002.

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 2002.

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 2002, both the uranium and stainless steel targets were utilized. Consequently, the facility reported releases of uranium-234, uranium-235, uranium-238, tritium, cobalt-60, manganese-54, nickel-63, and iron-55.

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 2002.

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 2002.

Sandia Pulsed Reactor (SPR) – The SPR is used to produce intense neutron bursts for effects testing on materials and electronics. Argon-41, an air activation product, was the only reported release in 2002.

CTF Sources

STAR Facility - The STAR facility uses four types of guns as research tools to provide controlled loading conditions from ambient to multi-Mbar pressure for material research studies. Very small amounts of Uranium-238, Uranium-235, and Uranium-234 were the only reported releases in 2002.

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 Chapter 9.

5.4.1 NESHAP Dose Assessment Input

Emission Sources

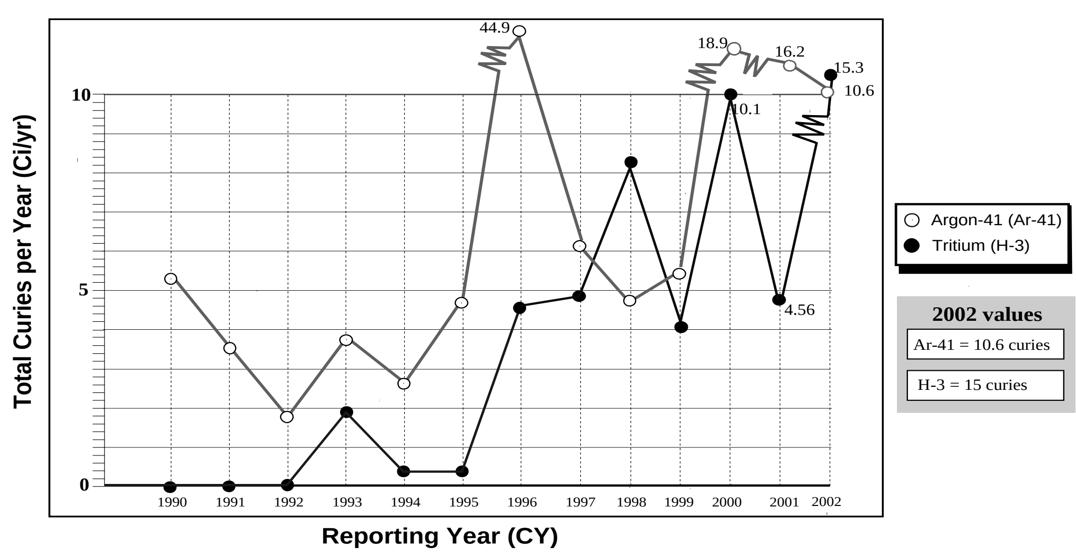
To assess compliance, all NESHAP facilities at SNL/NM must submit annual facility emission data to the NESHAP Program administrator. The emissions from eight "primary" sources (ACRR, CWL, SPR, HCF, Z Facility, NGF, RMWMF, and MWL) are modeled using version 2 of the EPA's CAA Assessment Package-1988 (CAP88) (EPA 2002) 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 was the only primary source to report zero emissions in CY02.

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 perform continuous stack monitoring. Other facilities base their emission estimates on periodic confirmatory measurements or engineering calculations.

In 2002, 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 2002, the NESHAP calculation for resident population was based on the state's 2000 to 2001 estimated urban and county population data and U.S.



NOTE: The atmosphere contains 72% nitrogen, 21% oxygen, 0.93% argon, 0.03% carbon dioxide, and minor concentrations of neon, methane, hydrogen, helium, and kyrpton. Some of these constituents are susceptible to isotope transformations during high energy processes, which result in air activation products such as Ar-41.

FIGURE 5-6. Summary of Atmospheric Releases in Argon-41 and Tritium from SNL/NM Facilities Since 1990 (Emissions vary from year to year based on operations within the facility)

New EPA Standard for Ozone

The EPA revoked the NAAQS in 1998 for the 1-hour standard of 0.12 ppm for O_3. 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. On December 18, 2002, the EPA issued a final response to the U.S. Court of Appeals for the D.C. Circuit's remand of the 8-hour ozone standard. The remand directed the EPA to consider the potential beneficial effects of ground-level ozone pollution in sheilding the public from potentially harmful solar radiation, known as UV-B. After carefully considering the scientific and technical information available when the standard was issued in 1997, in addition to public comments on the November 2001 proposed response to the remand, the EPA has reaffirmed the 8-hour ozone standard.

Census Bureau data (DOC 2003). The beef and dairy cattle numbers were calculated using 1998 agricultural statistics. The food crop area fractions were calculated using the 1995 agricultural statistics. Both of the statistics were supplied by the New Mexico Department of Agriculture (NMDOA 2003). The following values were used in the 2002 CAP88 calculation:

1.927	Dairy cattle/km^2
1.156	Beef cattle/km^2
87.7	Food crops square miles (sq mi)
793,740	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 2002, East Capeheart Housing Units were not occupied. They are scheduled to be demolished. The decision was made to remove this receptor and add the Sandia Elementary School.

Meteorology
Data from four meteorological towers (CW1, A36, A21, and MW1) in the proximity of NESHAP emission sources were used in 2002. 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 5-7 and 5-8, respectively. Dose assessment results are summarized in Table 5-9.

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 2002, the MEI was again located on KAFB, at the KAFB Storage Facility, northwest of TA-V. The MEI dose of 0.00211 mrem/yr resulted primarily from releases of tritium and argon-41.

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).

Collective Dose
The collective population dose resulting from all SNL/NM radiological emissions was calculated for both KAFB and the regional area (Table 5-9). 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 2002 was 0.0679 person-rem/yr. For the purpose of calculating the collective dose,

TABLE 5-7. Annual Source-Specific Effective Dose Equivalent (EDE) to Off-site Receptors in 2002

Receptor	ACRR	SPR	CWL	RMWMF	MWL	NGF	Z Facility	EDE (mrem/yr)
Albuquerque City Offices	2.40E-04	1.10E-09	6.70E-06	2.70E-06	7.90E-06	5.50E-04	4.50E-07	**8.08E-04**
East Resident	1.20E-05	5.30E-11	1.80E-06	6.10E-07	5.40E-06	4.20E-04	4.90E-08	**4.40E-04**
Eubank Gate Area	1.50E-04	6.60E-10	4.30E-06	1.70E-06	6.30E-06	6.60E-04	8.00E-07	**8.23E-04**
Four Hills	1.80E-04	7.80E-10	4.50E-06	1.70E-06	6.30E-06	4.90E-04	3.30E-07	**6.83E -04**
Isleta Bingo	3.90E-05	1.80E-10	3.90E-06	1.50E-06	5.80E-06	4.40E-04	9.40E-08	**4.90E-04**
Northeast Resident	6.10E-05	2.80E-10	3.50E-06	1.30E.06	5.70E-06	4.4E-04	1.10E-07	**5.12E-04**
Tijeras Arroyo (West)	3.40E-04	1.50E-09	8.50E-06	3.50E-06	9.10E-06	5.10E-04	5.40E-07	**8.72E-04**

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 5-8. Annual Source-Specific Effective Dose Equivalent (EDE) to On-site Receptors in 2002

Receptor	ACRR	SPR	CWL	RMWMF	MWL	NGF	Z Facility	EDE (mrem/yr)
Airport	3.40E-04	7.10E-10	3.40E-06	1.40E-06	1.20E-06	2.10E-04	6.60E-7	**5.75E-04**
Airport East	1.20E-04	5.50E-10	2.90E-06	1.40E-06	9.80E-07	1.20E-05	5.20E-05	**2.46E-04**
USAF #1	1.70E -04	7.60E-10	3.5 0E-06	1.50E-06	1.10E-06	3.90E-04	2.00E-06	**5.68E-04**
USAF #2	1.40E-04	6.00E+10	2.90E-05	1.20E-06	8.40E-07	1.60E-04	6.10E-07	**3.06E-04**
Capehart West	1.70E-04	7.30E-10	2.30E-06	9.50E-07	7.10E-07	6.10E-05	2.20E-07	**2.35E-04**
Chestnut Site	3.00E-04	1.40E-09	6.20E-05	3.00E-05	2.70E-06	3.00E-05	1.10E-07	**4.25E-04**
Golf Course Clubhouse	8.90E-03	3.90E-06	7.70E-06	3.10E-06	2.60E-06	9.20E-05	5.60E-07	**9.96E-04**
Golf Course Maintenance Area	5.10E-04	2.30E-05	6.30E-06	2.60E-06	2.00E-06	1.50E-04	1.10E-05	**6.72E-04**
Honeywell Instrument Support Site	2.30E-04	1.00E-90	4.20E-06	1.70E-06	1.30E-06	1.30E-03	8.80E-06	**1.55E-03**
ITRI/Lovelace	1.00E-04	4.90E-10	4.60E-06	1.80E-06	5.90E-07	1.60E-05	5.70E-08	**1.23E-04**
KAFB Fire Station #4	1.40E-04	6.70E-10	1.10E-05	1.90E-06	1.30E-06	2.80E-04	7.70E-08	**1.81E-04**
KAFB Landfill	2.80E-04	1.20E-90	4.50E-06	4.80E-06	1.50E-06	2.40E-05	3.30E-05	**5.71E-04**
KAFB Storage Facility	2.00E-03	9.10E-90	8.50E-06	4.00E-06	5.50E-06	9.60E-05	5.5 0E-07	**2.11E-03**
Loop Housing	1.20E-04	5.30E-10	2.70E-06	1.10E-06	7.90E-07	1.40E-07	5.50E-07	**2.65E-04**
Manzano Offices (Fire Station)	3.6 0E-04	1.60E-90	7.20E-06	2.80E-06	1.30E-06	2.10E-05	1.00E-06	**3.92E-04**
Maxwell Housing	1.60E-04	7.10E+00	2.20E-06	9.20E-07	6.80E-07	6.20E-05	2.20E-06	**2.260E-04**
Pershing Park	1.10E-04	4.70E-10	2.60E-06	1.10E-06	7.30E-07	1.50E-04	5.70E-07	**2.65E-04**
Riding Club	7.90E-03	3.50E-09	9.30E-06	3.80E-06	2.20E-06	5.80E-05	2.90E-07	**8.64E-04**
Sandia Federal Credit Union	1.50E-04	6.50E-10	3.20E-06	1.30E-06	9.60E-07	3.20E-04	1.40E-06	**4.77E-04**
Sandia Elementary School	1.10E-04	4.70E-10	2.60E-06	1.10E-06	7.3E-07	1.50E-04	5.60E-07	**2.65E-04**
USGS	1.20E-04	5.6 0E-10	5.20E-06	2.00E-06	7.10E-07	1.90E-05	7.10E-08	**1.47E-04**
Zia Park Housing	1.40E-04	6.40E-10	3.10E-06	1.30E-06	1.10E-06	1.90E-04	9.00E-07	**3.36E-04**

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

TABLE 5-9. Calculated Dose Assessment Results for On-site and Off-site Receptors and for Collective Populations in 2002

Dose to Receptor	Location	2002 Calculated Dose	NESHAP Standard
Individual Dose			
On-site Receptor EDE to the MEI	KAFB Facility	0.00211 mrem/yr *(0.000021 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)*
Collective Dose			
Collective Regional Population[1]	Residents within an 80-km (50-mi) radius	0.0679 person-rem/yr *(0.000679 person-Sv/yr)*	No standard available
Collective KAFB Population[2]	KAFB housing	0.000745 person-rem/yr *(0.0000795 person-Sv/yr)*	No standard available

NOTE: [1]Based on a population of 695,406 people estimated to be living within an 80-km (50-mi) radius.
[2]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-sievert 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

all releases are assumed to occur from a location centered in TA-V. The population dose was calculated by multiplying 793,740 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 2,522. This resulted in an estimated population dose of 0.000745 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 Chapter 9.

5.5.1 SNL/NM Air Emission Sources

As discussed in Section 5.2, criteria pollutants include SO_2, NO_2, CO, O_3, PM, and lead. For these criteria and other pollutants, the EPA:

- Sets ambient air quality standards, including those for 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 2002. The volume of fuel throughput used in the boilers may be reported to the City of Albuquerque. In 2002, fuel throughput reported at the Steam Plant was as follows:

Natural Gas (scf)	*Diesel (gal)*
585,443,313	39,148

NOTE: scf = standard cubic feet
gal = gallon

As defined by 20 NMAC 11.67, "Equipment, Emissions, and Limitations," the Steam Plant Boilers 1, 2, and 3 fall below the applicable minimum emission limits for NO_x; however, Boilers 5 and 6 will not allow NO_x emissions to the atmosphere in excess of 0.3 pounds per million British thermal units (BTU) of heat input. 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 are no longer subject to the requirements of Title V, since Application No. 515 was amended to limit 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 by retrofitting all five boilers with Flue Gas Recirculation.

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 ten 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 (Chapter 9, Table 9-1) 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 Microelectronics Development Laboratory (MDL) in 2002.

In 2002, the generator fuel throughput was 6,473 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

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 impact. As shown in Chapter 9, Table 9-1, there were 12 permits issued in 2002. 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 considered a major source based on its potential to emit NO_x and CO. Since potential emissions from the Steam Plant were greater than 100 tpy of criteria pollutants, this facility was 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 DOE/NNSA/SSO submitted Sandia Corporation's Title V Operating Permit application (DOE 2002a) 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 2002, the City of Albuquerque has yet to issue the final permit. Application No. 515 Volume I was amended and updated in 1999 and again in 2002.

Small Business Assistance
In 2002, the New Mexico Small Business Assistance (NMSBA) Program, which is managed by SNL/NM, continued assisting a Las Cruces, New Mexico cotton gin cooperative in reaching compliance with Title V. Assistance was also provided in 2002 to a brick manufacturer in Sunland Park, NM.

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 be 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 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 and 2002. (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, and took a step towards that goal in 2002 by amending its application.

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). The tank was removed in 2002, which eliminated this RMP consequence.

5.5.3 Ozone Depleting Substance (ODS) Reductions

Sandia Corporation did not make any progess in Fiscal Year (FY) 2002 towards the secretarial goal of replacing Class I refrigerant chillers greater than 150 tons capacity, manufactured prior to 1984. Replacement is part of a larger upgrade to improve the reliability and the overall efficiency of the associated chilled water system.

In FY02, Property Management partnered with Facilities, Waste Management, and P2 organizations to try to broker a transfer of 2,000 lbs of excess refrigerants and 96 accumulators with Halon 2402 to the DLA Supply Center. DLA would pay for the shipment that includes materials removed from Sprint Missile rocket motors in TA-III.

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Chapter 6

Wastewater, Surface Discharge, and Storm Water Monitoring Programs

In this Chapter ...

Wastewater Discharge Program 6-2
Surface Discharge Program 6-5
Storm Water Program 6-7

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 2002, 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 2002, all surface discharge requests met state standards and were approved.

Environmental Snapshot

- *Sandia Corporation received five "Gold Pre-treatment Awards" from the City of Albuquerque for 100 percent compliance to discharge limits set in permits during the 2001-2002 reporting year (November 2001 to November 2002).*
- *SNL/NM discharges approximately 800,000 gallons of wastewater per day to the public sewer.*

The Storm Water Program monitors storm water runoff at nine 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 2002, analytical monitoring was required under NPDES.

SNL/NM personnel taking well measurements.

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 Ordinances:

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 five "Gold Pre-treatment Awards" from the City of Albuquerque for the 2001 to 2002 reporting year (November 2001 to November 2002). 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. The primary regulatory drivers for the Wastewater Program and 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. 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 Chapter 9, Table 9-1. 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).

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/SSO will notify the City of Albuquerque within 24 hours. Wastewater Discharge Permits and Station Characteristics are listed in Table 6-1.

Sandia Corporation splits 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. 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. Station parameters are listed in the shaded box (shown on page 6-5).

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

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 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 2002, Sandia Corporation split SNL/NM wastewater samples with both the City of

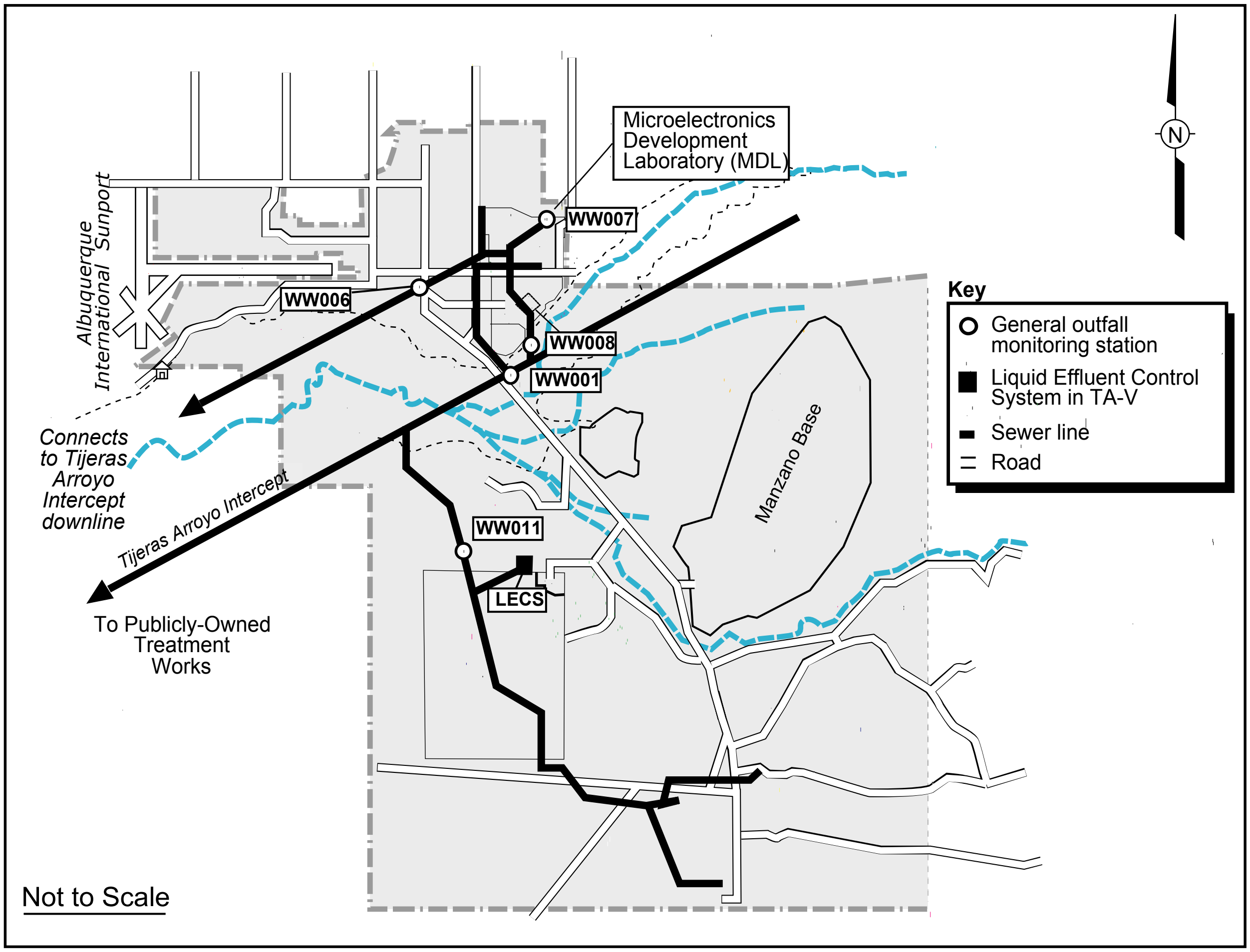

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FIGURE 6-1. Wastewater Monitoring Station Locations

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

Permit	Waste Stream Process
General Outfall	
WW001	All waste streams
WW006	All waste streams
WW008	All waste streams
WW011	All waste streams
Categorical	
WW007	MDL
Not Permitted	
LECS	Radiological screening of TA-V process water

NOTE: "All waste streams" include both domestic and industrial discharges.
TA-V = Technical Area V
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 (SVOCs)
- Chemical oxygen demand (COD)

Albuquerque and the NMED. In 2002, laboratory analytical results for these wastewater samples, based on the parameters shown above, confirmed that Sandia Corporation was in compliance with all City of Albuquerque regulations. 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. All water discharged from the LECS in 2002 also met federal regulatory standards and DOE Orders for radiological levels in wastewater.

Reportable releases that occurred in 2002 are discussed under occurrence reporting in Section 2.2.2. There was one reportable occurrence (a City of Albuquerque permit violation) in 2002. On December 16, 2002, a pH excursion occurred at monitoring station WW008, City of Albuquerque Permit 2069I, during start-up and testing activities of the De-Ionized Water system upgrade project, which is associated with the on-going Microsystems and Engineering Sciences Application (MESA) contstruction project. The pH dropped below pH=5 nine times and a low pH of 2.0 was recorded during the event until the system regained control. Approximately 38,000 gallons of water flowed through the monitoring station, but did not present an imminent danger to the health and welfare of persons, to the sanitary sewer system, or to the environment.

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 and 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 Internal Surface Discharge Program. 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.

2002 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 2002, 15 individual surface discharge requests were made; all met state standards and were approved.

6.2.2 Surface Discharge Releases in 2002

The Surface Discharge Program must be contacted in the event of an accidental release or spill to the ground surface. In 2002, nine reportable releases occurred. These occurrences are briefly summarized in Section 2.2.2 and are discussed in greater detail below.

On March 4, 2002, approximately 200–300 gallons of untreated/dilute sanitary wastewater was released to the storm sewer and was reported to NMED. During a tie-in procedure for a construction project, the flow in the sanitary sewer line was blocked, but the additional flow from on-going processes was not stopped causing sewage to back up and be released within a building. While cleaning the floors, it was discovered that some of the overflow exited the building, followed a swale in the parking lot, and entered a storm drain inlet. The overflow also exited a doorway and collected in a depression outside the building along the fence line.

On March 29, 2002, a water leak was reported at 9th Street and Ordinance Road. As a precaution, gas and electrical service to a nearby building was turned off. A 10" water line containing potable water developed a lengthwise crack approximately 14" to 16" long. Water from the leak flowed westward in a bar ditch adjacent to Ordinance Road to the storm water drainage ditch along Wyoming, entered the lined storm water channel immediately below the energy dissipater, and flowed into Tijeras Arroyo. The total discharge amount was approximately 330,000 gallons. Although the discharge consisted of potable water, the total volume of water discharged was large enough to notify the NMED Water Quality Bureau. Repair crews excavated and repaired the pipe.

On May 28, 2002, a water leak was reported at the TA-III Gate. As a precaution, gas and electrical service was turned off. A 10" water line containing domestic potable water developed a lengthwise crack. Repair crews excavated the pipe, back filled large holes, and proceeded with the repair. The total discharge amount was between 750,000 to 1,100,000 gallons and was reported to NMED. No ER sites or potable water wells were impacted.

On July 10, 2002, water from a ruptured 10-inch water line (domestic potable water and fire suppression) was released in TA I within a construction zone. The total release was approximately 293,000 gallons of water and did not enter any arroyo channels that enter “Waters of the United States.” No ER or potable water wells sites were impacted. Depth to groundwater at this location is in excess of 400 feet. There was no discharge to surface water.

On July 23, 2002, a release of mercury (Hg) occurred south of TA-I. The Hg was contained in a glass vial inside a section of copper tubing of an electrical subassembly that was used as a high current electrical switch. During disassembly of the equipment, a worker dropped the copper tube containing the glass vial, which broke and released less than 9.0 ounces of Hg. The bulk of the Hg was contained on the floor of the storage building where the disassembly was taking place. The remainder splashed out of the building onto compacted soil. The site was cordoned off and emergency personnel cleaned the area. Depth to groundwater at this location is in excess of 400 feet. There was no discharge to surface water.

On August 30, 2002, a release from an 8-inch water line (domestic potable water and fire suppression) was discovered in TA-I. The water, within a construction zone, was isolated and shut off. The release was due to the incorrect installation of a water plug, which was installed at the end of an 8-inch cap downstream of the shut off valve. Approximately 31,000 gallons of water was released. The release did not enter any arroyo channels that enter “Waters of the United States.” No ER sites or potable water wells sites were impacted. Depth to groundwater at this location is in excess of 400 feet. There was no discharge to surface water.

On October 30, 2002, a release occurred in TA-I. The discharge likely occurred over several days during rainfall. The released fluid was washed off metal chips that were stored in bins. Under normal conditions, pans placed below the storage bins collect any metal working fluid that drains from the metal chips, but heavy rainfall caused the pans to overflow. The released oil/water mixture flowed a short distance from the bins into a storm drain inlet. The material released was a non-hazardous, mineral oil based metal working fluid and was estimated to be ½ gallon or less.

On December 3, 2002, a release occurred within TA-I when a contractor reported cutting the chilled water loop during grading operations. Water from the thermal energy storage tank chilled water loop supply line was isolated and shut off. A large amount of water collected in the construction area and flowed west down K Avenue and south down 14th Street, where the chilled water entered the storm drain system. Approximately 33,000 gallons of chilled water was released to the surface. No ER or potable water well sites were impacted by this release. The depth to groundwater at this location is in excess of 500 feet. There was no discharge to surface water.

During a review of hazardous material inventories, it was determined that approximately 30 to 50 gallons of 50 percent concentration of hydrogen peroxide was unaccounted for. Sometime during the Labor Day weekend of CY02, the material (in diluted form) was released into the sanitary sewer in a fume hood. An unpermitted release of hazardous material along with voluminous quantities of tap water for dilution and safety control occurred. No potential for environmental harm was probable, nor did the amount released meet reporting threshold quantities.

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 2001d) 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 2001d). Water level measurements were obtained from Lagoons I and II on November 5, 2002. The water level in Lagoon I was recorded at 31 percent of capacity and the water level in Lagoon II was at 9 percent of capacity. Biennial samples were obtained from both lagoons during 2002. Lagoons I and II were cleaned and inspected during 2002 and the liners were determined to be sound and intact. All permit requirements for both lagoons were met in 2002. No analytical parameters were found to exceed the NMWQCC maximum allowable concentration (MAC) standards.

6.2.4 Sandia Corporation/New Mexico Tech Vadose Zone (STVZ) Infiltration Test Facility Discharge Plan

NMED approved Discharge Plan DP-1381 on March 4, 2002 for the STVZ. SNL/NM and New Mexico Institute of Mining and Technology (New Mexico Tech) staff used the STVZ Facility during 2002 to conduct research on contaminant flow and transport through a heterogeneous vadose zone. A sodium chloride (NaCl) tracer solution is delivered by an above ground infiltrator system that was designed to inject up to 64 gallons per day of potable water and the NaCl tracer into the 10-meter by 10-meter test area. Electrical Resistivity Tomography (ERT) and Cross Borehole Ground Penetrative Radar (XBGPR) are used to track the transport of simulated contaminants. The STVZ was required to measure the daily volume of tracer solution and potable water used during simulation studies. STVZ submitted, through SSO, monthly reports to NMED and complied with approved conditions in its operation plan, monitoring plan, contingency plan, and closure plan. During 2002, all of the permit conditions at the STVZ were met.

Infiltration at the STVZ was stopped on July 31, 2002. The permit expired on March 4, 2003 and transfer of the STVZ Facility to New Mexico Tech operational control was started. SNL/NM will continue to maintain responsibility for the facility security and permit requirements until the transfer is complete.

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. The Storm Water Program works in coordination with the P2 Group, the Surface Discharge Program, Facilities Engineering, 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);

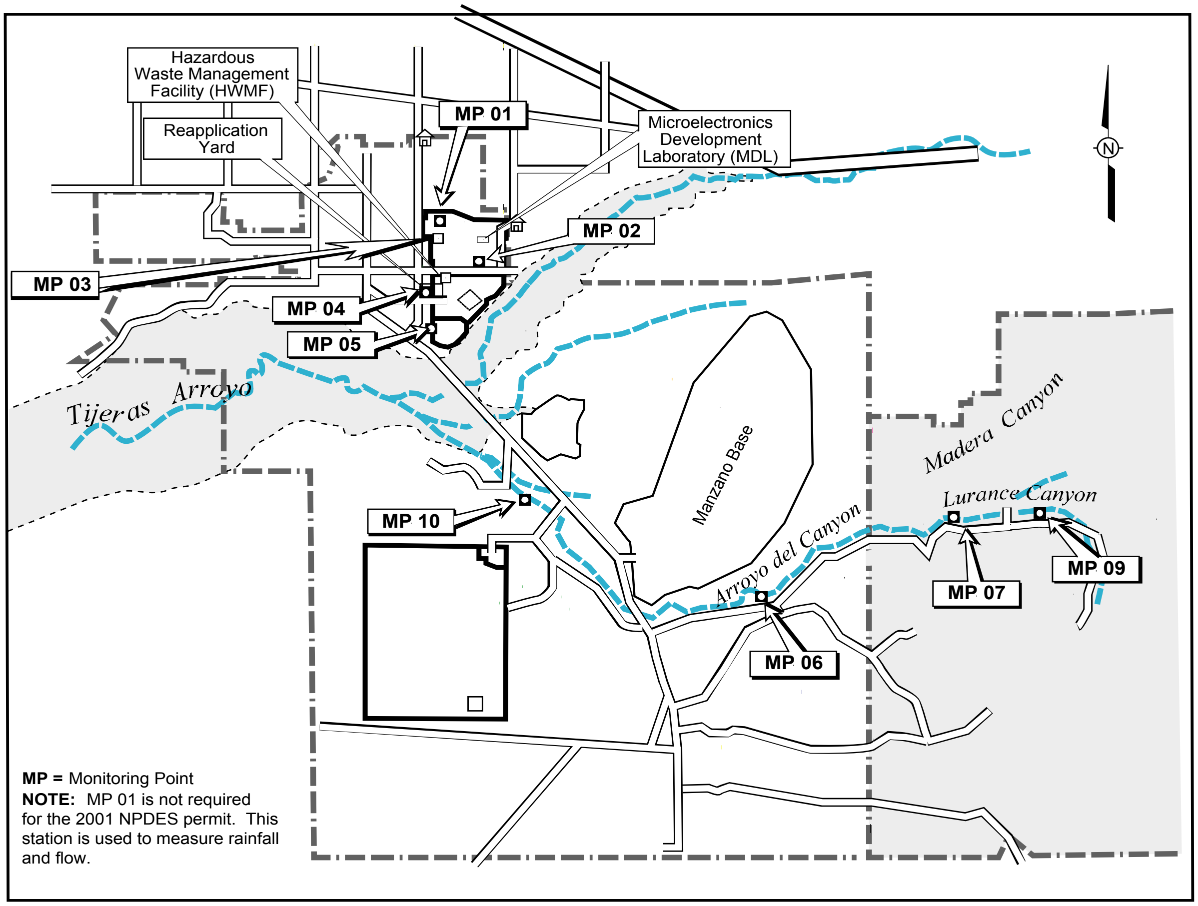


FIGURE 6-2. Storm Water Monitoring Point Locations at Nine Sites

- 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.

Water Sheds 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.

A new NPDES permit was issued in January 2002. Four stations were added to monitor runoff in the Arroyo del Coyote watershed.

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 nine SNL/NM monitoring points (MPs) 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. Chapter 9 of this report lists all applicable regulations and program documents.

Construction activities that disturb over five acres also require permitting under NPDES. A construction permit requires the ground to be stabilized upon completion of the project. Starting in March 2003, construction activities that disturb over one acre will be required to have NPDES coverage. In 2002, two storm water construction permits were in effect: the Storm Drain, Sanitary Sewer, Domestic Water System Modernization (SSWM) Project and the Joint Computational Engineering Laboratory (JCEL). Storm water permits are listed in Chapter 9, Table 9-1.

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 **
NPDES Multi-Sector Storm Water Permit		
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
Short-Term Construction Permits		
Construction Activities in 2002	- Building material pollutants - Disturbed soil	- MESA - Storm Drain Modernization Project - JCEL

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 2001b).

AMPL = Advanced Manufacturing Process Laboratory
CSRL = Compound Semi-Conductor Research Laboratory
HWMF = Hazardous Waste Management Facility
SWMU = Solid Waste Management Unit
MDL = Microelectronics Development Laboratory
MESA = Microsystems and Engineering Sciences Applications
JCEL = Joint Computational Engineering Laboratory

SSWM Project

In 1999, construction began on the SSWM Project. Phases 1, 2, and 3, completed in 2000, consisted of the realignment of 20th 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 was delayed due to funding issues and is scheduled to be completed in FY 2004.

JCEL Project

The JCEL will be a 64,900 square foot research facility. Construction began in April 2002 and is scheduled to be completed in September 2003. The building site will disturb a total of 6.5 acres.

6.3.2 Storm Water Monitoring Stations

Figure 6-2 illustrates the location of the nine MPs. MP 1 monitors the runoff from the Machine Shop located in TA-I. MP 2 through 5 monitor runoff from the majority of industrial activities in TA-I, TA-II, and TA-IV. MP 6,7,9, and 10 monitor discharges in Arroyo del Coyote.

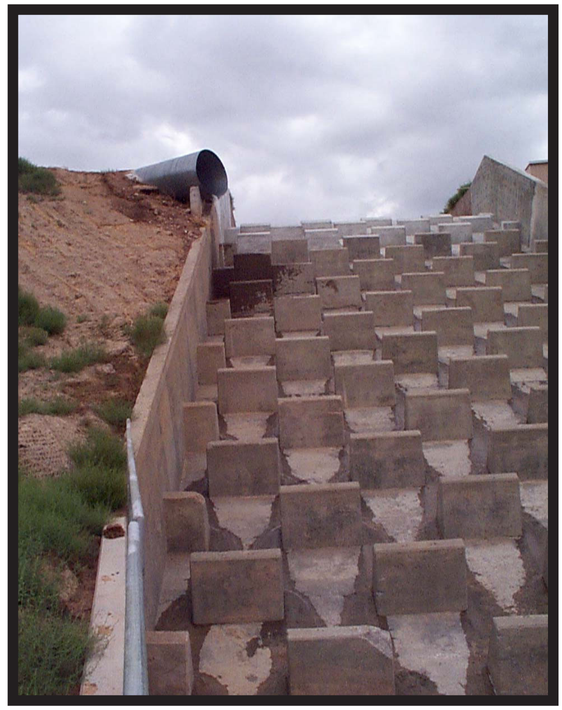
6.3.3 Routine Inspections

All routine inspection results are attached to the Storm Water Pollution Prevention Plan (SWP3). Routine inspections include:

- **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.



Storm Water Station 5 (the roofline shown just to the right of this channel) samples storm water at a discharge point to Tijeras Arroyo.

- **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 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 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 each monitoring 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 2002 Activities

2002 Sampling Results

Both analytical and quarterly visual sampling was conducted in 2002. The analytical results are listed in Table 6-3. The visual samples were collected at five MPs and inspected as described under "wet weather inspections." No unusual characteristics were noted.

TABLE 6-3. FY 02 Analytical Results

FY 02	3rd Qtr		4th Qtr				Benchmark
SAMPLING DATE	4/7/2002	4/7/2002	7/23/2002	7/9/2002	7/9/2002	8/5/2002	
COC Number	605474	605473	605475	605478	605477	605609	
RAINFALL	0.24	0.24	0.17	0.31	0.31	0.16	
Monitoring Point	MP 04	MP 05	MP 01	MP 04	MP 05	MP 06	
Measurements in mg/l unless noted							
Aluminum	6.42	2.76	1.7600	1.7900	0.8710	5.5500	0.7500
Arsenic	0.00721	ND	0.0054	0.0093	0.0085	0.0081	0.1685
Barium	0.119	0.052	0.0563	B .0803	B .0971	0.5700	4.0000
Boron	0.0646	J 0.0194	NT	BJ .026	BJ .0458	NT	
Cadmium	J 0.000953	J 0.0004	J .0018	J .00131	J .0004	J .000569	0.0159
Chromium	0.00601	J 0.00356	J .0019	BJ .00414	BJ .0041	J .0021	0.5000
Cobalt	J 0.00179	J 0.000814	NT	BJ .00226	BJ .0025	NT	
Copper	0.016	0.0105	0.0100	0.0124	0.0120	0.0121	0.0636
Iron	4.29	1.86	1.3900	1.3100	0.6080	1.4400	1.0000
Lead	0.0098	0.0124	0.0080	0.0075	0.0171	0.0230	0.0816
Magnesium	4.81	1.87	B 2.57	B 1.70	B 3.59	8.0300	0.0636
Manganese	0.0983	0.0512	0.0725	0.0779	0.1330	0.5700	1.0000
Molybdenum	0.0184	J 0.00187	NT	J .00344	J 0.00375	NT	
Mercury (total)	ND	ND	ND	J .000056	J 0.00005	U ND	0.0024
Nickel	J 0.00474	J 0.00187	J .0029	J .00321	J .00485	0.0093	1.4170
Selenium	ND	ND	U ND	U ND	U ND	U ND	0.2385
Silver	ND	ND	U ND	BJ .00293	BJ .00246	U ND	0.0318
Zinc	0.0484	0.0689	0.1100	0.0981	0.0781	0.0721	0.1170
Ammonia	0.2		0.8000	0.4100	1.2000	0.2100	19.0000
Cyanide (total)	ND	0.003	U ND	U ND	J .00176	U ND	0.0636
pH	NT	7				NT	6-9 S.U.
PCBs			U ND	NT	NT	NT	
Gross Alpha/Beta (pCi/L)	12.2/21.2	6.91/16.7	NT	9.11/0.414	14.5/23.0	NT	
Nitrate + Nitrite	3.51	1.39	0.0600	0.9000	0.0600	0.3300	0.0680
Total Kjeldahl Nitrogen	1.49	0.14	NT	1.1800	4.1500	2.1300	
Oil & Grease	J 5.11	J 5.17	J 4.33	5.3800	5.6000	8.3300	100.0000
Chemical Oxygen Demand	83.1		57.2000	90.0000	192.0000	64.1000	120.0000
Total Suspended Solids	110.0		183.0	NT	NT	NT	100.0

NOTE: B = the concentration of the compound was detected in the blank above the effective MDL
NT = this sample was not tested for this constituent
ND = not detected
J = detected below the reporting limit or is an estimated concentration
U = ND below this concentration
S.U. = Sorensen Units

Chapter 7

Groundwater Programs

In this chapter ...

Overview of Groundwater Programs at SNL/NM 7-2
Groundwater Quality Analysis Results 7-5
Water Levels 7-13

Chapter Summary

The Groundwater Protection Program (GWPP) and the Environmental Restoration (ER) Project collect groundwater data at Sandia National Laboratories, New Mexico (SNL/NM). Both programs work together to monitor wells throughout SNL/NM and obtain data from the surrounding communities.

The GWPP establishes baseline water quality and groundwater flow information, determines if any impact from operations is affecting the quality of groundwater, and maintains compliance with local, state, and federal regulations. Groundwater sampling is conducted at various locations and is analyzed for a variety of constituents, including Volatile Organic Compounds (VOCs), metals, and radionuclides. Results are described in subsequent sections of this chapter.

The ER Project conducts groundwater monitoring in six project areas. These areas include the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG) Investigation, Canyons Area, and Drain and Septic Systems (DSS). The New Mexico Environment Department (NMED) provides oversight for these monitoring activities.

The ER Project utilized the Vapor Extraction Project (VEP) to remove VOCs from the groundwater and vadose zone at the CWL. This method was effective in the reduction of the concentration of trichloroethene (TCE) in groundwater systems to below the drinking water maximum contaminant level (MCL).

Environmental Snapshot

- *Initial sampling started at four new monitoring wells at DSS sites in 2002.*

Groundwater monitoring at a DSS well

Groundwater monitoring wells are located at and around SNL/NM operational areas and environmental remediation sites to determine potential impacts to groundwater, monitor the effectiveness of groundwater protection strategies, characterize potential contamination at ER sites, and demonstrate compliance with federal, state, and local groundwater requirements. Groundwater monitoring is conducted on an annual, biannual, or quarterly basis, depending on individual project areas. Water level measurements are conducted quarterly and monthly.

Data results generated from both the ER Project and the GWPP at SNL/NM are summarized in the *FY 2002 Annual Groundwater Monitoring Report* (SNL 2003d). Specific task areas performed in Fiscal Year (FY) 2002 under both programs are shown in Figure 7-1. As shown in Figure 7-1, coordination with outside groundwater monitoring agencies is a key component of the GWPP and the ER Project.

Figure 7-2 shows groundwater wells located on and around Kirtland Air Force Base (KAFB). Wells shown in Figure 7-2 include ER monitoring wells, GWPP surveillance wells, City of Albuquerque production wells, KAFB production wells, U.S. Geological Survey (USGS) monitoring wells, and KAFB Installation Restoration Program (IRP) wells. In FY02, 87 wells were sampled by the GWPP or the ER Project and are shown in Figure 7-2.

7.1 OVERVIEW OF GROUNDWATER PROGRAMS AT SNL/NM

7.1.1 GWPP Activities

The primary function of the GWPP is to conduct groundwater surveillance monitoring to detect groundwater contamination from current operations or undiscovered legacy contamination. The following outlines the specific purpose of surveillance monitoring:

- Establish baseline water quality and groundwater flow information for the groundwater system at SNL/NM;
- Determine the impact, if any, of Sandia Corporation's operations on the quality and quantity of groundwater; and
- Demonstrate compliance with all federal, state, and local groundwater requirements.

The GWPP is responsible for tracking information on all wells owned by Sandia Corporation, including ER Project wells and characterization boreholes. The primary purpose of the GWPP Well Registry and Oversight task is to ensure that all wells owned by SNL/NM are properly constructed and maintained to protect groundwater resources. The GWPP works together with SNL/NM well owners to review new well design proposals, record construction information, track well ownership and maintenance records, perform annual well inspections, and consult with owners, if and when plugging and abandonment of a well or borehole is required.

DOE Orders and regulations applicable to the GWPP are listed in Chapter 9.

Trend Data

The GWPP performs statistical trending on groundwater surveillance results by comparing past years' data with current year results. Trend data for groundwater contaminants that exceed regulatory limits is presented in Appendix B, which provides statistical descriptors and graphical representation. Data are analyzed to determine if the results are within a normal range of expected values or if a significant difference is present. By doing so, early detection and possible source identification can be made when contaminants are at levels far below regulatory concern. Conversely, unchanging baseline levels demonstrate Sandia Corporation's successful groundwater best management practices (BMPs) and protection strategies.

7.1.2 ER Project Groundwater Activities

ER Project activities are directed by Resource Conservation and Recovery Act (RCRA) regulations that mandate the cleanup and management of active and inactive treatment, storage, and disposal (TSD) facilities. Applicable regulations are listed in Chapter 9. The regulatory basis for the ER Project is discussed in Section 3.1.

There are currently six ER Project areas with ongoing groundwater investigations:

- CWL
- MWL
- TA-V
- TAG
- Canyons Area
- DSS

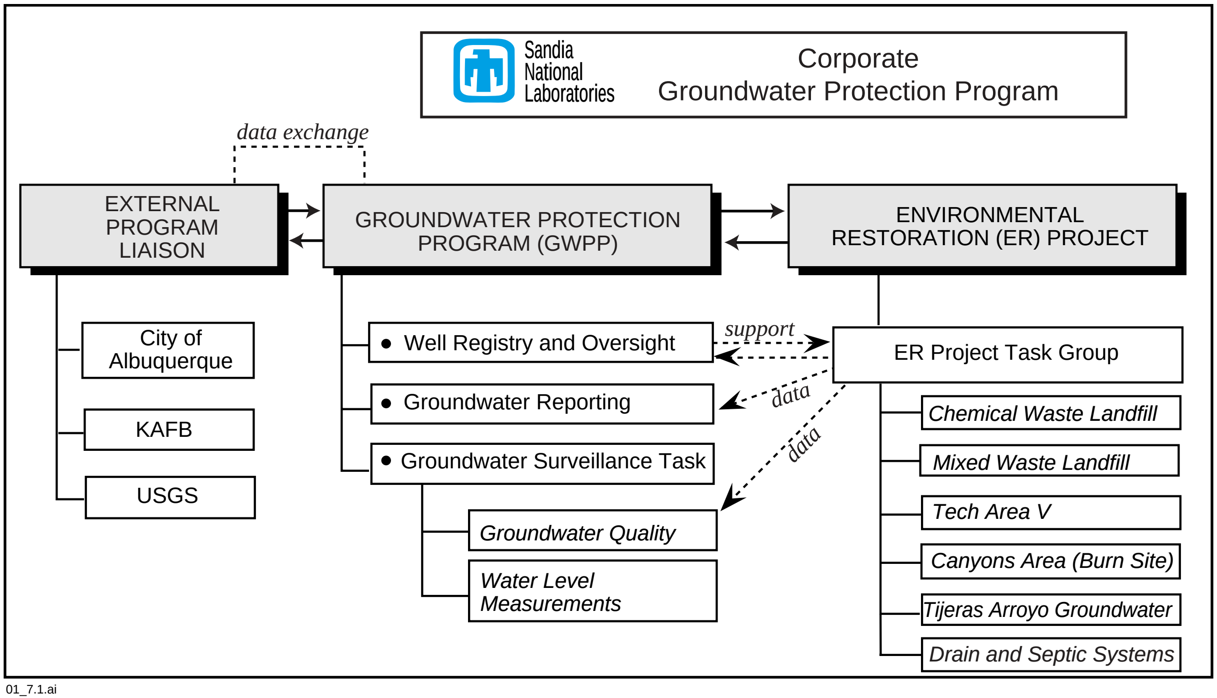


FIGURE 7-1. SNL/NM's Groundwater Programs and Interfaces

CWL – From 1962 to 1989, the CWL, covering just over two acres in the southeast corner of TA-III, was used to dispose of liquid chemical wastes by discharging them into pits. In 1985, the first monitoring wells were installed at the request of NMED. Currently, there are 12 active wells in the network, including three background (upgradient) wells and three multiple screen wells.

A Corrective Action Management Unit (CAMU) was established adjacent to the CWL to facilitate site cleanup as described in Section 3.1.2. The CAMU has extensive containment and detection systems to prevent groundwater contamination at the facility.

MWL – The MWL is a 2.6-acre site located in TA-III that was operational from 1959 to 1989 and was used to dispose of radioactive and mixed waste (MW). Cesium-137 and tritium are the contaminants on concern (COC) at this site.

TA-V – The Gamma Irradiation Facility (GIF), the Hot Cell Facility (HCF), and two reactor facilities are located in TA-V. From 1967 to 1971, the Liquid Waste Disposal System (LWDS) located in TA-V was used to dispose of reactor coolant water. Groundwater contaminants of concern at the LWDS are nitrates and VOCs such as TCE, which was first detected in the groundwater in 1993. There are currently nine active monitoring wells at this site.

TAG – The TAG Investigation includes groundwater beneath TA-I, TA-II, and the Tijeras Arroyo. There are currently 26 monitoring wells in the TAG study area. Of these, 12 are regional aquifer wells and 14 are shallow groundwater system (SGWS) wells. The SGWS consists of water-bearing strata elevated above the regional groundwater system (water table) that have not been developed for domestic use. TCE and nitrates are the contaminants of concern for TAG.

Canyons Area – The Canyons Area is located around the active Lurance Canyon Burn Site (LCBS) facility. Groundwater investigations were initiated in 1997 at the request of NMED after elevated nitrate levels were discovered in the LCBS water well. In 1997, one groundwater monitoring well was installed, and in 1999, two additional wells were installed, including two piezometers to detect any groundwater flow at the interface of the arroyo sediments and bedrock. To date, both piezometers have remained dry.

DSS – Operable Unit 1295 (Septic Tanks and Drainfields) originally included 23 individual septic and drain sites located throughout TA-III, and other remote sites east and south of TA-III. Passive soil vapor and soil samples were collected at 22 of the 23 sites from 1994 to 1997. Significant COC concentrations [high explosives (HE) compounds] were found at only one of the 22 sites (Solid Waste Management Unit [SWMU] 154) at which samples were collected. The 23rd site (SWMU 139) was granted a non-sampling administrative

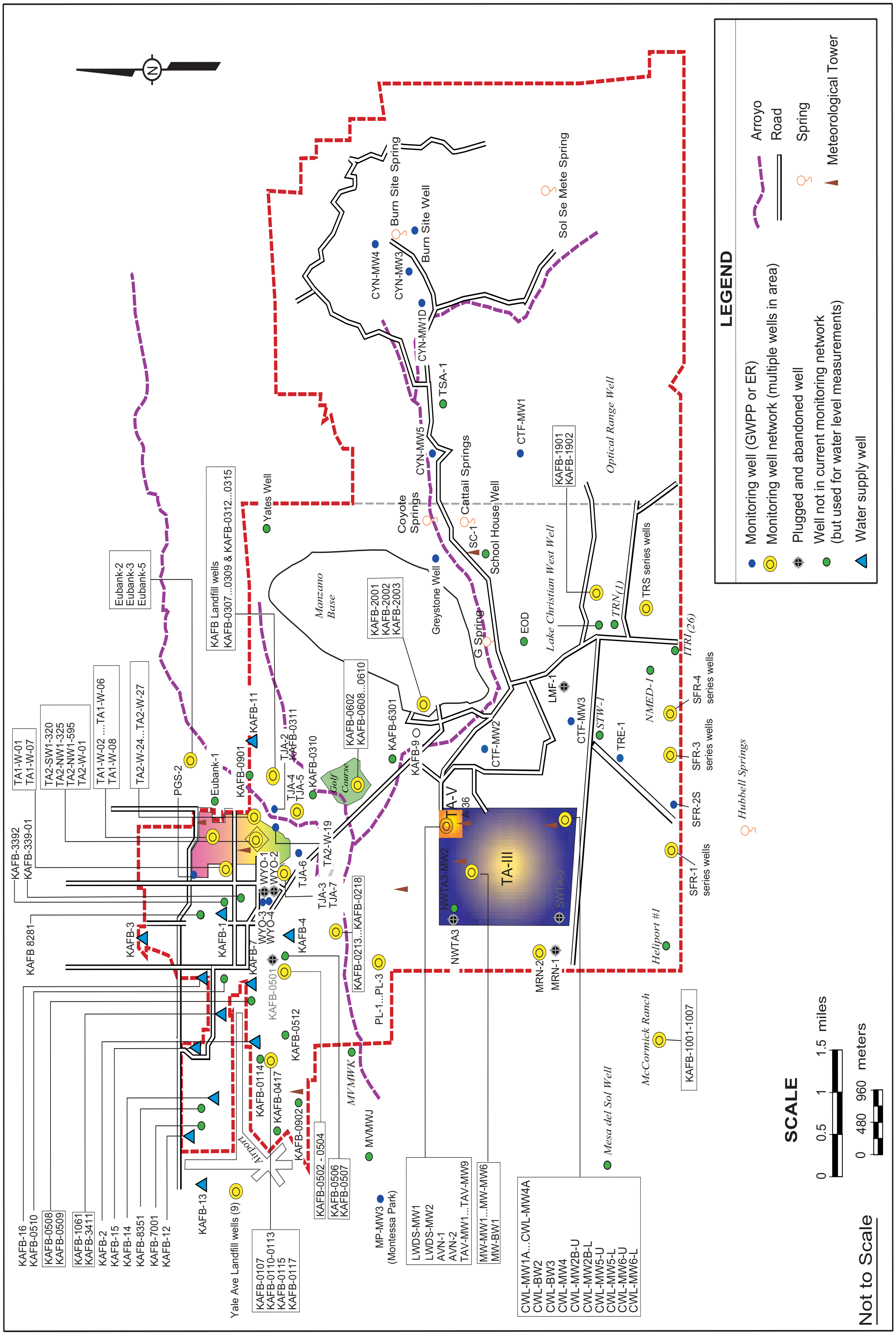


FIGURE 7-2. Wells and Springs on SNL/NM and KAFB

No Further Action (NFA) proposal by the NMED in 1995.

NFA proposals for the 22 sites were submitted to NMED from 1995 to 1997. NMED responded to the NFA proposals for SWMUs 49, 116, 149, and 154 and required that at least one groundwater monitoring well be installed at each of the four sites. These required monitor wells were installed in FY01 and initial sampling began in FY02.

An additional 121 individual DSS sites not originally included in the OU 1295 project have also been identified within the SNL/NM area. The NMED has required that environmental characterization be completed at 61 out of the 121 systems. Characterization work includes surface passive soil vapor surveys, shallow soil sampling, deep soil vapor monitoring well installation and sampling, and potential groundwater monitoring well installation depending on results of the shallow characterization work. Environmental characterization work started at these additional DSS sites in 1998.

7.2 GROUNDWATER QUALITY ANALYSIS RESULTS

Analytical results for groundwater quality monitoring conducted by the GWPP and the ER Project are compared to state, federal and DOE guidelines as shown in Table 7-2. The frequency of groundwater monitoring performed at SNL/NM is shown in Table 7-3. All groundwater samples are analyzed in accordance with U.S. Environmental Protection Agency (EPA) protocols.

Water quality results for both the GWPP and the ER Project are summarized in the following pages and in Table 7-1 and are published in the *FY 2002 Annual Groundwater Monitoring Report for SNL/NM* (SNL 2003d).

7.2.1 GWPP Surveillance Results

During June and July 2002, annual sampling of groundwater was conducted by the GWPP Groundwater Surveillance Task. Samples were collected from ten wells and one spring. Groundwater surveillance samples for the GWPP were analyzed for the following parameters:

- VOCs
- Metals
- Major ions including nitrate
- Alkalinity/total phenols
- Total halogenated organics (TOX)
- Gamma spectroscopy
- Selected radionuclides
- Gross alpha & beta activity

Metals, excluding mercury, were analyzed from filtered groundwater samples to conform to New Mexico Water Quality Control Commission (NMWQCC) Standards for dissolved concentration limits. An unfiltered groundwater sample was analyzed for total mercury.

In addition, field measurements taken at each well included alkalinity, turbidity, dissolved oxygen, potential of hydrogen (pH), specific conductivity, oxidation reduction potential (or redox [Eh]), and temperature.

VOCs

No groundwater samples exceeded MCLs for VOCs. Trace concentrations of acetone, chloroform, and bromoform were detected. Acetone is attributed to laboratory contamination of samples because it was also detected in quality control (QC) sample blanks. Chloroform was detected in well TRE-1 at a concentration of 1.32 µg/L. Bromoform was detected at 2.8 µg/L in monitor well SWTA3-MW2. This is the first time this well has been sampled since its installation.

Although there is no specific MCL established for chloroform and bromoform, an MCL of 0.1mg/L is established for total thihalomethanes. Chloroform and bromoform are trihalomethanes. In drinking water systems, trihalomethanes are the product of a disinfection chemical. The maximum allowable concentration (MAC) established by the NMWQCC for chloroform specifically is 100 µg/L.

Non-metal Inorganic Compounds and Phenolics

No groundwater samples exceeded MCLs for any non-metallic inorganic constituent:

- Nitrate plus nitrite (NPN) (as nitrogen)
- Phenolics
- TOX
- Total cyanide
- Alkalinity (calcium carbonate)
- Ions (bromide, chloride, fluoride, and sulfate)

Chloride exceeded the NMWQCC domestic use MAC for groundwater in water samples collected from Coyote Springs. Sulfate in SFR-4T exceeded the domestic use MAC. The elevated concentrations are from natural sources and are consistent with background concentrations determined for this location.

Metals

The analyses were conducted for dissolved metals using filtered samples, except for mercury, for which the total concentration was determined in an unfiltered aliquot of sampled groundwater. The

TABLE 7-1. Summary of SNL/NM Groundwater Monitoring Activities During Fiscal Year 2002

	Remediation	Environmental Surveillance
Number of Active Wells Monitored	64	11
Number of Samples Taken	192	13
Number of Analyses Performed	17,113	1,618
% of Analyses that are Non-Detect	80.107%	75.90%

	Remediation	Environmental Surveillance	MCL	MAC
Range of Results for Positive Detections				
Tritium (pCi/L)	-236 - 412	N/A	20,000	N/A
TCE (μg/L)	0 – 17.2	ND	5	100,000
Chloroform (μg/L)	N/A	1.23	N/A	N/A
Other VOCs (μg/L)				
Acetone	0 – 14.1	6.35 – 7.66	N/A	N/A
Methylene chloride	0 - 5.15	N/A	5	100
Trace Metals (mg/L) / (MCL, MAC)				
Aluminum	0.00846 - 3	0.0112 - 0.174	N/A	5
Antimony	0.00012 - 0.00111	0.000505	0.006	N/A
Arsenic	0.00037 - 0.0705	0.00152 - 0.00445	0.01	0.1
Barium	0.0228 - 0.26	0.0118 - 0.156	2	1
Beryllium	0.00001 - 0.00495	0.000175 - 0.00614	0.004	N/A
Cadmium	0.000044 - 0.00221	0.000087 - 0.000927	0.005	0.01
Calcium	26 - 460	41 - 294	N/A	N/A
Chromium	0.000592 - 1.95	0.000647 - 0.00293	0.1	0.05
Cobalt	0.00004 - 0.00968	0.000084 - 0.0097	N/A	0.05
Copper	0.00066 - 0.056	0.000946 - 0.00864	1.3	N/A
Iron	0.0152 - 21.7	0.116 - 0.706	N/A	1
Lead	0.00005 - 0.00493	0.000064 - 0.00202	0.05	0.05
Magnesium	5.6 - 98.1	3.59 - 55.1	N/A	N/A
Manganese	0.00101 - 3.1	0.00343 - 1.31	0.2	0.2
Mercury	0.00006	0.000047 - 0.00186	0.002	0.002
Nickel	0.000533 - 0.908	0.000929 - 0.031	N/A	0.2
Potassium	1.4 - 56.4	1.67 - 28.9	N/A	N/A
Selenium	0.0008 - 0.042	0.000696 - 0.00262	0.05	0.05
Silver	0.00004 - 0.00255	0.000042	N/A	0.05
Sodium	2.3 - 536	5.25 - 453	N/A	N/A
Thallium	0.00002 - 0.0102	0.00002 - 0.00143	0.002	N/A
Uranium	0.00326 - 0.00956	0.000396 - 0.0174	0.03	N/A
Vanadium	0.00196 - 0.011	0.00592 - 0.00737	N/A	N/A
Zinc	0.00158 - 0.25	0.00248 - 0.0566	10	10
Other Contaminants				
Nitrate as N (mg/L)	0.08 - 49.3	N/A	10	N/A
Nitrate plus Nitrite	0.03 - 22.5	0.2 - 6.85	10	N/A

NOTES: Remediation wells are those wells associated with Environmental Restoration (ER). Environmental Surveillance wells are those wells associated with the Groundwater Protection Program (GWPP).

pCi/L = picocurie per liter

μg/L = micorgram per liter ND = not detected

mg/L = milligram per liter MCL = maximum contaminant level

N/A = not applicable MAC = maximum allowable concentration

TABLE 7-2. Guidelines Used for Groundwater Quality Sample Comparisons

Regulation/Requirements	Standards and Guides	Regulating Agency
National Primary Drinking Water Regulations (this is an enforceable health standard) (40 CFR 141)	Maximum contaminant level (MCL)	U.S. Environmental Protection Agency (EPA)
New Mexico Water Quality Control Commission (NMWQCC) [(1)] Standards for Groundwater (20 NMAC 6.2)	Maximum allowable concentration (MAC)	NMWQCC
DOE Drinking Water Guidelines for Radioisotopes [(2)] (DOE Order 5400.5)	Derived concentration guide (DCG)	Department of Energy (DOE 1993)

NOTE: [(1)] MACs for Human Health and Domestic Water Supply Standards are identified in the analytical results tables in the appendices. Domestic water supply standards are based on aesthetic considerations, not on direct human health risks.

[(2)] DOE drinking water guidelines set allowable radionuclide levels in drinking water. The levels are calculated based on published DCGs and correspond to a 4 millirem-per-year (mrem/yr) dose from chronic exposures. This is equivalent to 4 percent of the DCG for ingestion, which is based on an exposure of 100 mrem/yr. These may be different than EPA's standards, where established.

TABLE 7-3. Sample Frequency for Groundwater Quality Monitoring at SNL/NM During FY02

Sampling period	GWPP	CWL	MWL	TA-V	TAG	Canyons Area	DSS
Oct 01			√	√			
Nov 01					√	√	
Dec 01							
Jan 02			√				
Feb 02		√		√			
Mar 02					√	√	
Apr 02			√				
May 02				√			
Jun 02	√					√	
Jul 02				√			
Aug 02		√	√				√
Sep 02						√	

groundwater standards of the NMWQCC are based on dissolved concentration. The metals analyses conducted can be found in Table 7-7.

The metals list was compiled from the EPA's primary drinking water standards and NMWQCC standards. This was the first year uranium concentration was determined as a metal analyte in addition to the various radioactive isotopes.

The water sample collected from Coyote Springs exceeded the MCL for beryllium. The exceedance is thought to be naturally occurring, but further investigation is needed. The sample from the spring also exceeded the NMWQCC domestic water supplies MAC for manganese, which is primarily of aesthetic significance. The spring is located on KAFB property and is not located near any known source of contamination.

All other metals analyses were below drinking water standards, where established.

Radionuclide Activity

Radioisotopic analyses were conducted on all samples. Specific analyses included:

- Gamma spectroscopy
- Gross alpha & beta
- Radium-226 and -228
- Uranium-233/234
- Uranium-235 and -238

Gamma spectroscopy analyses indicated the presence of radium-226, uranium-238, and thorium-234 in some of the groundwater samples. However, gamma spectroscopy is not the analytical tool of choice for what are primarily alpha particle emitting radionuclides. More reliable results for these isotopes were obtained from isotopic specific activities.

Uncorrected gross alpha results for samples from SFR-2S and TRE-1 exceeded the MCL of 15 pCi/L. When the results are corrected by subtracting the uranium activity, the results for SFR-2 and TRE-1 are below the MCL.

All groundwater samples were analyzed for uranium-234, -235/236, and -238. The activities for uranium-234 in samples from TRE-1 exceeded the DOE drinking water guideline of 20 pCi/L. Wells with elevated uranium are located east of the Tijeras fault complex (Figure 7-3). In this region, groundwater contacts bedrock material that contains minerals that are naturally high in uranium. The activity for uranium-234 detected in the sample from TRE-1 is consistent with elevated uranium activities for this well in prior years' groundwater analyses. Although the analysis for isotopic uranium-234 exceeds the DOE drinking water guideline, the total uranium concentration, as noted above, is below the newly promulgated EPA MCL for total uranium of 30 µg/L (40 CFR 141).

7.2.2 ER Project Water Quality Results

CWL

Semi-annual groundwater monitoring for VOCs, semi volatile organic compounds (SVOCs), PCBs, herbicides, cyanide, total sulfide, dissolved chromium, and total metals (40 CFR 264, Appendix IX) was performed in February and March 2002. Semi-annual groundwater sampling for VOCs and total metals was performed in August 2002. Samples were collected from 11 monitor wells located at the CWL. Groundwater monitoring at the CWL is a compliance driven activity with specific requirements mandated in Appendix G (Rev.4) of the *Chemical Waste Landfill Final Closure Plan and Post Closure Permit Application* (SNL 1993).

VOCS

VOCs were not detected at concentrations above MCLs or above the laboratory practical quantitation limit (PQL). VOCs that were detected above the method detection limit (MDL), but below the laboratory PQLs were TCE, 2-Hexanone, Methyl-2-Pentanone, and acetone.

Metals

The metals analyses conducted can be found in Table 7-7.

No Appendix IX metals were detected in the samples above established MCLs, except chromium. In February and March 2002, chromium was detected above the MCL of 0.1 mg/L in CWL-BW2, CWL-BW3, CWL-MW2A, and CWL-MW4 at concentrations of 1.95 mg/L, 0.188 mg/L, 0.328 mg/L, and 0.177 mg/L, respectively. In August 2002, chromium was not detected above the MCL in any groundwater samples.

SVOCs

No SVOCs were detected in any groundwater samples, except bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate was detected in CWL-MW5U at a concentration of 0.470 µg/L. No MCL is established for this compound.

PCBs

No PCBs were detected above associated laboratory MDL in any CWL groundwater samples.

Cyanide

Cyanide was detected below the MCL of 0.2 mg/L in CWL-MW5 at a concentration of 0.00678 mg/L.

Sulfide Analyses

Sulfide was not detected above associated laboratory MDL in any CWL groundwater samples.

Dissolved Chromium

During February and March 2002, filtered samples were collected and submitted for dissolved chromium analysis. Dissolved chromium concentrations ranged from 0.00133 mg/L to 0.617 mg/L.

Tritium

During February 2002, a tritium sample was collected from CWL-MW2A only. Tritium was not detected above the associated laboratory minimum detectable activity (MDA) in the sample.

MWL

Annual groundwater sampling of MWL-BW1, MWL-MW1,2,3 & 4 was conducted in April 2002. Quarterly sampling of MWL-MW5 and MWL-MW6 was conducted in October 2001, January 2002, April 2002, and July 2002. Verification samples were also collected in November 2001 and January 2002 from MWL-MW4.

Analytes Sampled

MWL groundwater samples were analyzed for VOCs, SVOCs, Target Analyte List (TAL) metals and total uranium, NPN, major ions, and radionuclides.

VOCs

No VOCs exceeded MCLs in any MWL wells. Toluene was detected in MWL-MW4 at concentrations of 130 and 121 µg/L in November 2001. Subsequent samples collected from MWL-MW4 in January 2002 and in April 2002 showed no toluene. No other VOCS were qualified as detected in any MWL wells during 2002.

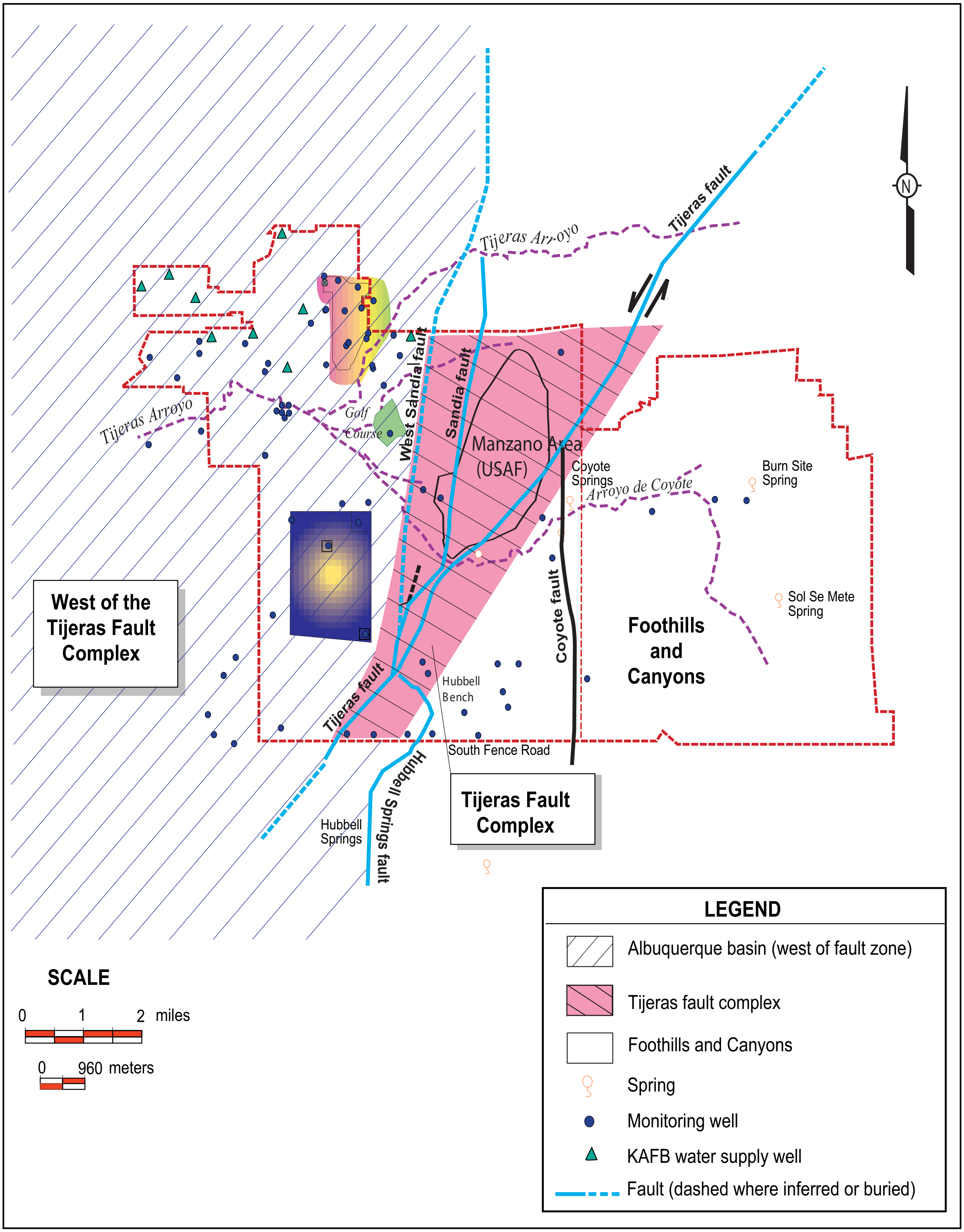


FIGURE 7-3. Hydrogeologically Distinct Areas at KAFB

NPN (as nitrogen)
NPN (reported as nitrogen) was detected in all monitoring wells at levels below the MCL of 10 mg/L.

Metals
Chromium exceeded the EPA MCL in MWL-MW2. No MCLs were exceeded for any other metals in MWL groundwater. Total nickel and/or chromium exceeded NMED-established background concentrations in MWL-MW1, MWL-MW2, and MWL-MW3. These elevated nickel and chromium concentrations are attributed to corrosion of the stainless screens installed in the wells. Barium was detected at concentrations slightly greater than the NMED-established background concentrations in MWL-MW5 and MWL-MW6. Total uranium was detected at concentrations slightly greater than the NMED-established background concentrations in all wells except MWL-MW1. Uranium concentrations did not exceed the newly established MCL of 30 µg/L. The complete list of metal analytes reported for the MWL are in Table 7-7.

Radionuclide Activity
The radiochemical analyses of MWL groundwater samples included:

- Gross alpha & beta
- Gamma spectroscopy
- Tritium
- Strontium-90
- Uranium isotopes

Analytical results were compared with DOE drinking water guidelines and EPA MCLs (DOE 1993), where established. No radionuclides were detected above standards. Gamma spectroscopy analyses did not detect any isotopes above associated MDAs. Tritium was detected at an activity slightly above the associated MDA in one sample collected from MWL-MW6, but was not detected above the MDA in the duplicate sample from the well. Tritium was not detected above MDAs in any other samples. Strontium-90 was detected at very low activities in the April 2002 sample and duplicate sample from MWL-MW6. These detections of tritium and strontium-90 are attributed to false positives. Isotopic uranium ratios of uranium-235 to uranium-238 indicate that uranium in groundwater beneath the MWL is of natural origin.

TA-V
Quarterly groundwater sampling at TA-V was performed in October/November 2001 and February, May/June, and July/August 2002. Samples were collected from 13 wells. The four new wells that were installed in 2001 (TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9) and LWDS-MW1 were sampled each quarter for VOCs, and nitrate (as nitrogen). Additional wells were sampled in the first and second quarters, but these wells were dropped from the sampling events in the third and fourth quarters. The four new wells were also sampled each quarter for SVOCs, metals and radionuclides. Samples were also collected for field alkalinity, laboratory alkalinity (as $CaCO_3$), anions, and cations.

VOCs and SVOCs
VOCs were detected in samples from TA-V wells at concentrations exceeding MCLs in monitoring wells LWDS-MW1, TAV-MW1, and TAV-MW8. Table 7-4 lists wells that exceeded the TCE and tetrachloroethylene (PCE) MCL of 5 µg/L in FY02.

TABLE 7-4. Wells That Exceeded MCL of 5µg/L in FY02

TCE

Well	Concentration (µg/L)	Period
LWDS- MW1	15	Oct/Nov 2001
LWDS- MW1	17	Feb 2002
LWDS- MW1	16.2/17.5(dup)	May/Jun 2002
LWDS- MW1	17.2 J/ 18.1 J (dup)	Jul/Aug 2002
TAV-MW-1	ND/5.7 J (dup)	Feb 2002
TAV-MW8	ND/6.09	Feb 2002
TAV-MW8	5.56	Jul/Aug 2002

PCE

Well	Concentration (µg/L)	Period
TAV-MW7	5.2	Oct/Nov 2001
TAV-MW7	7.5	Feb 2002
TAV-MW7	5.15	Jul/Aug 2002

NOTE: dup = duplicate sample
J= estimated value (validation qualifier)
µg/L = microgram per liter

NPN
Nitrate concentrations exceeded the MCL of 10 mg/L in LWDS-MW1 for the second, third, and fourth quarters of FY02.

Metals
Dissolved metal analyses were conducted for the four new wells in all four quarters of FY02. The metals analyses conducted can be found in Table 7-7. No metals were detected above established MCLs in any TA-V well.

Radionuclide Activity
Gamma spectroscopy and radioisotopic analyses were conducted on the four new wells in FY02. All radionuclide activities were below MCLs and DOE drinking water guidelines, where established.

TAG

The TAG Investigation performed quarterly groundwater sampling during November/ December 2001 and March/April 2002.

TAG wells are either screened in the regional aquifer or within a SGWS above the regional aquifer. Contaminants of concern include TCE, PCE, and nitrate, all of which have been detected at concentrations exceeding the EPA's established MCLs for drinking water. Samples were collected from 26 wells. The 14 SGWS wells and 12 regional aquifer wells sampled in FY02 included:

SGWS Wells

TA1-W-03	TA1-W-06	TA1-W-07
TA2-SW1-320	TA2-W-01	TA2-W-19
TA2-W-27	TJA-2	TJA-5
WYO-4	TA1-W-08	TA2-NW1-325
TA2-W-26	TJA-7	

Regional Aquifer Wells

PGS-2	TA2-W-25	TA1-W-01
TA1-W-02	TJA-4	TA1-W-04
TA1-W-05	TA2-NW1-595	TA2-W-24
TJA-3	TJA-6	WYO-3

Field water quality measurements were taken at each well before samples were collected. Collected samples were analyzed for VOCs, metals, inorganic chemical analyses (alkalinity, and anions, including nitrate), and gamma spectroscopy.

VOCs
TCE was detected in groundwater samples of several wells in the SGWS. The TCEs detected were in the perched groundwater and did not occur in the regional aquifer. Two monitoring wells, TA2-W-26 (SGWS) and WYO-4 (SGWS), had TCE concentrations above the MCL of 5.0 µg/L in at least one sampling event. The maximum TCE concentration was 7.5 µg/L in TA2-W-26 (March/ April 2002). PCE concentrations above the MCL of 5.0 µg/L were detected in groundwater samples from TA2-W-26 with a maximum PCE concentration of 8.1 µg/L (March/April 2002).

Non-metallic Inorganic Chemical Analyses
Inorganic chemical analysis of quarterly groundwater samples consisted of alkalinity and major anions such as bromide, chloride, fluoride, nitrate, and sulfate.

Historically, nitrate has consistently been detected above the MCL of 10 mg/L in wells TA2-SW1-320 and TJA-4. During FY02 quarterly sampling, nitrate exceeded the MCL in two other wells: TA1-W-08 and TJA-7. Of these two wells, only TJA-7 has nitrate concentrations that approach or exceed the concentrations seen in TA2-SW1-320 and TJA-4, as shown in Table 7-5.

TABLE 7-5. TAG Nitrate Concentrations Exceeding MCL of 10 mg/L in FY02

Well	Nov/Dec 2001 (µg/L)	Mar/Apr 2002 (µg/L)
TA2-SW1-320 (SGWS)	29	26
TJA-4 (Regional)	49	28
TA1-W-08 (SGWS)	11	7.8
TJA-7 (SGWS)	27	30

NOTE: SGWS = shallow groundwater system

All other inorganic analytes were below MCLs, where established.

Metals
The metals analyses conducted can be found in Table 7-7. No metals were detected at concentrations above the respective MCL.

Radionuclide Activity
No radionuclides were above established NMED approved background levels, MCLs, or DOE drinking water guidelines. Samples were analyzed for:

- Gross alpha & beta
- Tritium
- Uranium-234, -235, and –238
- Gamma spectroscopy

Canyons Area

The LCBS is the only ER site in the Canyons investigational area with groundwater issues. Quarterly sampling at three Canyon monitoring wells, CYN-MW1D, CYN-MW3, and CYN-MW4 were conducted in November 2001 and March, June, and September 2002. Groundwater samples were analyzed for organics, non-metallic inorganics, phenolics, metals, and radionuclides.

Organic Analysis

The contaminants of concern at the LCBS are petroleum products associated with fuels used in burn tests. Sampled parameters included:

- VOCs
- SVOCs
- Total extractable petroleum hydrocarbons (TPH) (diesel)
- TPH (gasoline)
- HE

Trace levels of VOCs and SVOCs were present in samples collected from CYN-MW1D. The VOCs and SVOCs detected in this well were all hydrocarbons or common lab contaminants. The VOCs (toluene and naphthalene) most likely originated from jet fuel used at the Burn Site Facility. For samples collected from CYN-MW1D, toluene was detected at less than 1 µg/L, as compared to the MCL of 1,000 µg/L; naphthalene was detected at less than 1 µg/L, as compared to the MCL of 5 µg/L. Only low levels of SVOCs (acenaphthene, flouranthene, and phthalates) were detected in the downgradient well (CYN-MW3). For samples collected from CYN-MW4, pentachlorophenol was detected at 4.07 µg/L, exceeding the MCL of 1.0 µg/L. All reported VOC and SVOC values were qualified with a "J" by the data validators. The "J" indicates an estimated value because laboratory control parameters were not within specified values.

Other organics found in groundwater samples included low levels of diesel range organics with up to 406 µg/L in duplicate samples from CYN-MW1D. Some of the diesel range organics were given a "J" in the data validation process. All analysis of samples from monitor wells for gasoline range organics resulted in non-detects. MCLs have not been established for diesel or gasoline range organics.

HE analyses of samples from CYN-MW1D revealed lowing levels of tetryl, o-nitrotoluene, m-nitrotoluene and 2-amino-4, 6-dinitrotoluene (some of these values were rejected in the data validation process). No MCLs have been established for these analytes.

Non-metallic Inorganics Chemical Analyses

The wells were sampled quarterly and analyzed for major ions, NPN (reported as nitrogen), and alkalinity. Nitrate results exceeded the MCL of 10 mg/L in samples from CYN-MW1D and CYN-MW3 in all sampling quarters. Only low levels of nitrate (0.03 mg/L to 0.100 mg/L) were detected in the CYN-MW4 well, which is upgradient of the Burn Site Facility (Table 7-6). All other major ions results were below established MCLs.

TABLE 7-6. Canyons Nitrate Concentrations (MCL = 10 mg/L)

Well	Nov 2001	Mar 2002	Jun 2002	Sep 2002
CYN-MW1D	20.7	22	21.3	22.5
CYN-MW3	14.3	13	13.5	12.0
CYN-MW4	0.1	ND	0.04	0.03

NOTE: mg/L = milligrams per liter

Metals

Groundwater samples from all wells were analyzed for 23 common metal analytes. The metals analyses conducted can be found in Table 7-7.

The samples were unfiltered and the results were reported as total metals concentration. No metals were detected above established MCLs.

Radionuclide Activity

Groundwater samples were analyzed for gross alpha, gross beta, gamma-emitting radionuclides, and tritium. All radionuclide activities were below MCLs and DOE drinking water guidelines, where established.

DSS

Quarterly groundwater sampling of the four new DSS wells CYN-MW5, CTF-MW1, CTF-MW2, and CTF-MW3 started in July 2002. A total of eight quarters of sampling is planned for these wells.

Analytes

DSS groundwater samples from each well were analyzed for all or part of the following list of constituents: VOCs, SVOCs, HE compounds, total RCRA metals, hexavalent chromium, total cyanide, NPN (reported as nitrogen), and major anions/cations.

VOC and SVOC Analyses

Trace concentrations of acetone were detected in samples from all four wells, and methylene chloride was detected at 4.97 J µg/L compared to the MCL of 5 µg/L. Acetone and methylene chloride are commonly encountered laboratory contaminants. A sample from well CYN-MW5 was analyzed for SVOC compounds and none were detected in that well.

HE Compounds

HE compound samples were collected from all four DSS wells. The sample from well CTF-MW3 contained a trace concentration (0.085 µg/L J) of 2-Amino-4,6-dinitrotoluene. No HE compounds

TABLE 7-7. Common Metal Analyses Conducted Among GWPP and ER Project Location Wells

	GWPP	CWL	MWL	TAV	TAG	Canyons	DSS
Aluminum	√		√	√	√	√	
Arsenic	√	√	√	√	√	√	√
Antimony	√	√	√	√	√	√	
Beryllium	√	√	√	√	√	√	
Barium	√	√	√	√	√	√	√
Cadmium	√	√	√	√	√	√	√
Calcium	√		√	√	√	√	√
Chromium	√	√	√	√	√	√	√
Cobalt	√	√	√	√	√	√	
Copper	√	√	√	√	√	√	
Iron	√	√	√	√	√	√	
Lead	√	√	√	√	√	√	√
Magnesium	√		√	√	√	√	√
Manganese	√		√	√	√	√	
Mercury	√	√	√	√	√	√	√
Nickel	√	√	√	√	√	√	
Potassium	√		√	√	√	√	√
Selenium	√	√	√	√	√	√	√
Silver	√	√	√	√	√	√	√
Sodium	√		√	√	√	√	√
Thallium	√	√	√	√	√	√	
Tin		√					
Uranium	√		√	√		√	
Vanadium	√	√	√	√	√	√	
Zinc	√	√	√	√	√	√	

NOTE: The metals list was compiled from 40 CFR 264 Appendix IX metals, plus iron

were detected in samples from the other three wells.

Inorganic Chemical Analytes

NPN (reported as nitrogen) samples were collected from the four DSS wells. NPN was detected in all four wells at levels below the MCL of 10 mg/L. NPN concentrations ranged from 0.03 to 7.9 µg/L in these wells. Cyanide was not detected in any of the three wells. Samples for alkalinity and major anions (bromide, chloride, fluoride, and sulfate) and cations (calcium, magnesium, potassium, and sodium) were also collected from all four DSS wells.

Total RCRA Metals and Hexavalent Chromium

Samples for the analysis for eight RCRA metals were collected from the four DSS wells, and a single hexavalent chromium sample from well CYN-MW5. Arsenic was detected in well CTF-MW2 at concentrations of 0.0705 and 0.0643 (reanalysis) mg/L, both of which exceed the arsenic MCL of 0.010 mg/L. The arsenic is presumed to be of natural origins and is associated with deep groundwater upwelling along the faults. Concentrations of the other seven RCRA metals and hexavalent chromium did not exceed established MCLs in any of the other three wells. Concentrations of arsenic in CTF-MW2, barium in CYN-MW5, selenium in CTF-MW1, and CTF-MW3, and hexavalent chromium in CYN-MW5 exceeded NMED-approved background concentrations for SNL/NM groundwater. A complete list of metal analytes for DSS can be found in Table 7-7.

Gross Alpha/Beta Activities

A single sample for gross alpha/beta activity analysis was collected from CYN-MW5. Gross alpha activity was not detected, and gross beta activity did not exceed DOE drinking water guidelines, where established (DOE 1993).

7.3 WATER LEVELS

Water levels are a means to assess the physical changes of the groundwater system over time. This includes changes in the local water table, the quantity of water available, as well as the direction and speed of groundwater movement. The GWPP gathers groundwater level measurements from a large network of wells on and around KAFB. In addition to wells owned by SNL/NM, data is solicited for the U.S. Air Force (USAF) IRP, the City of Albuquerque, and the USGS wells. In FY 2002, data from 162 wells were incorporated into the monitor well water level database. Water levels were measured monthly or quarterly by each agency.

7.3.1 Regional Hydrology

Groundwater Conceptual Model

A brief overview of the regional hydrology is given in Chapter 1, section 1.5 of this report. Although water levels may fluctuate over the course of the year in response to seasonal recharge and groundwater withdrawal, the overall level of the regional aquifer within the basin continues to decline at about 1 to 2 ft/yr. Most of the City of Albuquerque and KAFB water supply wells are completed in the coarser-grained layers of the upper and middle units of the Santa Fe Group. The regional aquifer is located within these units of the Santa Fe Group.

Water level information, with respect to the regional water table in the KAFB area, can be categorized into three general areas. These areas are delineated by bounding faults, as shown in Figure 7-3. Groundwater levels east of the Tijeras fault complex are approximately 100 to 150 ft below the surface. The water table west of the Tijeras fault complex and the Sandia fault are approximately 500 ft or more below the surface. The aquifer system on the eastside of the Tijeras fault complex is not well understood due to the complex geology and the limited number of wells available to characterize the system.

Regional Water Table

The Regional Water Elevation Contour map for SNL/KAFB, FY02 is presented in Figure 7-4. The extent of the contoured map area was constructed using August, September, and October 2002 static water level data from 53 wells. Generally, these wells are screened across the regional water table in the upper unit of the Santa Fe Group. They penetrate different depths into the aquifer, and have various lengths of screened intervals. Although most of the water level data represent an unconfined water table, some water levels may represent semi-confined aquifer conditions.

The contour lines shown on Figure 7-4 represent lines of equal elevation of the groundwater table. Groundwater flow is perpendicular to these lines in the direction of decreasing elevation. The apparent direction of groundwater flow within the region (west of the Tijeras fault complex) is west and northwest. This contrasts with the southwesterly direction reported in 1961 (Bjorklund and Maxwell 1961). This change in flow direction results from groundwater pumping by KAFB production wells at the northern part of the KAFB and nearby City of Albuquerque production wells. The groundwater withdrawal has created a depression in the water table. This semi-ellipsoidal depression with the major axis running north-to-south, extends south to the Isleta Pueblo, and is a result of preferential flow through highly conductive ancestral Rio Grande fluvial deposits, which are the primary aquifer material in this area.

SGWS

A SGWS exists in the northern part of KAFB in the vicinity of SNL/NM TA I, II, and III and extending southward to the location of the former KAFB sewage lagoons. The eastward extent of the SGWS is under the KAFB Landfill and to the southeast the KAFB Golf Course. The elevation data to the first water reached in the SGWS are illustrated in Figure 7-5. The contours indicate a gradient to the east-southeast. The western-most elevation contour is at 5150 feet above sea level (fasl). This elevation corresponds to a depth to water from the surface of approximately 280 ft, where the regional water table is a 530 ft below the ground surface. Along the eastern boundary of the SGWS the elevation of first water is at 5008 fasl. Because of the eastern dip of the SGWS and the western dip of the regional system, the two systems appear to merge.

Groundwater Recharge and Loss

The dynamics of water table fluctuations, as reflected by water levels in individual wells, are a balance between groundwater inflow to the basin, recharge, water withdrawal, and basin outflow. Recharge to the groundwater in the Middle Rio Grande basin occurs primarily through mountain front recharge and infiltration from active arroyos, washes, and rivers within the basin.

Recharge potential to the groundwater system is directly related to the amount of precipitation. The regional climate for the Albuquerque basin area is semi-arid. A detailed description of the regional climate and precipitation is included in Chapter 5.

KAFB water production wells supply most of the water used by SNL/NM and KAFB. KAFB production wells extract groundwater from the upper and middle units of the Santa Fe Group at a depth of up to 2,000 ft. These units constitute the primary aquifer for the Albuquerque Metropolitan Area. In FY02, KAFB pumped approximately 1.26 billion gallons (3,876 acre-ft) of groundwater from ten water supply wells. In comparison, 1.24 billion gallons (3,815 acre-ft) of water were pumped for the same period of time in FY01.

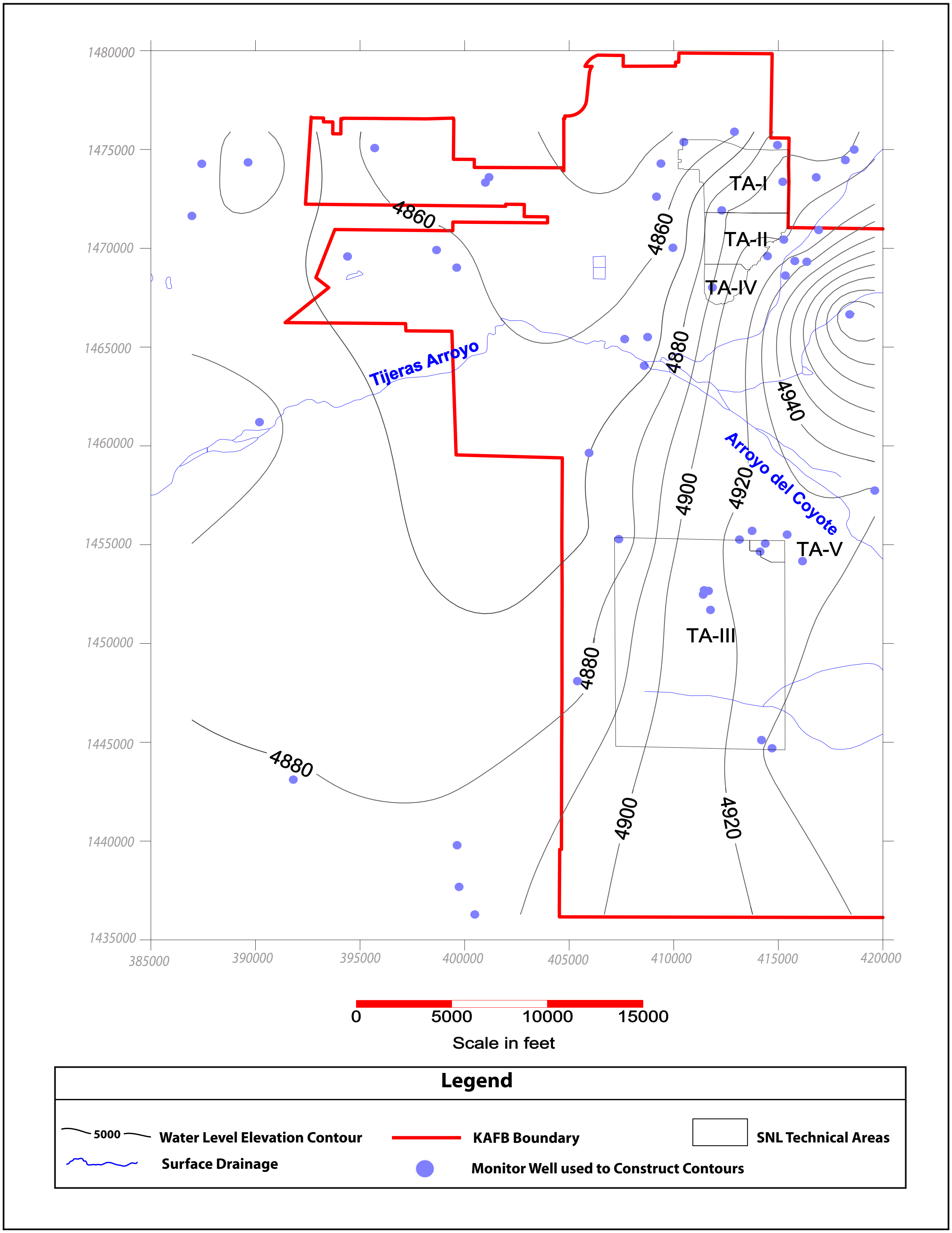


FIGURE 7-4. Regional Groundwater Elevation Map for SNL/KAFB, FY02

7.3.2 Groundwater Level Trends

In 1993, the USGS conducted a study on the Santa Fe Group and the Albuquerque area and found that the quantity of water in the aquifer was significantly less than previously estimated (Thorn et al. 1993). The imbalance between recharge and groundwater withdrawal has resulted in a general decline in water levels. Figure 7-6 shows the contour map of the annual water table elevation changes recorded for the western area of KAFB. Annual water level differences in 56 wells were used to construct the map.

As illustrated in Figure 7-6, water levels in the Regional Aquifer continue to decline. However, the amount of decline over the FY01 to FY02 period has decreased to approximately 1.2 ft/yr, where for the period of FY00 to FY01, the maximum decline was calculated at 1.4 ft/yr. The decrease in drawdown appears to be a direct consequence of decreasing amount of water being pumped from the aquifer. The largest declines continue to be in the vicinity of McCormick Ranch, which is located along the southeastern border of KAFB with the Isleta Pueblo Reservation. In the eastern portion of the mapped area, including TA-III, water levels show moderate declines. In contrast to the trend of water level declines throughout most of the region, the water levels in the northeast portion of the mapped area are actually rising. This area coincides with a potential recharge area associated with Tijeras Arroyo. Its not clear why water levels continue to rise in this area, since the amount of annual precipitation is actually declining. The lag time for recharge to reach the water has not been established.

The water level trends for the SGWS systems indicate a decrease in water level elevations in the western portion of KAFB (Figure 7-7). The water level elevations in the central part of the system seem to be relatively stable. The water levels in the eastern part appear to be increasing, which is consistent with the apparent rise in water level in the regional system in the northeast portion of KAFB.

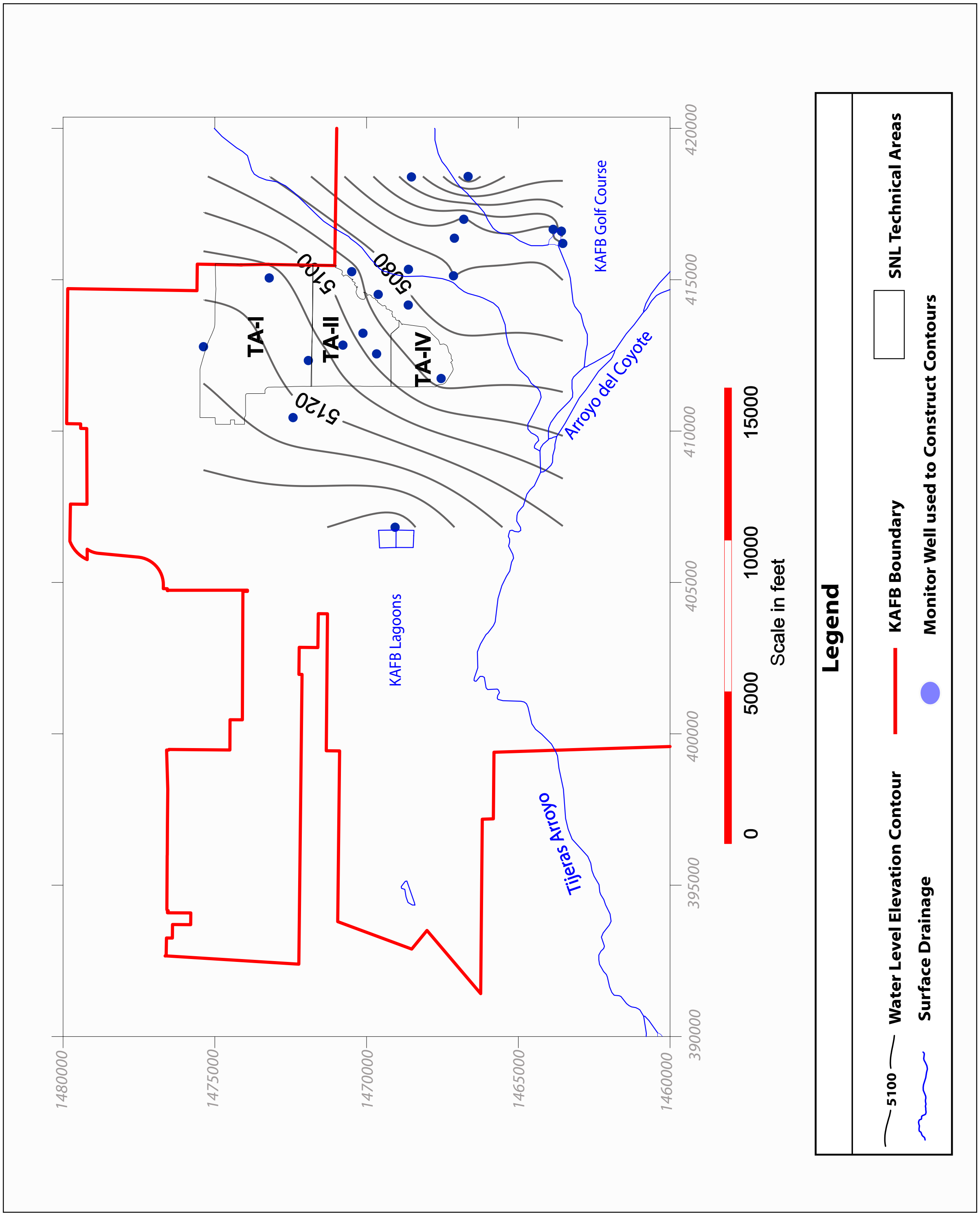


FIGURE 7-5. Perched Groundwater System First Water Elevation

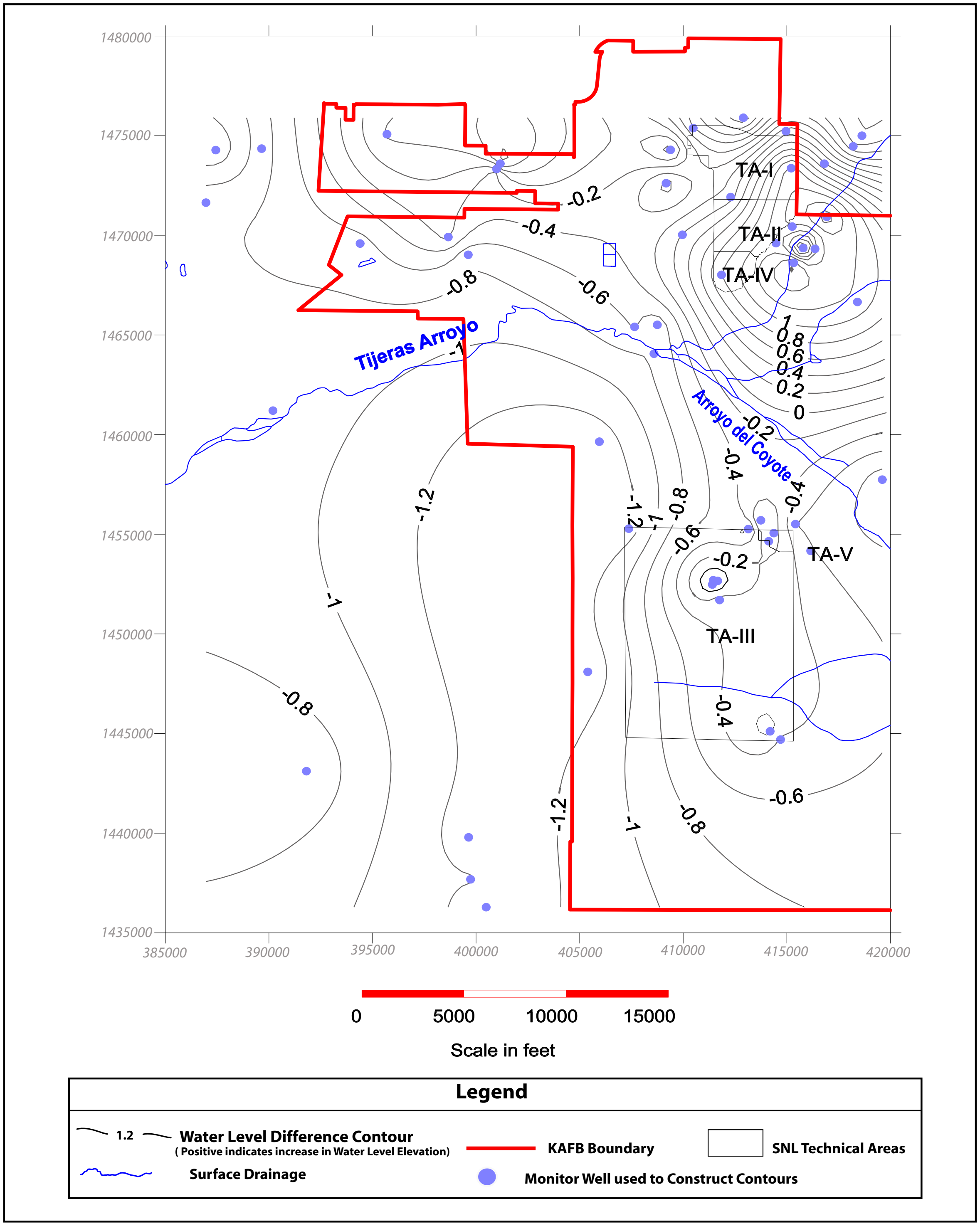


FIGURE 7-6. Annual Regional Groundwater Elevation Difference For SNL/KAFB

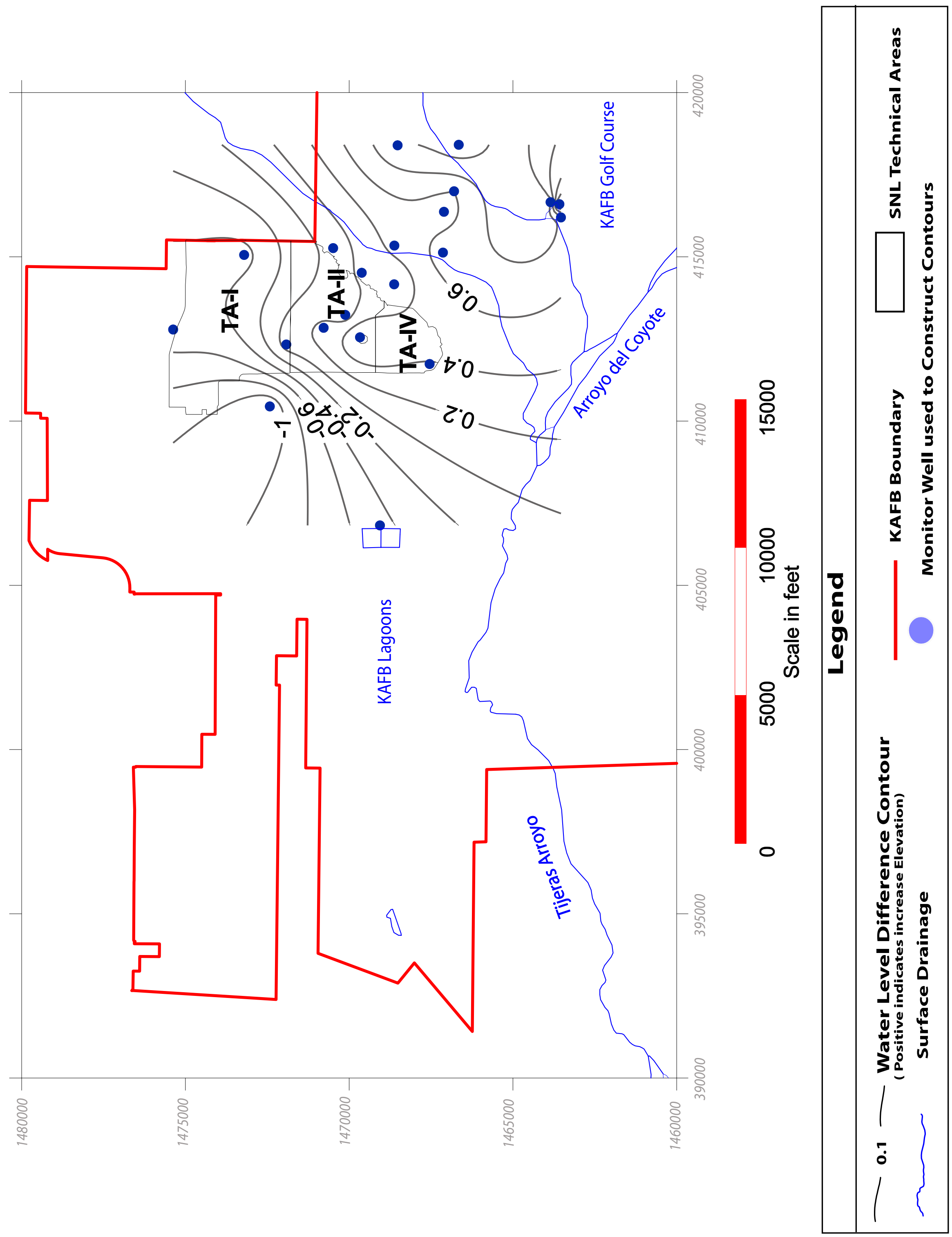


FIGURE 7-7. Perched Groundwater System Elevation Changes, FY01 - FY02

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Chapter 8

Quality Assurance

In this Chapter ...

Corporate Level QA 8-2
Environmental Program QA 8-2
Environmental Sampling and Analysis 8-3
2002 SMO Activities 8-3

Chapter Summary

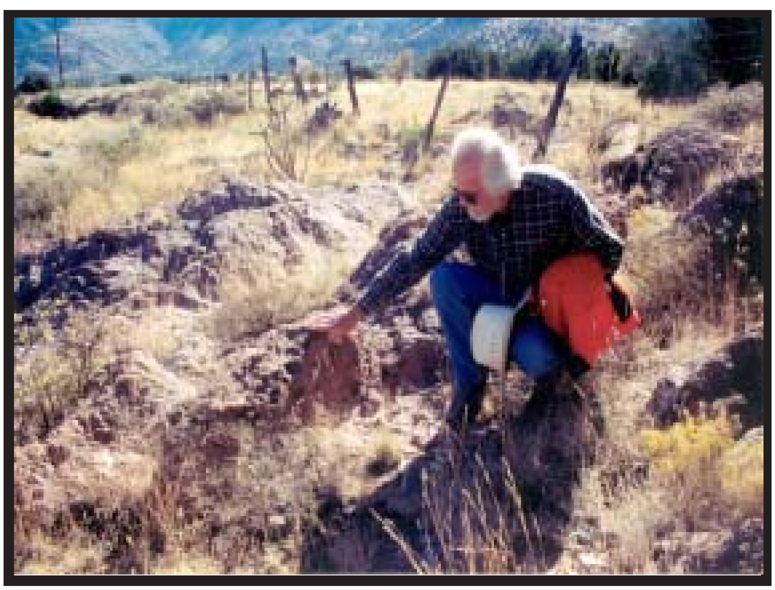
Quality Assurance (QA) principals, elements, and tools are an integral part of Sandia National Laboratories, New Mexico (SNL/NM) activities to assure management, customers, regulators, and the community that SNL/NM is conducting business in a compliant manner, with respect for our employees, the community, and the environment. One of the QA principles used by SNL/NM is the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) Integrated Safety Management System (ISMS) to ensure that work is planned, hazards are analyzed and controlled, work is performed according to approved plans, and lessons learned are communicated. ISMS is a process that continually improves operations and performance.

Environmental programs utilize QA principles to maintain the integrity of program plans, sampling, and analysis. The Sample Management Office (SMO) helps provide environmental programs with guidance and sample management support.

Environmental Snapshot

- *The SMO processed 6,793 samples in 2002. Of those, 1,971 samples were for environmental monitoring and surveillance projects.*
- *Quality Control (QC) samples totalled 759 in 2002. Of those, 260 were for environmental monitoring and surveillance projects.*

The SMO works to ensure that contractor laboratories provide the quality data and labaroratory analysis through validation of laboratory data packets and by conducting audits of contractor laboratories. QA plans ensure that data validation and records management are a key asset to providing quality environmental data.



SNL/NM employee striving to maintain quality assurance throughout the project.

8.1 CORPORATE LEVEL QA

The Integrated Laboratory Management System (ILMS) (SNL 2000) is the overarching management system for performing all work at Sandia Corporation. ILMS provides a uniform, corporate-wide baseline that provides a set of fundamental management principles and elements that represent essential corporate objectives and requirements.

Sandia Corporation Quality Policy
Quality principles are applied to work performed at SNL/NM as follows:

- Provide the greatest value to our customers by understanding and meeting their expectations with respect to cost, schedule, and performance,
- Focus on prevention rather than correction,
- Measure our progress using data, and
- Continually strive to improve our skills, processes, products, and services.

QA Criteria
DOE Order 414.1A, *Quality Assurance* (DOE 2001a) lists 10 Quality Criteria that, when effectively implemented, make up a quality program.

Management criteria:
- Program
- Personnel Training and Qualification
- Quality Improvement
- Documents and Records

Performance criteria:
- Work processes
- Design
- Procurement
- Inspection and Acceptance Testing

Assessment criteria:
- Management assessment
- Independent assessment

DOE ISMS
ISMS was developed by the DOE to systematically integrate safety into management and work practices at all levels. The main objective is to ensure that DOE/NNSA-related missions are accomplished while protecting the public, the worker, and the environment. A Sandia Corporation EMS is being designed as an enhancement to the environmental aspect of ISMS to ensure quality environmental programs are in place. Additional information on the DOE ISMS can be found at the following website:

http://tis.eh.doe.gov/ism/

8.2 ENVIRONMENTAL PROGRAM QA

Environmental Sampling
Environmental samples are collected by personnel in various programs and analyzed for radiological and non-radiological contaminants. Some sampling is specifically mandated by regulations to meet compliance while other sampling activities, which are not regulatory driven, are carried out in accordance with DOE Orders.

All samples are tracked, packaged, and shipped to off-site laboratories by the SMO as discussed in Section 8.3.

8.3 ENVIRONMENTAL SAMPLING AND ANALYSIS

Environmental Sampling
Environmental sampling is conducted in accordance with program-specific sampling and analysis plans (SAPs) or work plans, each of which contains applicable QA elements. These documents are prepared and implemented in accordance with the *Sample Management Office (SMO) Quality Assurance Plan (QAP)* (SNL 1996a), and meet appropriate federal, state, and local regulatory guidelines for conducting sampling and analysis activities.

SMO Roles and Responsibilities
The SMO provides guidance and sample management support for field activities. However, each distinct program is responsible for its overall adherence and compliance regarding any sampling and analysis activity performed.

The SMO is responsible for QA and QC once the samples are relinquished to the SMO by field team members.

Program-Specific SAPs
Each program involved in environmental monitoring and sampling develops and follows a relevant SAP. Most project SAPs include the following specific elements: (1) descriptions of sampling procedures (mechanics of the process) applicable to each activity–such as sample handling descriptions, preservation, labeling, and event documentation, (2) a list of EPA-approved sample collection equipment, appropriate sample containers, and equipment decontamination procedures, and (3) a field QC sample collection schedule, at defined frequencies, to estimate sample representativeness and potential contamination acquired during the sampling and handling process.

Selection of a Contract Laboratory
All off-site contract laboratories are selected based on an appraisal (pre-award audit) as described in the SMO QAP (SNL 1996a). All laboratories must employ EPA test procedures wherever possible; if not available, other suitable and validated test procedures are used. Laboratory instruments must be calibrated in accordance with established procedures, methods, and statements of work (SOW). All calibrations must be verified before instruments can be used for analysis. Once a laboratory has passed the initial appraisal and has been awarded a contract, an audit is performed annually thereafter by the SMO.

Contract laboratories are required to participate in applicable DOE and EPA programs for blind-audit check sampling to monitor the overall accuracy of analyses routinely performed on SNL/NM samples.

Project QC
The Project QC process monitors the quality of data generated by each contract laboratory. Various field QC sample methods are used during the sample collection process to assess the quality of the data. Errors that can be introduced into the sampling process include potential sample contamination in the field or the laboratory, some of which are unavoidable. Additionally, the variability present at each sample location can also affect sample results.

QC samples are submitted to contract laboratories in accordance with project-specific Data Quality Objectives (DQOs) and SAPs.

Laboratory QC
With each SNL/NM sample batch, laboratory QC samples are concurrently prepared at defined frequencies and analyzed in accordance with established methods. Analytical accuracy, precision, contamination, and matrix effects associated with each analytical measurement are determined.

QC sample results are compared to statistically established control criteria for acceptance. Analytical results generated concurrently with QC sample results within established limits are considered acceptable. If QC analytical results exceed control limits, the results are qualified and corrective action is initiated if warranted. Reanalysis is then performed for samples in the analytical batch as specified in the SOW and laboratory procedures.

QC sample data results are included in analytical reports prepared by contract laboratories for SNL/NM.

8.4 2002 SMO ACTIVITIES

In 2002, the SMO processed a total of 6,793 samples in support of Sandia Corporation projects, including environmental monitoring (air and water), waste characterization, D&D, and ER. Of these, 1,971 were for environmental monitoring and surveillance projects. A total of 759 samples were submitted as field and analytical QC samples to assist with data validation and decision-making.

Approximately 260 QC samples were for environmental monitoring and surveillance projects.

SMO contract laboratories perform work based on both the Sandia Corporation SOW (Puissant 2001) and the *DOE/AL Model Statement of Work* (DOE 2002).

Inter-Laboratory Comparisons

SMO contract laboratories are required to participate in the EPA's Environmental Monitoring Systems Laboratory (EMSL) inter-laboratory comparison programs. In 2002, all result expectations were met.

The DOE Assessment Programs include the Mixed Analyte Performance Evaluation Program (MAPEP), the inter-laboratory QAP, and an EPA-approved vendor program with a similar scope as the privatized EPA Water Pollution and Water Supply studies. SMO contract laboratories have a history of achieving a 90 percent or greater success rate during these comparisons. Acceptable results are based on either established control limits as stated in the applicable methods or statistically applied acceptance windows as determined by the MAPEP. Windows are typically two or three standard deviations around the true value.

Laboratory QA

In 2002, the SMO continued on-site data package assessments and validation at the EPA-approved laboratories used by Sandia Corporation. Data packages (including a wide array of analysis methods) are requested at the time of the on-site visit; the laboratories are not notified in advance and do not know which data packages will be assessed. The handling history of the data package is carefully reviewed from sample receipt to data completion by retracing each step through documentation files. Specific checks for documentation completeness, proper equipment calibration, and batch QC data are made. These assessments focus on data defensibility and regulatory compliance.

During 2002, Sandia Corporation employed the following contract laboratories to perform analysis of SNL/NM samples:

- ***General Engineering Laboratories (GEL)*** - Charleston, South Carolina;

> SMO Sample Processing
>
> *The SMO processed the following types of samples in 2002 in support of SNL/NM projects:*
>
> - *Radioactive waste*
> - *Mixed waste*
> - *Hazardous waste*
> - *Decontamination and Demolition (D&D)*
> - *D&D swipes*
> - *D&D materials*
> - *Underground Storage Tank (UST)*
> - *Sludges and liquids*
> - *Soil*
> - *Groundwater*
> - *Decon water*
> - *Solid waste*
> - *Air*
> - *Wastewater effluent*
> - *Surface water*
> - *Storm water*
> - *Soil gas*
> - *Air filters*

- ***Severn Trent*** - St. Louis, Missouri; Santa Ana, California; Richland, Washington; and Knoxville, TN;

- ***Southwest Laboratories*** - Broken Arrow, Oklahoma.

QA Audits

The SMO conducted audits in 2002 at all three of its contract laboratories using the centralized QA program criteria established by the DOE/NNSA, Sandia Site Office (SSO) Analytical Management Program (AMP). The SMO together with the AMP work closely with the contract laboratories to expeditiously resolve audit findings. Decisions regarding sample distribution to the contract laboratories are based on audit findings and unresolved corrective actions. In 2002, no priority one findings that impacted SMO work were documented during laboratory audits. All corrective actions were expeditiously resolved.

Data Validation and Records Management

Sample collection, Analysis Request and Chain of Custody (ARCOC) documentation, and measurement data were reviewed and validated for each sample collected. Analytical data reported by the laboratories were reviewed to assess laboratory and field precision, accuracy, completeness, representativeness, and comparability with respect to method compliance and the DQOs of the particular program. Data were reviewed and validated at a minimum of three levels:

- By the analytical laboratory, where the data were validated according to the laboratory's QA plan, standard operating procedures, and client specific requirements;

- By a qualified member of Sandia Corporation's SMO staff, who reviewed the analytical reports and corresponding sample collection and ARCOC documentation for completeness and laboratory contract compliance; and

- By the Sandia Corporation Project Leader responsible for program objectives, regulatory compliance, and project-specific data quality requirements. The Project Leader determines the decision of data usability.

In addition, a predetermined percentage of data are validated to the methods in accordance with the *SNL/ER Data Validation Procedure for Chemical and Radiochemical Data* (SNL 2000a).

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Chapter 9

References, Documents, Permits, Laws, Regulations, and Standards for Environmental Programs

In this Chapter ...

References *9-1*
Executive & DOE Orders *9-9*
Acts and Statutes & Important Environmental Program Documents *9-10*
Permits *9-13*
Regulations *9-18*

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- Clean Air Act (CAA) and CAA Amendments (CAAA) of 1990 (42 U.S.C. §7401)
- Clean Water Act (CWA) of 1977 (the Federal Water Pollution Control Act) (33 U.S.C. §1251)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. §9601) Amended by the Superfund Amendments and Reauthorization Act (SARA)
- Emergency Planning and Community Right to Know Act (EPCRA) of 1986 (42 U.S.C. §11001 et seq.) (Also known as SARA Title III.)
- Endangered Species Act (ESA) (16 U.S.C.§1531 et seq.)
- Federal Facility Compliance Act (FFCA) of 1992 (42 U.S.C. §6961)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. §136)
- Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. §703 et seq.)
- National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. §4321)
- National Historic Preservation Act of 1966 (16 U.S.C. §470)
- Pollution Prevention Act of 1990 (42 U.S.C. §13101 et seq.)
- Quiet Communities Act of 1978 (42 U.S.C. §4901 et seq.)
- Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S.C. §6901 et seq.)
- Safe Drinking Water Act (SDWA) (42 U.S.C §300f)
- Superfund Amendments and Reauthorization Act (SARA) of 1986 (see CERCLA)
- Toxic Substances Control Act (TSCA) of 1976 (15 U.S.C. §2601 et seq.)

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NOTE: U.S.C. = United States Code

IMPORTANT ENVIRONMENTAL PROGRAM DOCUMENTS

Air Quality

Meteorological Monitoring Program

- *Quality Assurance Project Plan (QAPjP) Meteorological and Ambient Air Monitoring Program* (SNL 1997e)

Ambient Air Surveillance Program

- *Quality Assurance Project Plan (QAPjP) Meteorological and Ambient Air Monitoring Program* (SNL 1997e)

NESHAP Program

- (1) *NESHAP Annual Report for CY02, SNL/NM* (SNL 2003b)
- (2) *Radiological Dose Calculations and Supplemental Dose Assessment Data for NESHAP Compliance, SNL/NM, 2002* (SNL 2003c)
- *Radiological NESHAP Quality Assurance Project Plan (QAPjP*) (SNL 1997c)

Air Quality Compliance Program

- Title V Operating Permit Application # 515 (2002 update; Volume 1for Sandia National Laboratories) (DOE 2002a)
- *Air Quality* (SNL 1999f)
- *Chemical Inventory Report, Calendar Year 2002* (SNL/Outrider Corporation 2003)
- *Corporate Ozone-Depleting Substances Management Program* (SNL 2003g)
- Section 17B, “Air Permits in Bernalillo County,” *ES&H Manual* (SNL 1997h)
- Section 17C, “Air Emissions Control Measures,” *ES&H Manual* (SNL 1999g)
- Section 17D, “Ozone Depleting Substances,” *ES&H Manual* (SNL 1999c)

Water Quality

All Water Quality Programs

- *Water Quality* (SNL 1997f)
- Section 10E, "Chemical Spills," *ES&H Manual* (SNL 2001g)
- *Sandia National Laboratories, New Mexico Emergency Plan, ES&H Manual Supplement* (SNL 2002d)

Wastewater Program

- Section 10H, "Discharges to the Sanitary Sewer System," *ES&H Manual* (SNL 1997)
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Surface Discharge Program

- *Discharge Plan Renewal Application, DP-530, SNL/NM* (SNL 2001d)
- Section 10T, "Surface and Storm Water Discharges," *ES&H Manual* (SNL 1997d)
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Storm Water Program

- *Storm Water Pollution Prevention Plan (SWP3)* (SNL 2001b)
- Section 10T, "Surface and Storm Water Discharges," *ES&H Manual* (SNL 1997d)
- *Storm Water and Non-Storm Water Discharge Sampling and Analysis Project Plan for SNL/NM* (SNL 1996c)

Groundwater Protection Program (GWPP)

- *Annual Groundwater Monitoring Report (Fiscal Year 2002) for Sandia National Laboratories/ New Mexico* (SNL 2003d)

NEPA Program

- *The National Environmental Policy Act (NEPA), Cultural Resources and Sensitive Species Programs (PG 470110, Issue D)* (SNL 2002c)
- *Sandia National Laboratories Final Site-Wide Environmental Impact Statement (SWEIS)* (DOE 1999)
- *Environmental Assessment (EA) Rapid Reactivation Project* (DOE 1999a)
- *Sandia National Laboratories/New Mexico Facilities and Safety Information Document (FSID)* (SNL 1999a)
- *Sandia National Laboratories/New Mexico Environmental Information Document (EID*) (SNL 1999b)
- Section 10B, "NEPA, Sensitive Species, and Historic Properties," *ES&H Manual* (SNL 2002e)
- *Quality Assurance Project Plan (QAPjP) for the Preparation of Environmental Assessments at Sandia National Laboratories, New Mexico* (SNL 2002g)
- *SWEIS Annual Review- FY 2001* (SNL 2002k)

Various Other Environmental Programs

Biological Control Activity

- Section 6K, "Hazardous Waste Operations and Emergency Response (HAZWOPER)," *ES&H Manual* (SNL 2001f)
- Section 6D, "Hazard Communication Standard," *ES&H Manual* (SNL 2002f)

Oil Storage and Spill Containment

Oil Storage Programs

- *Sandia National Laboratories Spill Prevention Control and Countermeasures (SPCC) Plan* (SNL 1999e)
- Section 10K, "Underground Storage Tanks," *ES&H Manual* (SNL 1997b)
- Section 10F, "Oils, Greases, and Fuels," *ES&H Manual* (SNL 1999)

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- *The Role of Data Analysis in Sampling Design of Environmental Monitoring* (Shyr, Herrera, Haaker 1998)
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- *2002 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2003a)
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- *Sample Management Office (SMO) Quality Assurance Plan (QAP)* (SNL 1996a)

Waste Management

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- *Storm Water Pollution Prevention Plan (SWP3)* (SNL 2001b)
- *Programmatic Waste Acceptance Criteria (*SNL 2001a)
- *Waste Management* (SNL 2003f)
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ER Project

Multiple documents too numerous to list here.

Hazardous Waste Management Program
- *2001 Hazardous Waste Biennial Report for Sandia National Laboratories/New Mexico and Sandia National Laboratories/Tonopah Test Range* (SNL 2002b)
- Section 19A, "Hazardous Waste Management," *ES&H Manual* (SNL 2002j)
- Section 10E, "Chemical Spills," *ES&H Manual* (SNL 2001g)

Solid Waste Program
- Section 19F, "Other Waste," *ES&H Manual* (SNL 1999d)

Radioactive Waste Management Program
- *Site Treatment Plan for Mixed Waste, Sandia National Laboratories/New Mexico,* Revision 6 (SNL 2002i)
- Section 19B, "Radioactive Waste Management," *ES&H Manual* (SNL 2002h)
- *Radioactive Waste/Nuclear Materials Disposition Department (RWNMDD) Waste Management Program* (SNL 2003e)
- *Site Treatment Plan for Mixed Waste, FY01 Update* (SNL 2002i)
- *Manzano Nuclear Facilities Maintenance Support Program* (SNL 2001)
- Section 19D, "Radioactive Material Management Areas (RMMAs)," *ES&H Manual* (SNL 2001e)
- Section 19C, "Mixed Waste Management," *ES&H Manual* (SNL 2001c)
- Section 19E, "Treatability Studies for Hazardous and Mixed Waste," *ES&H Manual* (SNL 1997a)

TSCA Waste
- Section 6S, "Toxic Substances Control Act (TSCA)," *ES&H Manual* (SNL 1997g)

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2002

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
SEWER WASTEWATER					
General	WW001 Station Manhole, south of TA-IV at Tijeras Arroyo	2069 A-5	3/23/00	6/30/03	COA
General	WW006 Station Manhole, at Pennsylvania Ave.	2069 F-5	1/3/00	7/31/03	COA
Microelectronics Development Laboratory (MDL)	WW007 Station Manhole, TA-I	2069 G-5	6/1/02	5/31/05	COA
General	WW008 Station Manhole, south of TA-II at Tijeras Arroyo	2069 I-4	1/24/00	1/31/04	COA
General	WW011 Station Manhole, north of TA-III (includes TAs-III and V, and Coyote Test Field sewer lines)	2069 K-4	3/1/02	10/31/04	COA
SURFACE DISCHARGE					
Pulsed Power Development Facilities (Discharge Plan)	TA-IV, Lagoons I and II	DP-530	9/21/01	9/21/06	NMED
Sandia Corporation/New Mexico Tech Vadose Zone Infiltration Test Facility	Socorro County	DP-1381	3/4/02	3/4/03	NMED
UNDERGROUND STORAGE TANKS					
Emergency generator fuel (9,750 gallon)	TA-I	06383	7/1/01[a]	6/30/03	NMED, PST Bur.
Oil storage tank (20,000 gallons)	TA-I	06384	7/1/01[a]	6/30/03	NMED, UST Bur.
Oil storage tank (20,000 gallons)	TA-I	06385	7/1/01[a]	6/30/03	NMED, UST Bur.
ABOVE GROUND TANKS					
AST/ 1,024,000	605 tank farm	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 508,000	605 tank farm	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 213,898	605 tank farm	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 209, 421	605 tank farm	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 45,490	605 tank farm	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 44,129	605 tank farm	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 10,000	605 east	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 10,000	605 east	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 10,000	605 east	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 75,000	966 outside east	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 75,000	966 outside east	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 75,000	966 outside east	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 250,000	970 outside S-SE	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 250,000	970 outside S	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 250,000	981 outside E	NMED has not issued #	7/1/02	6/30/03	NMED

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2002 (continued)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
Above Ground Tanks (continued)					
AST / 250,000	981 outside W	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 250,000	983 outside	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 250,000	983 outside sw	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 250,000	983 outside se	NMED has not issued #	7/1/02	6/30/03	NMED
AST / 25,000	Burn site outside north	NMED has not issued #	7/1/02	6/30/03	NMED
STORM WATER					
National Pollution Discharge Elimination System (NPDES) "Multi-sector General" Permit	Storm water discharges from Monitoring Point (MP) 03 and MP 04	NMR05A961	2/01	9/30/05	EPA
Storm Drain, Sanitary Sewer, and Domestic Water System Modernization (SSWM)	9th and 20th Street realignment area	NMR10B507	6/29/99	6/31/03 (estimated date)	EPA
NPDES construction permit for the Joint Computational Engineering Laboratory	South end of TA-1	EPA has not issued #	4/20/02	10/03	EPA Region IV
MESA	TA-1	EPA has not issued permit #	1/28/02	7/31/09 (estimated date)	EPA
ECOLOGICAL					
Permit to take or band birds Bird banding is conducted under a permit granted to Los Alamos National Laboratory (LANL)	Site-Wide Ecological Monitoring Activity	22783 (LANL permit)	4/30/00	6/30/03	U.S Fish and Wildlife Service
New Mexico Department of Game and Fish for Scientific/Educational Purposes Authorization for Taking of Protected Wildlife	Site-Wide Ecological Monitoring Activity	2931	1/1/02	12/31/02	New Mexico Department of Game and Fish
U.S. Fish and Wildlife Service Special Purpose Salvage Permit	Site-Wide Ecological Monitoring	MB040780-0	5/30/01	12/31/03	U.S. Fish and Wildlife Service
RCRA					
RCRA Part B Operating Permit for the Hazardous Waste Management Facility (HWMF) Module I - General Permit Conditions Module II - General Facility Conditions Module III - Containers	HWMF, TA-II (storage)	NM5890110518-1	8/6/92	08/06/02*** (request for renewal submitted 2/6/02)	NMED

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2002 *(continued)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
RCRA *(continued)*					
RCRA Part B Operating Permit Module IV - Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units (SWMUs)	Environmental Restoration (ER) Sites	NM5890110518-1	8/26/93	9/20/02 *** (request for renewal submitted 2/6/02)	EPA/NMED
Thermal Treatment Facility (TTF) Module I - General Permit Conditions Module II - General Facility Conditions Module III - Containers	TTF, TA-III, Bldg. 6715 (Treatment of explosive waste)	NM5890110518-2	12/4/94	12/4/04[b] *** (request for renewal submitted 2/6/02)	NMED
Class III Permit Modification for the Management of Hazardous Remediation Waste in the Corrective Action Management Unit (CAMU), Tech Area III Modification to Part B Operating Permit	CAMU, TA-III	NM5890110518	9/25/97	9/20/02 *** (request for renewal submitted 2/6/02)	NMED
Class II Permit Modification request for Temporary Treatment Operations at the Corrective Action Management Unit (CAMU)	CAMU, TA-III	NM5890110518	4/4/02	One year after TU is ready for operation	NMED
Class II Permit Modification request for Low Temperature Thermal Desorption Treatment Operations at the CAMU	CAMU, TA-III	NM5890110518	9/24/02	None	NMED
RCRA Part A and B Permit Applications for Hazardous Waste Management Units for the hazardous component in mixed waste stored and/or treated at three waste management areas.	RMWMF (MW treatment and storage) 7 Manzano Bunkers (storage only) Auxiliary Hot Cell Facility (storage and treatment) Bldg. 6596 (storage only)	NM5890110518	Interim status first submitted 8/90; Most recent revision 02/06/02	Under Review[b] (No expiration date)	NMED
TSCA					
Risk-Based Approval Request under 40 CFR 761.61(c); Risk-Based Method for Management of PCB Materials; Chemical Waste Landfill and CAMU			6/26/02	Storage until 9/30/03	EPA, Region 6

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2002 *(continued)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
Open Burn Permits*					
TTF*	Thermal Treatment	76-OB-1-2002	1/1/02	12/30/02	COA
Lurance Burn Site	Large Pool Fire Tests	76-OB-2-2002	1/15/02	12/30/02	COA
Explosive Testing	Thermite Applications	76-OB-3-2002	1/15/02	12/30/02	COA
Burn or Cable Site	Propellant Testing	76-OB-4-2002	1/15/02	12/30/02	COA
Lurance Burn Site	Building 9830	76-OB-5-2002	1/15/02	12/30/02	COA
Fire Extinguisher Fire Training	Fire Training	76-OB-6-2002	1/15/02	12/30/02	COA
Above Ground	Explosive Detonations	76-OB-7-2002	1/15/02	12/30/02	COA
Burn Site/Sled Track	Wood Crib Fire Tests	76-OB-8-2002	1/15/02	12/30/02	COA
10,000’ Sled Track	Blast Tube Test Series	76-OB-9-2002	4/01/02	12/31/02	COA
Lurance Burn Site	Package Performance	76-OB-10-2002	6/21/02	12/30/02	COA
Fire Extinguisher	Lithium Fire Training	76-OB-11-2002	9/06/02	12/31/02	COA
10,000’ Sled Track	.50 Caliber Riffle Test	76-OB-12-2002	9/06/02	12/31/02	COA
AIR (Permits & Registrations)					
Hammermill Facility	TA-III	144	08/28/85	Biennial update	COA
Fire Laboratory (formally SMERF) used for the Authentication of Modeling and Experiments (FLAME)	Burn Site	196	5/19/88	Registration[†]	COA
High Energy Radiation Megavolt Electron Source-III (HERMES-III)	TA-III	NESHAP	6/29/88	Approval[††]	EPA, Region 6
Neutron Generator Facility (NGF)	TA-I	374- M1	9/23/94	Biennial update	COA
Neutron Generator Recertification	TA-I	396	5/7/96	Biennial update	COA
Standby diesel generators (four)	TA-I	402 (old 150)	5/07/96	Biennial update	COA
Radioactive and Mixed Waste Management Facility (RMWMF)	TA-III	415- M1	5/10/97	Biennial update	COA
Isotope Production Facility (HCF)	TA-V	428	7/08/96	Biennial update	COA
Title V Operating Permit	Site-Wide	515 (pending)	Submitted[b] 3/1/96	Pending (5 yr renewal)	COA
Chemical Waste Landfill (CWL) Excavation	TA-III, CWL	540	5/19/99	Registration	COA
Classified Waste Landfill	TA-II, Landfill	560	12/17/96	Biennial update	COA
Classified Waste Landfill	TA-II, Landfill	NESHAP	06/96	Approval[††]	EPA, Region 6
Advanced Manufacturing Processes Laboratory (AMPL)	TA-I	646	1/23/97	Biennial update	COA

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2002 *(concluded)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
AIR (Permits & Registrations) *(concluded)*					
Portable Burn Pools	Burn Site	647	5/5/97	Biennial update	COA
Chemical Waste Landfill (CWL) -Voluntary Corrective Measure (VCM)	TA-III, CWL	648	5/23/97	Registration†	COA
Soil Washing / Soil Stabilization Unit, CAMU	TA-III, CAMU, next to CWL	888-M1	8/21/02	Biennial update	COA
Emergency Generator	TA-I	924	5/5/98	Biennial update	COA
Processing and Environmental Technology Laboratory (PETL)	TA-I	925-M1	3/5/01	Biennial update	COA
Advanced Manufacturing Prototype Facility (AMPF)	TA-I	1406	11/6/00	Registration	COA
Microelectronics Development Laboratory (MDL)	TA-1	1678	12/23/02	Biennial update	COA

NOTES: NMED = New Mexico Environment Department
EPA = U.S. Environmental Protection Agency
UST Bur. = Underground Storage Tank
[a]Applied for permit renewal; not yet received.
[b]Combined with application for permit renewal submitted to NMED on 02/06/2002
†Registration = Certificate, no permit required.
††Approval = EPA does not issue a permit.
**Open Burn Permits are issued by the City of Albuquerque for no more than a year at any one time.
NESHAP = National Emission Standards for Hazardous Air Pollutants
TA= technical area
COA= City of Albuquerque
*** Sandia submitted a timely application for permit renewal (RCRA Part A and Part B permit applications) to NMED on 02/06/2002. The old permit remains in force until the new one is issued.

Applicable Regulations for Environmental Programs

Water Quality

All Water Quality Programs
Clean Water Act (CWA) (Federal Water Pollution Control Act)
20 NMAC 6.2, "Ground and Surface Water Protection"
Clean Air Act (CAA) and CAA Amendments (CAAA) of 1990

Drinking Water
Safe Drinking Water Act (SDWA)
40 CFR 125, "Criteria and Standards for the National Pollutant Discharge Elimination System (NPDES)"
40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants"
40 CFR 141, "National Primary Drinking Water Regulations"
20 NMAC 7.10, "Drinking Water"
40 CFR 143, "National Secondary Drinking Water Regulations"

Wastewater Program
City of Albuquerque, "Sewer Use and Wastewater Control Ordinance" (Albuquerque Code of Ordinances Chapter 6, Article 3)
40 CFR 403, "General Pretreatment Regulations for Existing and New Sources of Pollution"
10 CFR 20, "Standards for Protection Against Radiation" (addresses radiological levels in wastewater)
20 NMAC 7.3, "Liquid Waste Disposal" (includes effluents to sewer and septic tanks)

Surface Discharge Program
40 CFR 112, "Oil Pollution Prevention"
20 NMAC 6.4, "Standards for Interstate and Intrastate Streams"

Storm Water Program
40 CFR 122-125 (National Pollutant Discharge Elimination System [NPDES] Regulations)
40 CFR 123, "State Program Requirements"
40 CFR 124, "Procedures for Decision Making"
40 CFR 125, "Criteria and Standards for the National Pollutant Discharge Elimination System"
40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants"

Groundwater Protection Program (GWPP)
40 CFR 141, "National Primary Drinking Water Regulations"
20 NMAC 7.10, "Drinking Water"
20 NMAC 6.2, "Ground and Surface Water Protection"

Groundwater Monitoring at ER Project Sites
40 CFR 265, Subpart F, "Groundwater Monitoring"
40 CFR 264.101, "Corrective Action for Solid Waste Management Units (SWMU)" (applies to all permitted ER sites, except the CWL)

NEPA

NEPA Program
National Environmental Policy Act (NEPA) of 1969
American Indian Religious Freedom Act (AIRFA) of 1978
Archaeological Resources Protection Act (ARPA) of 1979
Endangered Species Act (ESA)
Migratory Bird Treaty Act (MBTA) of 1918, as amended
National Historic Preservation Act of 1966
10 CFR 1021, "National Environmental Policy Act Implementing Procedures" (General Provisions for DOE)

40 CFR 1500-1508, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act

Air Quality

All Air Quality Programs

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

Meteorological Monitoring Program

40 CFR 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans"

Ambient Air Surveillance Program

40 CFR 50, "National Primary and Secondary Ambient Air Quality Standards" (20 NMAC 11)
40 CFR 58, "Ambient Air Quality Surveillance"
20 NMAC 11, "Albuquerque/Bernalillo County Air Quality Control Board Regulations"

NESHAP Program

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants (NESHAP)"
40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"

Risk Management Plans

40 CFR 68, "Chemical Accident Prevention Provisions"

Air Quality Compliance

(See Table 9-2 on page 9-22)

Various Other Environmental Programs

Biological Control Activity

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
New Mexico Pesticide Control Act
21 NMAC 17.50, "Pesticides"

Pollution Prevention (P2) Program

Pollution Prevention Act of 1990
RCRA Section 6002, "Federal Procurement"

EO 13101	"Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition"
EO 13148	"Greening the Government Through Leadership in Environmental Management"
EO 12856	"Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements" (superceded by EO 13148)
EO 13149	"Greening the Government Through Federal Fleet and Transportation Efficiency"
EO 13123	"Greening the Government Through Efficient Energy Management"

Chemical Inventory and Emergency Management Programs

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601 et. seq.)
Superfund Amendments and Reauthorization Act (SARA) of 1986
Emergency Planning and Community Right to Know Act (EPCRA) of 1986 (42 U.S.C. 11001 et seq.)
40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan" (NCP)
40 CFR 302, "Designation, Reportable Quantities, and Notification" (CERCLA Implementing Regulation)
40 CFR 355, "Emergency Planning and Notification (EPCRA)"
40 CFR 370, "Hazardous Chemical Reporting: Community Right-to-Know (EPCRA)"
40 CFR 372, "Toxic Chemical Release Reporting: Community Right-to-Know (EPCRA)"

Oil Storage and Spill Containment

Oil Storage Programs

40 CFR 110, "Discharge of Oil"
40 CFR 112, "Oil Pollution Prevention"
40 CFR 122, "EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES)"
40 CFR 123, "State Program Requirements (NPDES)"
40 CFR 280, "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks"
40 CFR 281, "Approval of State Underground Storage Tank Programs"
20 NMAC 5, "Underground Storage Tanks (USTs)"

Waste Management

ER Project

40 CFR 261, "Identification and Listing of Hazardous Waste" (20 NMAC 4.1, Subpart II)
40 CFR 262, "Standards Applicable to the Generators of Hazardous Wastes" (20 NMAC 4.1, Subpart III)
40 CFR 264, "Standards for Owners and Operators of Hazardous Waste TSD Facilities" (20 NMAC 4.1, Subpart V)
40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste TSD Facilities" (20 NMAC 4.1, Subpart VI)
Subpart F, *Groundwater Monitoring*
Subpart G, *Closure and Post-Closure*
40 CFR 268, "Land Disposal Restrictions" (20 NMAC 4.1, Subpart VIII)
40 CFR 270, "The Hazardous Waste Permit Program" (20 NMAC 4.1, Subpart IX)
40 CFR 761, "PCBs Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions"

Hazardous Waste Management Program

Resource Conservation and Recovery Act (RCRA) of 1976
RCRA Section 3004j: Land Disposal Restrictions
RCRA Section 6002: Federal Procurement
40 CFR 61, Subpart M, "NESHAP, Asbestos"
40 CFR 68, "Chemical Accident Prevention Provisions"
40 CFR 260, "Hazardous Waste Management System: General"
40 CFR 261, "Identification and Listing of Hazardous Waste"
40 CFR 262, "Standards Applicable to Generators of Hazardous Waste"
40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste"
40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities", including Subpart F, "Releases from Solid Waste Management Units" and Section 264.101, "Corrective Action for Solid Waste Management Units"
40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"
40 CFR 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities"
40 CFR 268, "Land Disposal Restrictions"
40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program"
40 CFR 271, "Requirements for Authorization of State Hazardous Waste Programs"
40 CFR 272, "Approved State Hazardous Waste Management Programs"
40 CFR 279, "Standards for the Management of Used Oil"
Hazardous and Solid Waste Amendments Act (HSWA) of 1984 (Module IV to RCRA Section 3004u)
Toxic Substances Control Act (TSCA) of 1976
Pollution Prevention Act of 1990
40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions"

40 CFR 763, “Asbestos”
49 CFR 171–180 (Department of Transportation regulations for hazardous and radioactive waste shipments)
20 NMAC 4.1, “Hazardous Waste Management” (40 CFR 260-270)
20 NMAC 4.3, “Annual Hazardous Waste Fees”
20 NMAC 9.1, “Solid Waste Management”

Solid Waste Program
20 NMAC 9.1, “Solid Waste Management”

Radioactive Waste Management Program
Atomic Energy Act of 1954
Federal Facility Compliance Act (FFCA) of 1992
10 CFR 835, “Occupational Radiation Protection” (Implements Price Anderson Act)
49 CFR 100-199, (Department of Transportation requirements)
40 CFR 61, “National Emission Standards for Hazardous Air Pollutants (NESHAP)”
Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities”
40 CFR 260-279, RCRA regulations for hazardous waste (as it pertains to mixed waste)

TABLE 9-2. Federal and State Air Regulations Applicable to SNL/NM

CAA Title	CAA Section	Federal Regulation	Local Regulation	Subject
I	176 (c)	40 CFR 51 W 40 CFR 93 B	20 NMAC 11.04 20 NMAC 11.03	Conformity of Federal Actions (State and Federal Plans) General and Transportation
	110	40 CFR 58	N/A	Ambient Air Quality Surveillance
	109	40 CFR 50	20 NMAC 11.01	National Primary and Secondary Ambient Air Quality Standards (NAAQS)
	165-166	40 CFR 52	20 NMAC 11.02	Permit Fees
		40 CFR 52	20 NMAC 11.05	Visible Air Contaminants
		40 CFR 52	20 NMAC 11.06	Emergency Action Plan
		40 CFR 52	20 NMAC 11.07	Variance Procedure
		40 CFR 52	20 NMAC 11.20	Airborne Particulate Matter (PM)
		40 CFR 52	20 NMAC 11.21	Open Burning
		40 CFR 51–52	20 NMAC 11.40	Source Registration
		40 CFR 51–52	20 NMAC 11.41	Authority-to-Construct
		40 CFR 51.100	20 NMAC 11.43	Stack Height Requirements
		40 CFR 51	20 NMAC 11.44	Emissions Trading
	171-193	40 CFR 51–52	20 NMAC 11.60	Permitting in Nonattainment Areas
	160-169 B	40 CFR 52	20 NMAC 11.61	Prevention of Significant Deterioration
	165-166	40 CFR 60 40 CFR 63	20 NMAC 11.65	Volatile Organic Compounds (VOC)
		40 CFR 60	20 NMAC 11.66	Process Equipment
		40 CFR 60	20 NMAC 11.22	Wood Burning
		40 CFR 60	20 NMAC 11.63	New Source Performance Standards (NSPS)
		40 CFR 60	20 NMAC 11.67	Equipment, Emissions and Limitations (stationary combustion sources)
		40 CFR 60	20 NMAC 11.68	Incinerators
		40 CFR 60	20 NMAC 11.69	Pathological Waste Destructors
II	202-210 213-219 211	40 CFR 85-86	20 NMAC 11.100	Motor Vehicle Inspection
			20 NMAC 11.101	- Decentralized and Centralized (respectively)
		40 CFR 80	20 NMAC 11.102	Oxygenated Fuels
			20 NMAC 11.103	Motor Vehicle Visible Emissions
III	112	40 CFR 61 40 CFR 63	20 NMAC 11.64	National Emission Standards for Hazardous Air Pollutants (NESHAP) <u>Subpart H</u> – Radionuclides <u>Subpart M</u> – Asbestos
IV	401-416	40 CFR 72-78	20 NMAC 11.62	Acid Rain
V	501-507	40 CFR 70-71	20 NMAC 11.42	Operating Permits
VI	601-618	40 CFR 82	20 NMAC 11.23	Ozone Protection
VII	113-114	40 CFR 64	20 NMAC 11.90	Administration, Enforcement, Inspection

NOTE: ODS = ozone depleting substances
PM = particulate matter
HAP = Hazardous Air Pollutant
AEHD=Albuquerque Environmental Health Department
SWISH=Small Wind Shielded Facility
SLAMS=Standards for State and Local Air Monitoring Stations
FLAME=Fire Laboratory used for the Authentication of Models and Experiments

TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM

Date	Milestone	Comment
1984	Amendments to Resource Conservation and Recovery Act (RCRA) and Hazardous and Solid Waste Amendments (HSWA) in 1984	MW became an issue after amendments to RCRA and HSWA enforced Land Disposal Restrictions (LDRs), including prohibition on storage of wastes for more than one year.
Aug 1990	RCRA Part A Interim Status Permit Application	Submitted RCRA Part A Interim Status Permit application for MW storage. Later revisions to the interim status permit added proposed MW treatment processes.
Oct 1992	Federal Facilities Compliance Act (FFCA) Passed	The FFCA allows storage of MW over one-year RCRA time limit. Requires U.S. Department of Energy (DOE) to submit a site treatment plan for MW.
Dec 1992	Notice of Noncompliance (NON) Issued	U.S. Environmental Protection Agency (EPA) issued a NON for storage of RCRA-regulated MW over the one-year maximum period.
Oct 1993	Conceptual Site Treatment Plan Submitted	DOE submitted *Conceptual Site Treatment Plan for Mixed Waste* to NMED; other drafts followed.
Mar 1995	Final Site Treatment Plan submitted	DOE submitted final *Site Treatment Plan for Mixed Waste* to NMED
Jun 1995	Historical Disposal Requests Validation (HDRV) Project Initiated	The HDRV Project was initiated to characterize and sort legacy MW. Project continued into 1997, when it was replaced with new sorting procedures
Oct 1995	Federal Facility Compliance Order (FFCO) Signed	The FFCO, an agreement between State, DOE, and Sandia Corporation, details specific actions required with regard to MW management, including the requirement to develop of a Site Treatment Plan (STP), to be updated annually
Oct 1995	Compliance Order Issued	NMED issued a Compliance Order enforcing SNL/NM's STP
Sep 1996	First MW Shipment	First MW shipment made to Perma-Fix/DSSI
Oct 1996	FFCO 1st Amendment	FFCO amended
Dec 1996	Revisions to Proposed Treatment Methods	Re-submitted Part A and B permit application, to reflect revisions to proposed on-site treatment methods
May 1997	FFCO 2nd Amendment	FFCO amended
Dec 1997	On-site MW Treatment	Onsite treatment of MW began at the RMWMF in Bldg. 6920. Additionally, Bldg. 6921 was converted to a laboratory for the treatment of certain types of MW
1997	STP Milestones Met	Treated wastes on site and shipped mixed to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1996 activities, and changes to proposed treatment technologies. NMED approved Revision 1 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.

NOTE: NON = Notification of Non-compliance
RCRA = Resource Conservation and Recovery Act
HSWA = Hazardous and Solid Waste Amendments
FFCA = Federal Facility Compliance Act
NMED = New Mexico Environment Department
DSSI = Diversified Scientific Services, Inc.

TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM (concluded)

1998	STP Milestones Met	Treated wastes on site and shipped mixed to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1997 activities, and changes to proposed treatment technologies. NMED approved Revision 2 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
1999	STP Milestones Met	Treated wastes on site and shipped mixed to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1998 activities, and changes to proposed treatment technologies. NMED approved Revision 3 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
2000	STP Milestones Met	Treated wastes on site and shipped mixed to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1999 activities, and changes to proposed treatment technologies. NMED approved Revision 4 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
2001	STP Milestones Met	Treated wastes on site and shipped mixed to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2000 activities, and changes to proposed treatment technologies. NMED approved Revision 5 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
2001	FFCO Amendment 3	FFCO amended
2002	STP Milestones Met	Treated wastes on site and shipped mixed to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2001 activities, and changes to proposed treatment technologies. NMED approved Revision 6 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.

NOTE: NON = Notification of Non-compliance
RCRA = Resource Conservation and Recovery Act
HSWA = Hazardous and Solid Waste Amendments
FFCA = Federal Facility Compliance Act
NMED = New Mexico Environment Department
DSSI = Diversified Scientific Services, Inc.

RADIOLOGICAL DOSE

Radiation Protection

The U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) has established radiation protection standards for the public to control and limit radiation doses resulting from activities at DOE facilities. Sandia National Laboratories, New Mexico (SNL/NM) is the DOE facility specific to this discussion. Public areas are defined as any location that is accessible to non-DOE facility employees (e.g., excluding Sandia Corporation employees and contractors), such as Kirtland Air Force Base (KAFB) personnel and the surrounding community. Radiation protection standards are provided in DOE Order 5400.5, *General Radiation Protection of the Public and the Environment* (DOE 1993). Environmental monitoring requirements for DOE operations are given in DOE Order 5400.1, *General Environmental Protection Program* (DOE 1990). In addition to these quantitative standards, the overriding DOE policy is that exposures to the public shall be maintained "as low as reasonably achievable" (ALARA).

DOE Order 5400.5 limits the total annual effective dose equivalent (EDE) of all potential exposure pathways to the public (including air, water, and the food chain) to 100 millirem per year (mrem/yr). The Order lists the Derived Concentration Guides (DCGs) for radionuclides in water and air that could be continuously consumed or inhaled (365 days/year). This is a conservative approach that assumes that a member of the public resides at the location continuously. Table 9-4 lists the DCGs pertinent to activities at SNL/NM and to this report.

TABLE 9-4. Derived Concentration Guides (DCGs) for Selected Radionuclides*

	Ingested Water		Inhaled Air†	
Radionuclide	DCG (µCi/ml)	f_1 Value**	DCG (µCi/ml)	Solubility Class
Tritium (water)	2×10^{-3}	--	1×10^{-7}	W
Cesium-137	3×10^{-6}	1	4×10^{-10}	D
Uranium, total (U_{tot}) §	6×10^{-6}	--	1×10^{-13}	Y

NOTE: µCi/ml = microcuries per milliliter

*From Figure III-1, DOE Order 5400.5, Change 2, January 7, 1993 (DOE 1993).

†DCG for tritium in air is adjusted for skin absorption.

** F_1 value is the gastrointestinal absorption factor.

§ Listed DCG's for U_{tot} are based on U_{nat} listing in 5400.5. Conversion from microcuries per milliliter (µCi/ml) to micrograms per liter (µg/L) may be made using:

$$\mu g / L = X \, \mu Ci / ml \, \frac{\left[1.48 \, x \, 10^{9} \, \mu g / L\right]}{\left[1 \, \mu Ci / ml\right]}$$

- *Water Pathways* - DOE drinking water guidelines are based on an annual EDE not to exceed 4 mrem/yr. Guideline values for drinking water are calculated at 4 percent of ingested water using DCG values for specific nuclides.

- *Air Pathways* - DOE facilities are required to comply with U.S. Environmental Protection Agency (EPA) standards for radiation protection as given in National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H, specific to radionuclides emitted from DOE facilities (with the exception of radon). This rule mandates that air emissions from DOE facilities shall not cause any individual of the public to receive an EDE of greater than 10 mrem/yr from air pathways. Table 9-5 summarizes the public radiation protection standards that are applicable to DOE facilities.

WATER QUALITY MONITORING PARAMETERS

Resource Conservation and Recovery Act (RCRA)

Table 9-5 lists the 40 CFR 265, Subpart F, parameters required for groundwater monitoring analysis, implemented under RCRA. Table 9-6 gives the EPA interim primary drinking water standards (40 CFR 265, Appendix III) for the groundwater monitoring parameters. Table 9-7 gives EPA secondary drinking water standards. At SNL/NM, this regulation applies to Environmental Restoration (ER) sites.

TABLE 9-5. General Dose Limits to the Public from DOE Facilities

Pathway	Effective Dose Equivalent (EDE) Limit	Comments
All Pathways*	100 mrem/yr 1 mSv/yr	The EDE for any member of the public from all routine DOE operations (normal planned activities including remedial actions). Radiation dose occurring from natural background and medical exposures are not included in the total allowed dose from all pathways.
Air Pathway **	10 mrem/yr 0.10 mSv/yr	Sandia Corporation calculates doses resulting from all potential air depositions and direct inhalation (e.g., emissions, ground shine, food crops)

NOTE: *DOE Order 5400.5, Chapters I and II (DOE 1993)
**40 CFR 61, Subpart H for radionuclides, National Emission Standards for Hazardous Air Pollutants (NESHAP).
mrem/yr = millirem per year mSv/yr = millisievert per year

TABLE 9-6. Groundwater Monitoring Parameters Required by 40 CFR 265, Subpart F*

Contamination Indicator	Groundwater Quality	Appendix III† Drinking Water Supply
pH Specific Conductivity Total Organic Halogen (TOX) Total Organic Carbon (TOC)	Chloride Iron Manganese Phenol Sodium Sulfate	Arsenic Barium Cadmium Chromium Fluoride Lead Mercury Nitrate (as N) Selenium Silver Endrin Lindane Methoxychlor Toxaphene 2,4-D 2,4,5-TP Silvex Radium Gross Alpha Gross Beta Coliform Bacteria Turbidity

NOTE: *Resource Conservation and Recovery Act (RCRA)
†40 CFR 265, Appendix III.

TABLE 9-7. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards

Inorganic Chemicals	MCL	Units
Antimony	0.006	mg/L
Arsenic	0.05	mg/L
Asbestos	7	MFL
Barium	2.0	mg/L
Beryllium	0.004	mg/L
Cadmium	0.005	mg/L
Chromium	0.1	mg/L
Copper	1.3*	mg/L
Cyanide (free cyanide)	0.2	mg/L
Fluoride	4.0	mg/L
Lead	0.015**	mg/L
Mercury (inorganic)	0.002	mg/L
Nickel (New Mexico only) [5]	0.1	mg/L
Nitrate (measured as N)	10	mg/L
Nitrite (measured as N)	1	mg/L
Total Nitrate and Nitrite (measured as N)	10	mg/L
Selenium	0.05	mg/L
Thallium	0.002	mg/L
Organic Chemicals	**MCL**	**Units**
Alachlor	0.002	mg/L
Atrazine	0.003	mg/L
Benzene	0.005	mg/L
Benzo(a)pyrene	0.0002	mg/L
Carbofuran	0.04	mg/L
Carbon tetrachloride	0.005	mg/L
Chlordane	0.002	mg/L
Chlorobenzene	0.1	mg/L
2,4-D	0.07	mg/L
Dalapon	0.2	mg/L
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	mg/L
o-Dichlorobenzene	0.6	mg/L
p-Dichlorobenzene	0.075	mg/L
1,2-Dichloroethane	0.005	mg/L
1,1-Dichloroethylene	0.007	mg/L
cis-1,2-Dichloroethylene	0.07	mg/L
trans-1,2-Dichloroethylene	0.1	mg/L
Dichloromethane	0.005	mg/L
1,2-Dichloropropane	0.005	mg/L
Di(2-ethylhexyl)adipate	0.4	mg/L
Di(2ethylhexyl)phthalate	0.006	mg/L
Dinoseb	0.007	mg/L
Dioxin (2,3,7,8-TCDD)	0.00000003	mg/L
Diquat	0.02	mg/L
Endothall	0.1	mg/L
Endrin	0.002	mg/L

See notes at end of table.

TABLE 9-7. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards *(concluded)*

Organic Parameter *(continued)*	MCL	Units
Ethylbenzene	0.7	mg/L
Ethylene Dibromide	0.00005	mg/L
Glyphosate	0.7	mg/L
Heptachlor	0.0004	mg/L
Heptachlor epoxide	0.0002	mg/L
Hexachlorobenzene	0.001	mg/L
Hexachlorocyclopentadiene	0.05	mg/L
Lindane	0.0002	mg/L
Methoxychlor	0.04	mg/L
Oxamyl (Vydate)	0.2	mg/L
Polychlorinated biphenyls (PCBs)	0.0005	mg/L
Pentachlorophenol	0.001	mg/L
Picloram	0.5	mg/L
Simazine	0.004	mg/L
Styrene	0.1	mg/L
Tetrachloroethylene	0.005	mg/L
Toluene	1	mg/L
Toluene	1	mg/L
Total Trihalomethanes (TTHMs)	0.1	mg/L
Toxaphene	0.003	mg/L
2,4,5-TP (Silvex)	0.05	mg/L
1,2,4-Trichlorobenzene	0.07	mg/L
1,1,1-Trichloroethane	0.2	mg/L
1,1,2-Trichloroethane	0.005	mg/L
Trichloroethylene	0.005	mg/L
Vinyl chloride	0.002	mg/L
Xylenes (total)	10	mg/L
Radionuclides	**MCL**	**Units**
Beta particles and photon emitters	4	mrem/yr
Gross alpha particle activity	15	pCi/L
Radium 226 and Radium 228 (combined)	5	pCi/L
Uranium	0.030	mg/L

NOTE: *action level concentrations which trigger systems into taking treatment steps if 10% of tap water samples exceed the value
**New Mexico Drinking Water Standard only, EPA removed nickel in 1995
MCL = Maximum Contaminant Level
mg/L = milligram per liter; ml = milliliter
MFL= Micro-fibers per liter
mrem/yr = millirem per year
pCi/L = picocurie per liter

TABLE 9-8. EPA Secondary Drinking Water Supply Standards

Contaminant	Level
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 color units
Copper	1.0 mg/L
Corrosivity	Non-corrosive
Fluoride	2.0 mg/L
Foaming agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.1 mg/L
Sulfate	250 mg/L
Total dissolved solids (TDS)	500 mg/L
Zinc	5 mg/L

NOTE: EPA = Environmental Protection Agency
mg/L = milligram per liter
pH = potential of hydrogen (acidity)

TABLE 9-9. New Mexico Water Quality Control Commission (NMWQCC) Standards for Groundwater of 10,000 mg/L total dissolved solid (TDS) Concentration or Less

Contaminant	MAC	Units
A. Human Health Standards		
Arsenic	0.1	mg/L
Barium	1.0	mg/L
Cadmium	0.01	mg/L
Chromium	0.05	mg/L
Cyanide	0.2	mg/L
Fluoride	1.6	mg/L
Lead	0.05	mg/L
Total Mercury	0.002	mg/L
Nitrate (as N)	10.0	mg/L
Selenium	0.05	mg/L
Silver	0.05	mg/L
Uranium	5.0	mg/L
Radioactivity: Radium-226 & Radium 228	30.0	pCi/L
Benzene	0.01	mg/L
Polychlorinated biphenyls (PCB’s)	0.001	mg/L
Toluene	0.75	mg/L
Carbon Tetrachloride	0.01	mg/L
1,2-dichloroethane (EDC)	0.01	mg/L
1,1-dichloroethylene (1,1-DCE)	0.005	mg/L
1,1,2,2-tetrachloroethylene (PCE)	0.02	mg/L
1,1,2- trichloroethylene (TCE)	0.1	mg/L
Ethylbenzene	0.72	mg/L
Total Xylene	0.62	mg/L
Methylene Chloride	0.1	mg/L
Chloroform	0.1	mg/L
1,1 –dichloroethane	0.025	mg/L
Ethylene dibromide (EDB)	0.0001	mg/L
1,1,1 –trichloroethane	0.06	mg/L
1,1,2 –trichloroethane	0.01	mg/L
1,2,2,2 –tetrachloroethane	0.01	mg/L
Vinyl Chloride	0.001	mg/L
PAHs: total naphtalene + monomethylnapthalenes	0.03	mg/L
Benzo(a)pyrene	0.0007	mg/L
B. Other Standards for Domestic Water Supply		
Chloride	250.0	mg/L
Copper	1.0	mg/L
Iron	1.0	mg/L
Manganese	0.2	mg/L
Phenols	0.005	mg/L
Sulfate	600.0	mg/L
Total Dissaolved Solids	1000.0	mg/L
Zinc	10.0	mg/L
pH	Between 6 and 9	

NOTE: mg/L = milligram per liter
pH = potential of hydrogen (acidity)
pCi/L = picocurie per liter

MAC = maximum allowable concentration

TABLE 9-9. New Mexico Water Quality Control Commission (NMWQCC) Standards for Groundwater of 10,000 mg/L total dissolved solid (TDS) Concentration or Less *(concluded)*

Contaminant	MAC	Units
C. Standards for Irrigation Use – Groundwater shall meet the standards of Subsection A,B, and C unless other wise provided		
Aluminum	5.0	mg/L
Boron	0.75	mg/L
Cobalt	0.05	mg/L
Molybdenum	1.0	mg/L
Nickel	0.2	mg/L

NOTE: mg/L = milligram per liter
MAC = maximum allowable concentration
pCi/L = picocurie per liter

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APPENDIX A

2002 Wastewater Monitoring Results

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TABLE A-1. Permitted Sanitary Outfalls, March 2002

(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit No:	2069-A		2069F-4		2069G-2		2069I-3		2069K		Regulatory Limit COA (mg/L)
Station:	WW001		WW006		WW007		WW008		WW011		
Date Collected:	3/5/2002		3/5/2002		3/5/2002		3/5/2002		3/5/2002		
Sample ID:	058277		058278		058279		058280		058281		
Analyte											
Aluminum	0.0474	J	0.18		1.02		1.2		0.107		900
Arsenic	0.0127		0.0122		0.00457	U	0.0123		0.0142		0.051
Boron	1.14	B	0.234	B	0.0119	BJ	0.0767	B	0.169	B	NE
Cadmium	0.000417	J	0.000569	J	0.000251	U	0.000251	U	0.000251	U	0.5
Chromium	0.000781	U	0.00215	J	0.000781	U	0.000781	U	0.000804	J	4.1
Copper	0.0342		0.0489		0.00267	U	0.0076		0.0254		5.3
Fluoride	0.648		0.253		11.1		6.32		0.52		36
Lead	0.00344	U	0.00353	J	0.00344	U	0.00499	J	0.00344	U	1
Molybdenum	0.987		0.0269		0.000755	J	0.0534		0.0881		2
Nickel	0.000743	U	0.00649		0.000743	U	0.000743	U	0.000743	U	2
Selenium	0.00309	U	0.00309	U	0.00309	U	0.00309	U	0.00309	U	0.46
Silver	0.000197	U	0.0014	J	0.000197	U	0.000197	U	0.000197	U	5
Zinc	0.129		0.101		0.00281	U	0.049		0.114		2.2

Permit No:	2069-A		2069F-4		2069G-2		2069I-3		2069K		Regulatory Limit COA (mg/L)
Station:	WW001		WW006		WW007		WW008		WW011		
Date Collected:	3/6/2002		3/6/2002		3/6/2002		3/6/2002		3/6/2002		
Sample ID:	058282		058283		058284		058285		058286		
Analyte											
Aluminum	0.097		0.102		0.0343	U	0.215		0.0343	U	900
Arsenic	0.014		0.0128		0.00457	U	0.0116		0.0102		0.051
Boron	0.352		0.22		0.0092	J	0.0692		0.129		NE
Cadmium	0.000445	J	0.000528	J	0.000251	U	0.000277	J	0.000251	U	0.5
Chromium	0.00123	J	0.00242	J	0.000781	U	0.000781	U	0.000781	U	4.1
Copper	0.0839		0.0282		0.00267	U	0.0117		0.0134		5.3
Fluoride	0.822		1.03		9.2		5.96		0.482		36
Lead	0.00403	J	0.00389	J	0.00344	U	0.0068		0.00344	U	1
Molybdenum	0.248		0.107		0.000594	U	0.0533		0.0448		2
Nickel	0.00181	J	0.00531		0.000743	U	0.00122	J	0.000743	U	2
Selenium	0.00394	J	0.00309	U	0.00309	U	0.00309	U	0.00309	U	0.46
Silver	0.000844	J	0.00205	J	0.000197	U	0.000197	U	0.000763	J	5
Zinc	0.113		0.0632		0.00281	U	0.0849		0.0571		2.2

NOTES: COA = City of Albuquerque

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).

NE = not established.

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TABLE A-2. Summary of Sanitary Outfalls of Radiological Analyses, March 2002

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			Regulatory Limit 10 CFR 20
Station:	WW001			WW006			WW008			WW011			
Date Collected:	3/5/2002			3/5/2002			3/5/2002			3/5/2002			
Sample ID :	058277			058278			058280			058281			
Analyte	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	
Actinium-228	0 ± 7.83	U	15.6	1.41 ± 18.2	U	19.4	0.501 ± 13	U	15.1	0 ± 9.77	U	18.8	300,000
Americium-241	0.85 ± 12.6	U	19.7	-7.93 ± 12.8	U	18.6	-3.5 ± 10.5	U	18.4	0.76 ± 3.7	U	6.41	200
Antimony-124	0.104 ± 2.24	U	3.93	-0.286 ± 2.83	U	5.05	2.19 ± 2.63	U	4.8	-0.0835 ± 2.75	U	4.94	NE
Antimony-125	-2.58 ± 5.49	U	9.47	-0.679 ± 6.12	U	11.1	1.29 ± 5.46	U	9.84	-6.25 ± 6.69	U	10.7	NE
Barium-133	-1.58 ± 2.67	U	4.61	2.22 ± 3.07	U	5.46	-1.56 ± 2.72	U	4.72	0.381 ± 3	U	5.22	NE
Beryllium-7	-9.03 ± 19	U	32.7	5.11 ± 27.6	U	45	-9.47 ± 22.5	U	38.9	-24.1 ± 24	U	37.5	NE
Bismuth-211	0 ± 21.9	U	21.3	12.8 ± 15.1	U	26.9	6.45 ± 12.6	U	23	0 ± 26.5	U	24.7	NE
Bismuth-212	3 ± 17.1	U	30.1	0 ± 36	U	31	13.5 ± 17.8	U	32.4	11.2 ± 41	U	38.1	NE
Bismuth-214	0 ± 8.36	U	7.5	0.705 ± 9.62	U	9.49	3.47 ± 8.2	U	9.81	2.37 ± 8.42	U	10.5	NE
Cadmium-109	5.02 ± 66	U	82.2	-8.89 ± 44.9	U	80.3	19.4 ± 46.2	U	81.3	8.53 ± 59.4	U	67.6	NE
Cerium-139	-0.612 ± 2	U	3.33	-0.00865 ± 2.03	U	3.57	0.773 ± 1.98	U	3.42	1.31 ± 2	U	3.33	NE
Cerium-141	-0.116 ± 4.27	U	7.22	0 ± 7.46	U	7.85	1.91 ± 7.51	U	7.89	-4.21 ± 3.89	U	6.72	NE
Cerium-144	5.02 ± 13.6	U	23.4	9.66 ± 16	U	24.4	-3.09 ± 13.5	U	23	-0.729 ± 13.1	U	21.4	30,000
Cesium-134	0.342 ± 2.15	U	3.34	-1.29 ± 2.2	U	3.77	-0.948 ± 2.48	U	3.69	-1.67 ± 2.37	U	4.07	9,000
Cesium-137	-1.25 ± 2.11	U	3.54	0.778 ± 2.14	U	4.01	-0.259 ± 2.15	U	3.75	-0.522 ± 2.91	U	4.52	10,000
Chromium-51	-6.71 ± 23.1	U	40.6	5.35 ± 32.5	U	56.2	-14.4 ± 27.7	U	48.6	8.92 ± 25.5	U	45	5,000,000
Cobalt-57	0.259 ± 1.73	U	2.95	0 ± 1.77	U	3.3	0.0112 ± 1.67	U	2.87	0.464 ± 1.62	U	2.71	NE
Cobalt-60	1.46 ± 2.35	U	4.49	-0.275 ± 2.57	U	4.75	0.365 ± 2.08	U	3.89	0.257 ± 2.75	U	5.12	30,000
Europium-152	-2.31 ± 5.62	U	9.8	-1.92 ± 7.46	U	11.1	0.598 ± 6.59	U	10.5	1.1 ± 6.91	U	12	NE
Europium-154	1.78 ± 6.08	U	11.4	-2.9 ± 7.42	U	13.2	-2.67 ± 6.67	U	9.98	0.069 ± 8.27	U	13.4	NE
Gross Alpha	1.29 ± 0.988	U	1.35	0.353 ± 3.15	U	5.43	2.5 ± 1.22		1.57	1.93 ± 0.964		1.23	NE
Gross Beta	21.9 ± 2.09		2.31	65.9 ± 6.72		7.88	11.1 ± 1.98		2.82	12.7 ± 1.68		2.19	NE
Iron-59	-3.07 ± 5.1	U	8.81	3.48 ± 5.81	U	11.6	1.4 ± 5.38	U	10	-3.26 ± 6.12	U	10.8	100,000
Lead-211	7.31 ± 55.6	U	98.9	0.943 ± 57.7	U	106	-25.2 ± 57.6	U	96.7	0.354 ± 63.5	U	109	NE
Lead-212	10.8 ± 7.69		6.27	0.862 ± 7.73	U	6.74	0 ± 8.84	U	9.11	0 ± 5.58	U	9.54	20,000
Lead-214	0 ± 7.62	U	8.6	2.88 ± 5.45	U	9.53	3.58 ± 4.33	U	7.96	0 ± 9.22	U	10.1	1,000,000
Manganese-54	0.0588 ± 2.12	U	3.68	0.975 ± 2.51	U	4.62	0.348 ± 2.15	U	3.78	0.955 ± 2.53	U	4.63	NE
Mercury-203	1.15 ± 2.42	U	4.39	0.832 ± 2.99	U	5.24	1.14 ± 4.73	U	4.81	-0.395 ± 2.72	U	4.72	NE
Neptunium-237	1.48 ± 19.4	U	24.3	-11.4 ± 13.9	U	23.7	-12.2 ± 14.2	U	23.6	2.5 ± 17.5	U	21	NE
Neptunium-239	-4.06 ± 12.9	U	21.7	-0.122 ± 12.6	U	22.4	9.25 ± 14	U	22.3	-4.72 ± 12.2	U	19.8	NE
Niobium-95	1.42 ± 2.72	U	4.9	-0.0778 ± 3.72	U	5.85	0.136 ± 3.09	U	5.41	2.78 ± 3.53	U	6.58	NE

See notes at end of table.

TABLE A-2. Summary of Sanitary Outfalls of Radiological Analyses, March 2002 (concluded)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			Regulatory Limit 10 CFR 20
Station:	WW001			WW006			WW008			WW011			
Date Collected:	3/5/2002			3/5/2002			3/5/2002			3/5/2002			
Sample ID :	058277			058278			058280			058281			
Analyte	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	
Potassium-40	0 ± 38.6	U	41.5	0 ± 62.9	U	52.4	0 ± 41	U	38.4	16.1 ± 63.8	U	44.7	40,000
Protactinium-231	-18.2 ± 91.8	U	163	-24.3 ± 109	U	185	17.6 ± 101	U	171	20.9 ± 102	U	179	NE
Protactinium-233	-0.561 ± 3.83	U	6.78	-2.54 ± 4.59	U	7.59	1.24 ± 3.92	U	7.11	2.28 ± 4.26	U	7.6	NE
Protactinium-234	8.29 ± 16.1	U	30.6	-8.95 ± 17.6	U	29.5	0.0764 ± 16	U	29.4	-24.2 ± 21.5	U	32.8	NE
Radium-223	0 ± 39.9	U	73.5	-1.07 ± 46.4	U	79.5	33.7 ± 46.3	U	72.1	-16.8 ± 45	U	76.5	NE
Radium-224	0 ± 44.6	U	76.7	22.8 ± 48.9	U	77.7	0 ± 49.6	U	78.8	-181 ± 54.8	U	78.2	NE
Radium-226	0 ± 8.36	U	7.5	0.705 ± 9.62	U	9.49	3.47 ± 8.2	U	9.81	2.37 ± 8.42	U	8.71	600
Radium-228	0 ± 7.83	U	15.6	1.41 ± 18.2	U	19.4	0.501 ± 13	U	15.1	0 ± 9.77	U	18.8	600
Radon-219	-21.7 ± 25.2	U	42.7	0 ± 26.7	U	50.9	-9.76 ± 24.5	U	42.8	-8.5 ± 29.7	U	49.9	NE
Rhodium-106	2.53 ± 19.7	U	34.6	-25 ± 20.8	U	33.5	5.64 ± 19.3	U	34.5	15.3 ± 23.6	U	44.1	NE
Ruthenium-103	1.16 ± 2.59	U	4.17	-1.17 ± 3.01	U	5.32	-2.12 ± 3.37	U	4.95	0 ± 3.8	U	5.08	300,000
Ruthenium-106	-2.93 ± 19.8	U	34.2	-21.3 ± 20.7	U	33.8	-1.15 ± 19.6	U	34.3	10.9 ± 24	U	44.2	30,000
Selenium-75	0.367 ± 2.67	U	4.8	-0.761 ± 3.21	U	5.47	-0.745 ± 3.03	U	5.02	2.01 ± 2.99	U	5.38	NE
Sodium-22	0.652 ± 2.18	U	4.09	-1.03 ± 2.67	U	4.76	-1.55 ± 2.49	U	3.59	0.00551 ± 2.96	U	4.77	NE
Strontium-85	-23 ± 3.59	U	4.55	-20.1 ± 4.8	U	6.11	-20.1 ± 4.4	U	5.51	-17.3 ± 4.47	U	6.06	NE
Thallium-208	2.37 ± 5.19	U	5.32	0 ± 5.74	U	5.3	0.166 ± 4.45	U	3.6	1.27 ± 4.98	U	6.21	NE
Thorium-227	-12.9 ± 23	U	40.3	-6.31 ± 27.4	U	46.7	14.7 ± 28.4	U	43.3	-12.4 ± 24.5	U	41.8	NE
Thorium-231	-7.23 ± 10.8	U	18.8	5.87 ± 12.5	U	22.1	3.1 ± 11.6	U	19.7	5.97 ± 14.4	U	19.5	300
Thorium-234	16.4 ± 183	U	163	9.89 ± 122	U	162	0 ± 105	U	177	0 ± 75.1	U	93.4	50,000
Tin-113	0.415 ± 2.71	U	4.83	-1.66 ± 3.26	U	5.35	0.949 ± 3.09	U	4.96	1.4 ± 3.15	U	5.55	NE
Tritium	26.4 ± 89.8	U	156	-26.7 ± 87.2	U	157	53.5 ± 92.4	U	158	103 ± 91.7	U	151	10,000,000
Uranium-235	0 ± 14.2	U	24.8	11.7 ± 21.5	U	26.1	6.39 ± 20.7	U	24.5	0 ± 13.3	U	24.4	3,000
Uranium-238	16.4 ± 183	U	163	9.89 ± 122	U	162	0 ± 105	U	177	0 ± 75.1	U	93.4	3,000
Yttrium-88	0.503 ± 2.5	U	4.83	-0.899 ± 2.82	U	5.03	-0.283 ± 2.97	U	5.28	0 ± 3.4	U	5.41	100,000
Zinc-65	1.55 ± 5.39	U	8.77	-2.53 ± 5.82	U	10.4	-7.45 ± 5.24	U	8.33	1.16 ± 5.65	U	9.44	NE
Zirconium-95	0.683 ± 3.89	U	6.89	2.34 ± 5.38	U	8.95	-1.11 ± 4.31	U	7.4	0.788 ± 5.55	U	9.95	200,000

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.
NE = not established.
MDA = minimum detectable activity.
CFR = Code of Federal Regulations

TABLE A-3. Permitted Sanitary Outfalls of Volatile Organic Compounds, March 2002

(All Results in micrograms per liter [μg/L] unless otherwise noted.)

Permit Number:	**2069-A**		**2069F-4**		**2069G-2**	**2069I-3**		**2069K**	
Station:	**WW001**		**WW006**		**WW007**	**WW008**		**WW011**	
Date Collected:	**3/5/2002**		**3/5/2002**			**3/5/2002**		**3/5/2002**	
Sample ID:	**058277**		**058278**			**058280**		**058281**	
Analyte									
1,1,1-Trichloroethane	0.37	U	0.37	U	Not Sampled	0.37	U	0.37	U
1,1,2,2-Tetrachloroethane	0.09	U	0.09	U	Not Sampled	0.09	U	0.09	U
1,1,2-Trichloroethane	0.32	U	0.32	U	Not Sampled	0.32	U	0.32	U
1,1-Dichloroethane	0.21	U	0.21	U	Not Sampled	0.21	U	0.21	U
1,1-Dichloroethylene	0.29	U	0.29	U	Not Sampled	0.29	U	0.29	U
1,2-Dichloroethane	0.19	U	0.19	U	Not Sampled	0.19	U	0.19	U
1,2-Dichloropropane	0.28	U	0.28	U	Not Sampled	0.28	U	0.28	U
2-Butanone	3.51	J	5.85		Not Sampled	3.11	J	3.55	J
2-Hexanone	0.78	U	0.78	U	Not Sampled	0.78	U	0.78	U
4-Methyl-2-pentanone	0.77	U	0.77	U	Not Sampled	0.77	U	0.77	U
Acetone	36.1	B	90.8	B	Not Sampled	126	B	150	B
Benzene	1.09		0.28	U	Not Sampled	0.28	U	0.28	U
Bromodichloromethane	0.18	U	0.18	U	Not Sampled	0.18	U	0.18	U
Bromoform	0.328	J	0.17	U	Not Sampled	0.17	U	0.17	U
Bromomethane	0.78	U	0.78	U	Not Sampled	0.78	U	0.78	U
Carbon disulfide	1.26	U	1.26	U	Not Sampled	1.26	U	1.26	U
Carbon tetrachloride	0.3	U	0.3	U	Not Sampled	0.3	U	0.3	U
Chlorobenzene	0.23	U	0.23	U	Not Sampled	0.23	U	0.23	U
Chloroethane	0.91	U	0.91	U	Not Sampled	0.91	U	0.91	U
Chloroform	0.233	J	0.19	U	Not Sampled	0.19	U	0.19	U
Chloromethane	0.33	U	0.33	U	Not Sampled	0.33	U	0.33	U
cis-1,2-Dichloroethylene	0.31	U	0.31	U	Not Sampled	0.31	U	0.31	U
cis-1,3-Dichloropropylene	0.32	U	0.32	U	Not Sampled	0.32	U	0.32	U
Dibromochloromethane	0.19	U	0.19	U	Not Sampled	0.19	U	0.19	U
Ethylbenzene	0.17	U	0.17	U	Not Sampled	0.17	U	0.17	U
Methylene chloride	0.35	U	0.35	U	Not Sampled	0.35	U	0.35	U
Styrene	0.25	U	0.25	U	Not Sampled	0.25	U	0.25	U
Tetrachloroethylene	0.25	U	0.25	U	Not Sampled	0.25	U	0.25	U
Toluene	0.552	BJ	0.917	BJ	Not Sampled	0.176	BJ	0.365	BJ
trans-1,2-Dichloroethylene	0.31	U	0.31	U	Not Sampled	0.31	U	0.31	U
trans-1,3-Dichloropropylene	0.19	U	0.19	U	Not Sampled	0.19	U	0.19	U
Trichloroethylene	0.31	U	0.31	U	Not Sampled	0.31	U	0.31	U
Vinyl chloride	0.39	U	0.39	U	Not Sampled	0.39	U	0.39	U
Xylenes (total)	0.31	U	0.31	U	Not Sampled	0.31	U	0.31	U

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL

SNL/NM uses the City of Albuquerque's value of 3.2 mg/L as the standard (that value has not been exceeded). This value is derived from the summation of all values greater than 0.01 mg/L for the list of toxic organics as developed by the EPA for each National Categorical Pretreatment Standard. For non-categorical users, the summation of all values above 0.01 mg/L of those listed in 40 CFR 122, Appendix D, Table II, or as directed by the Industrial Waste Engineer. Based on the Sewer Use and Wastewater Control Table, this value should never exceed 3.2 mg/L.

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TABLE A-4. Permitted Sanitary Outfalls, September 2002
(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit No:	2069-A		2069F-4		2069G-2		2069I-3		2069K		Regulatory Limit
Station:	WW001		WW006		WW007		WW008		WW011		COA
Date Collected:	9/10/2002		9/10/2002		9/10/2002		9/10/2002		9/10/2002		(mg/L)
Sample ID:	059755		059756		059757		059758		059759		
Analyte											
Aluminum	0.0876	J	0.131		0.267		0.0979	J	0.1		900
Arsenic	0.0168		0.0151		0.00224	U	0.0142		0.0116		0.051
Boron	0.132		0.299		0.00488	U	0.0595		0.239		NE
Cadmium	0.000313	U	0.000313	U	0.000313	U	0.000313	U	0.000571	J	0.5
Chromium	0.00147	J	0.00162	J	0.00113	J	0.00152	J	0.00235	J	4.1
Copper	0.0225		0.0143		0.00139	U	0.019		0.0249		5.3
Fluoride	0.781		0.616		13.3		6.79		0.702		36
Lead	0.00186	J	0.00172	U	0.00172	U	0.00296	J	0.00538		1
Molybdenum	0.144		0.0966		0.00143	U	0.0733		0.611		2
Nickel	0.00116	J	0.00129	J	0.00111	J	0.000738	J	0.00309	J	2
Selenium	0.00383	J	0.00281	U	0.00281	U	0.00319	J	0.00281	U	0.46
Silver	0.000835	U	0.000835	U	0.000835	U	0.000835	U	0.000835	U	5
Zinc	0.21		0.0517		0.000883	U	0.0714		0.116		2.2

Permit No:	2069-A		2069F-4		2069G-2		2069I-3		2069K		Regulatory Limit
Station:	WW001		WW006		WW007		WW008		WW011		COA
Date Collected:	9/11/2002		9/11/2002		9/11/2002		9/11/2002		9/11/2002		(mg/L)
Sample ID:	059761		059762		059763		059764		059765		
Analyte											
Aluminum	0.207		0.164		0.364		0.184		0.0669	J	900
Arsenic	0.0244		0.0136		0.00224	U	0.0122		0.00827		0.051
Boron	0.173		0.185		0.00488	U	0.0491	J	0.128		NE
Cadmium	0.000313	U	0.000313	U	0.000313	U	0.000313	U	0.000313	U	0.5
Chromium	0.00207	J	0.00218	J	0.00143	J	0.00158	J	0.00215	J	4.1
Copper	0.0169		0.0129		0.00139	U	0.0152		0.0166		5.3
Fluoride	0.994		0.67		13.9		7.95		0.444		36
Lead	0.00172	U	0.00172	U	0.00172	U	0.00207	J	0.00264	J	1
Molybdenum	0.217		0.0701		0.00143	U	0.0565		1.04		2
Nickel	0.00127	J	0.00069	U	0.00069	U	0.00069	U	0.00216	J	2
Selenium	0.00281	U	0.00281	U	0.00304	J	0.00281	U	0.00313	J	0.46
Silver	0.000835	U	0.000835	U	0.000835	U	0.000835	U	0.000835	U	5
Zinc	0.111		0.035		0.00197	J	0.0558		0.118		2.2

Permit No:	2069-A		2069F-4		2069G-2		2069I-3		2069K	Regulatory Limit
Station:	WW001		WW006		WW007		WW008		WW011	COA
Date Collected:	9/10/2002		9/11/2002		9/11/2002		9/9/2002			(mg/L)
Sample ID:	059937		059938		059939		059940			
Analyte										
Cyanide, Total	0.00975		0.00817		0.00172	U	0.00172	U	Not Sampled	0.45
Cyanide, Total	0.0133		0.0108		0.00172	U	0.00469	J	Not Sampled	0.45
Cyanide, Total	0.00638		0.00484	J	0.00172	U	0.00172	U	Not Sampled	0.45
Cyanide, Total	0.00523		0.00248	J	0.00172	U	0.00309	J	Not Sampled	0.45

NOTES: COA = City of Albuquerque
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE A-5. Summary of Sanitary Outfalls of Radiological Analyses, September 2002
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			Regulatory Limit 10 CFR 20
Station:	WW001			WW006			WW008			WW011			
Date Collected:	9/10/2002			9/10/2002			9/10/2002			9/10/2002			
Sample ID :	059755			059756			059758			059759			
Analyte	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	
Actinium-228	0 ± 19.8	UX	24.8	0 ± 7.68	UX	15	4.45 ± 16.8	U	14.6	0 ± 13.9	UX	16.4	300,000
Americium-241	-0.522 ± 4.24	U	7.28	0 ± 9.44	UX	16	-8.96 ± 11.9	U	17.9	-4.61 ± 9.3	U	14.9	200
Antimony-124	-1.12 ± 3.45	U	6.12	0 ± 3.15	UX	4.77	0.592 ± 2.43	U	4.27	-0.572 ± 2.61	U	4.52	NE
Antimony-125	-4.16 ± 7.66	U	12.7	-1.01 ± 5.01	U	8.88	-5 ± 4.87	U	8.11	-1.96 ± 5.04	U	8.84	NE
Barium-133	-2.27 ± 3.88	U	5.69	0.0619 ± 2.62	U	4.18	1.08 ± 2.62	U	4.17	0.13 ± 2.55	U	4.08	NE
Beryllium-7	17.5 ± 30	U	53.6	-5.81 ± 20.4	U	35.8	-4.16 ± 19.4	U	33.8	4.47 ± 21.1	U	38	NE
Bismuth-211	0 ± 31.6	UX	28.3	3.18 ± 24.1	U	19.2	0 ± 25.9	UX	18.7	0 ± 28.1	UX	20.8	NE
Bismuth-212	0 ± 25.8	UX	50.1	0 ± 15	UX	28.1	0.364 ± 14.6	U	25.3	9.79 ± 16.6	U	29.9	NE
Bismuth-214	11.2 ± 11		10.6	0 ± 9.67	UX	8.38	7.44 ± 8.45		6.11	0 ± 8.37	UX	8.98	NE
Cadmium-109	34.7 ± 45.4	U	78.7	-28 ± 38.7	U	67.3	2.34 ± 49.4	U	75.7	-37.3 ± 45	U	69.6	NE
Cerium-139	-0.915 ± 2.48	U	3.94	-1.02 ± 1.79	U	3.04	0.782 ± 1.88	U	3.21	0.125 ± 1.85	U	3.22	NE
Cerium-141	4.38 ± 5.8	U	9.85	-0.046 ± 4.48	U	7.82	2.25 ± 4.79	U	8.18	2.58 ± 8.7	U	8.15	NE
Cerium-144	4.25 ± 16	U	26.7	7.58 ± 12.1	U	21.5	2.79 ± 12.6	U	21.5	9.33 ± 13.7	U	20.8	30,000
Cesium-134	-0.391 ± 2.74	U	4.93	-0.27 ± 2.33	U	3.54	-0.269 ± 1.89	U	3.25	1.13 ± 2.21	U	3.53	9,000
Cesium-137	1.04 ± 2.9	U	5.42	0 ± 1.82	UX	3.63	-0.361 ± 2.07	U	3.56	-0.0828 ± 2.06	U	3.6	10,000
Chromium-51	1.09 ± 35	U	61.5	0.811 ± 27.9	U	47	-18.3 ± 27.2	U	46.9	11.5 ± 31.6	U	54	5,000,000
Cobalt-57	-0.223 ± 1.91	U	3.14	0.749 ± 1.49	U	2.65	0.204 ± 1.61	U	2.74	0 ± 2.52	UX	2.63	NE
Cobalt-60	0 ± 3.67	UX	7.57	0.259 ± 2.13	U	3.9	0.314 ± 2.16	U	3.94	-0.483 ± 2.25	U	3.97	30,000
Europium-152	-6.57 ± 7.8	U	12.8	-3.11 ± 5.65	U	9.19	0.809 ± 5.23	U	9.31	-2.26 ± 5.76	U	9.47	NE
Europium-154	-11.9 ± 9.36	U	14.6	2.43 ± 5.94	U	11.2	-2.83 ± 5.62	U	9.7	-1.32 ± 6.61	U	11.7	NE
Gross Alpha	5.58 ± 1.55		1.6	6.54 ± 2.91		3.44	4.3 ± 1.83		2.66	5.12 ± 2.12		2.77	NE
Gross Beta	19.9 ± 2.03		2.44	25.5 ± 3.88		5.35	11.6 ± 1.69		2.19	29.3 ± 3.47		4.12	NE
Iron-59	-1.42 ± 8.01	U	14.7	0.05 ± 5.36	U	9.75	2.67 ± 5.01	U	9.43	-5.88 ± 5.94	U	9.81	100,000
Lead-211	-41 ± 78	U	123	-26.6 ± 51.5	U	85.3	-11 ± 51.6	U	89.3	-46.2 ± 57.3	U	85.2	NE
Lead-212	0 ± 8.99	UX	11	0 ± 3.75	UX	6.65	0.391 ± 8.81	U	7.58	4.7 ± 7.82	U	5.43	20,000
Lead-214	9.77 ± 11		9.3	1.11 ± 8.39	U	7.48	0 ± 9.02	UX	8.18	0 ± 9.76	UX	7.87	1,000,000
Manganese-54	-2.65 ± 3.05	U	4.98	0 ± 1.94	UX	3.61	-0.676 ± 1.96	U	3.29	-0.629 ± 2.19	U	3.71	NE
Mercury-203	1.31 ± 3.59	U	6.42	-0.404 ± 2.62	U	4.41	2.04 ± 2.62	U	4.76	0 ± 2.93	UX	5.12	NE
Neptunium-237	-3.56 ± 13.9	U	23	-1.13 ± 11.3	U	20.2	0 ± 14.7	UX	22.8	0.408 ± 19.6	U	20.3	NE
Neptunium-239	-1.05 ± 13.5	U	22.3	0 ± 11.1	UX	20	-7.99 ± 12	U	20	-2.61 ± 11.1	U	19.4	NE
Niobium-95	-2.48 ± 4.86	U	8.32	-2.92 ± 3.22	U	5.2	1.67 ± 6.83	U	5.16	1.2 ± 3.51	U	6.23	NE

See notes at end of table.

TABLE A-5. Summary of Sanitary Outfalls of Radiological Analyses, September 2002 (concluded)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			Regulatory Limit 10 CFR 20
Station:	WW001			WW006			WW008			WW011			
Date Collected:	9/10/2002			9/10/2002			9/10/2002			9/10/2002			
Sample ID :	059755			059756			059758			059759			
Analyte	Activity		MDA	Activity		MDA	Activity		MDA	Activity		MDA	
Potassium-40	0 ± 49	UX	105	0 ± 30.3	UX	60.3	21.5 ± 48.1	U	33.5	0 ± 32.1	UX	58	40,000
Protactinium-231	-47.4 ± 119	U	205	-16.5 ± 88.3	U	148	30.6 ± 84.8	U	152	18.3 ± 86.9	U	149	NE
Protactinium-233	-2.6 ± 4.92	U	8.33	1.1 ± 3.93	U	6.7	0.062 ± 3.51	U	6.23	-0.234 ± 3.84	U	6.45	NE
Protactinium-234	-0.389 ± 23	U	41.3	0 ± 15.4	UX	29.7	1.46 ± 27.4	U	26.2	9.53 ± 14.6	U	27.9	NE
Radium-223	-13.4 ± 50	U	85.9	-11.4 ± 37.9	U	62.7	3.04 ± 36.6	U	64.9	8.25 ± 39.6	U	67.1	NE
Radium-224	0 ± 51.9	UX	86.6	-50.2 ± 40.4	U	64.9	4.42 ± 99.5	U	61	0 ± 88.3	UX	58.4	NE
Radium-226	11.2 ± 11		10.6	7.55 ± 9.67		7.3	7.44 ± 8.45		6.11	9.95 ± 8.37		7.19	600
Radium-228	0 ± 19.8	UX	24.8	0 ± 7.68	UX	15	4.45 ± 16.8	U	14.6	0 ± 13.9	UX	16.4	600
Radon-219	18.3 ± 31.9	U	57.2	3.54 ± 22	U	39.8	-8.5 ± 22.2	U	38.4	0 ± 22.3	UX	41.4	NE
Rhodium-106	-24.1 ± 26.3	U	44.2	-0.152 ± 20.4	U	31.5	5.9 ± 20.7	U	32.2	3.55 ± 18.4	U	32.8	NE
Ruthenium-103	0.423 ± 3.84	U	7.11	-1.83 ± 2.79	U	4.76	-0.497 ± 2.73	U	4.74	-0.461 ± 2.93	U	5.17	300,000
Ruthenium-106	-16.1 ± 25.5	U	43.9	-4.29 ± 20.7	U	31.2	5.58 ± 20.7	U	32.2	6.07 ± 18.4	U	33	30,000
Selenium-75	0 ± 4.23	UX	6.34	1.45 ± 2.75	U	4.77	-1.25 ± 2.6	U	4.54	-3.25 ± 2.78	U	4.44	NE
Sodium-22	-4.3 ± 3.35	U	5.23	0.85 ± 2.14	U	4	-1.03 ± 2.02	U	3.49	-0.492 ± 2.38	U	4.2	NE
Strontium-85	-19.2 ± 5.4	U	7.38	-22.9 ± 4.4	U	5.09	-9.08 ± 3.89	U	6.01	-8.06 ± 4.12	U	6.58	NE
Thallium-208	1.94 ± 6.37	U	7.12	0.859 ± 3.86	U	4.16	0 ± 2.52	UX	4.7	0 ± 3.93	UX	4.52	NE
Thorium-227	-24.8 ± 30.5	U	51	17 ± 23	U	39.9	-1.35 ± 21.6	U	38.4	-3.97 ± 21.7	U	36.6	NE
Thorium-231	0 ± 19.6	UX	24.7	-0.0411 ± 10.4	U	17.7	-1.24 ± 9.99	U	17.7	-7.46 ± 10.9	U	17.9	300
Thorium-232	5.42 ± 8.77	U	7.57	0 ± 3.65	UX	6.48	0.382 ± 8.59	U	5.13	4.57 ± 7.6	U	5.28	500,000
Thorium-234	0 ± 76.1	UX	104	0 ± 89	UX	145	0 ± 119	UX	176	0 ± 89.6	UX	147	50,000
Tin-113	-1.35 ± 3.59	U	6.05	0.682 ± 2.52	U	4.58	-0.627 ± 2.65	U	4.62	0.334 ± 2.66	U	4.8	NE
Tritium	-57.3 ± 109	U	197	89.1 ± 121	U	204	-29.7 ± 115	U	204	29 ± 115	U	200	10,000,000
Uranium-235	7.15 ± 23.9	U	28.4	2.44 ± 12.1	U	21.2	0 ± 13.2	UX	22.6	6.45 ± 21.8	U	19.6	3,000
Uranium-238	0 ± 76.1	UX	104	0 ± 89	UX	145	0 ± 119	UX	176	0 ± 89.6	UX	147	3,000
Yttrium-88	-1.36 ± 3.07	U	5.67	-0.672 ± 2.12	U	3.88	0.686 ± 2.25	U	4.38	-0.45 ± 2.56	U	4.71	100,000
Zinc-65	-3.49 ± 8.27	U	12.6	-1.32 ± 4.78	U	8.44	0.214 ± 4.17	U	6.67	-0.241 ± 4.29	U	7.76	NE
Zirconium-95	4.94 ± 6.63	U	12.6	-0.027 ± 4.21	U	7.35	-0.878 ± 4.15	U	7.08	-1.55 ± 4.18	U	7.11	200,000

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.
X = Presumptive evidence that the analyte is not present.
NE = not established.
CFR = Code of Federal Regulations

Table A-6. Permitted Sanitary Outfalls of Volatile Organic Compounds, September 2002
(All Results in micrograms per liter [μg/L] unless otherwise noted.)

Permit Number:	2069-A		2069F-4		2069G-2		2069I-3		2069K	
Station:	WW001		WW006		WW007		WW008		WW011	
Date Collected:	9/11/2002		9/11/2002		9/11/2002		9/11/2002		9/11/2002	
Sample ID:	059755		059756		059757		059758		059759	
Analyte										
1,1,1-Trichloroethane	0.34	U	0.34	U	0.34	U	0.34	U	0.34	U
1,1,2,2-Tetrachloroethane	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U
1,1,2-Trichloroethane	0.44	U	0.44	U	0.44	U	0.44	U	0.44	U
1,1-Dichloroethane	0.41	U	0.41	U	0.41	U	0.41	U	0.41	U
1,1-Dichloroethylene	0.41	U	0.41	U	0.41	U	0.41	U	0.41	U
1,2-Dichloroethane	0.29	U	0.29	U	0.29	U	0.29	U	0.29	U
1,2-Dichloropropane	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2-Butanone	2.31	U	2.31	U	12.6		2.31	U	2.65	J
2-Hexanone	1.45	U	1.45	U	1.45	U	1.45	U	1.45	U
4-Methyl-2-pentanone	1.78	U	1.78	U	1.78	U	1.78	U	1.78	U
Acetone	168		79		12.7		52.2		255	
Benzene	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Bromodichloromethane	0.38	U	0.38	U	0.38	U	0.38	U	0.38	U
Bromoform	35.9		0.5	U	0.5	U	0.5	U	0.5	U
Bromomethane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon disulfide	1.91	U	1.91	U	1.91	U	1.91	U	1.91	U
Carbon tetrachloride	0.29	U	0.29	U	0.29	U	0.29	U	0.29	U
Chlorobenzene	0.32	U	0.32	U	0.32	U	0.32	U	0.32	U
Chloroethane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U
Chloromethane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-Dichloroethylene	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
cis-1,3-Dichloropropylene	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Dibromochloromethane	0.617	J	0.29	U	0.29	U	0.29	U	0.29	U
Ethylbenzene	0.21	U	0.21	U	0.21	U	0.21	U	0.362	J
Methylene chloride	3.3	U	3.3	U	3.3	U	3.3	U	275	
Styrene	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
Tetrachloroethylene	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Toluene	0.39	U	0.39	U	0.39	U	0.39	U	1.22	
trans-1,2-Dichloroethylene	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U
trans-1,3-Dichloropropylene	0.29	U	0.29	U	0.29	U	0.29	U	0.29	U
Trichloroethylene	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U
Vinyl chloride	0.55	U	0.55	U	0.55	U	0.55	U	0.55	U
Xylenes (total)	0.25	U	0.25	U	0.25	U	0.25	U	1.64	

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

SNL/NM uses the City of Albuquerque's value of 3.2 mg/L as the standard (that value has not been exceeded). This value is derived from the summation of all values greater than 0.01 mg/L for the list of toxic organics as developed by the EPA for each National Categorical Pretreatment Standard. For non-categorical users, the summation of all values above 0.01 mg/L of those listed in 40 CFR 122, Appendix D, Table II, or as directed by the Industrial Waste Engineer. Based on the Sewer Use and Wastewater Control Table, this value should never exceed 3.2 mg/L.

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TABLE A-7. Permitted Sanitary Outfalls of Semi-Volatile Organic Compounds, December 2002
(All results reported in micrograms per liter [μg/L] unless otherwise noted.)

Permit No: / Station: / Date Collected: / Sample ID:	SNL Lagoon #1 12/10/2002 060600		SNL Lagoon #2 12/10/2002 060601		Regulatory Limit 10 CFR 20
Analyte					
1,2,4-Trichlorobenzene	0.689	U	0.689	U	NE
2,4,6-Trichlorophenol	0.379	U	0.379	U	NE
2,4-Dichlorophenol	0.456	U	0.456	U	NE
2,4-Dimethylphenol	0.456	U	0.456	U	NE
2,4-Dinitrophenol	4.85	U	4.85	U	NE
2,4-Dinitrotoluene	0.68	U	0.68	U	NE
2,6-Dinitrotoluene	20.4		0.485	U	NE
2-Chloronaphthalene	0.388	U	0.388	U	NE
2-Chlorophenol	0.398	U	0.398	U	NE
2-Methyl-4,6-dinitrophenol	0.971	U	0.971	U	NE
2-Nitrophenol	0.573	U	0.573	U	NE
4-Chloro-3-methylphenol	0.67	U	0.67	U	NE
4-Nitrophenol	4.85	U	4.85	U	NE
Acenaphthene	0.485	U	0.485	U	NE
Acenaphthylene	0.485	U	0.485	U	NE
Anthracene	0.485	U	0.485	U	NE
Benzo(a)anthracene	0.485	U	0.485	U	NE
Benzo(a)pyrene	0.485	U	0.485	U	NE
Benzo(b)fluoranthene	0.485	U	0.485	U	NE
Benzo(ghi)perylene	0.485	U	0.485	U	NE
Benzo(k)fluoranthene	0.485	U	0.485	U	NE
bis(2-Chloroethoxy)methane	0.466	U	0.466	U	NE
bis(2-Chloroethyl) ether	1.33	U	1.33	U	NE
bis(2-Chloroisopropyl)ether	0.777	U	0.777	U	NE
bis(2-Ethylhexyl)phthalate	13	B	4.38	BJ	NE
Chrysene	0.485	U	0.485	U	NE
Dibenzo(a,h)anthracene	0.485	U	0.485	U	NE
Dibenzofuran	0.408	U	0.408	U	NE
Diethylphthalate	0.864	U	0.864	U	NE
Di-n-butylphthalate	0.971	U	0.971	U	NE
Di-n-octylphthalate	0.845	U	0.845	U	NE
Fluoranthene	0.485	U	0.485	U	NE
Fluorene	0.485	U	0.485	U	NE
Hexachlorobenzene	0.631	U	0.631	U	NE
Hexachlorobutadiene	0.311	U	0.311	U	NE
Hexachlorocyclopentadiene	0.971	U	0.971	U	NE
Hexachloroethane	0.417	U	0.417	U	NE
Indeno(1,2,3-cd)pyrene	0.485	U	0.485	U	NE
Isophorone	0.573	U	0.573	U	NE
Naphthalene	0.107	U	0.107	U	NE

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Semi-Volatile Organic Compounds, December 2002 (concluded)

(All results reported in micrograms per liter [μg/L] unless otherwise noted.)

Permit No: / **Station:** / **Date Collected:** / **Sample ID:**	**SNL Lagoon #1 12/10/2002 060600**		**SNL Lagoon #2 12/10/2002 060601**		**Regulatory Limit 10 CFR 20**
Analyte					
Nitrobenzene	0.612	U	0.612	U	NE
N-Nitrosodipropylamine	0.728	U	0.728	U	NE
Pentachlorophenol	4.85	U	4.85	U	NE
Phenanthrene	0.485	U	0.485	U	NE
Phenol	0.291	U	0.291	U	NE
Pyrene	0.485	U	0.485	U	NE

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.
B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
NE = not established.
CFR = Code of Federal Regulations

TABLE A-8. Permitted Sanitary Outfalls of Volatile Organic Compounds, December 2002
(All results reported in micrograms per liter [μg/L] unless otherwise noted.)

Permit No: / Station: / Date Collected: / Sample ID:	SNL Lagoon #1 12/10/2002 060600		SNL Lagoon #2 12/10/2002 060601		Regulatory Limit 10 CFR 20
Analyte					
1,1,1-Trichloroethane	0.34	U	0.34	U	NE
1,1,2,2-Tetrachloroethane	0.49	U	0.49	U	NE
1,1,2-Trichloroethane	0.44	U	0.44	U	NE
1,1-Dichloroethane	0.41	U	0.41	U	NE
1,1-Dichloroethylene	0.41	U	0.41	U	NE
1,2-Dichlorobenzene	0.398	U	0.398	U	NE
1,2-Dichloroethane	0.29	U	0.29	U	NE
1,2-Dichloropropane	0.25	U	0.25	U	NE
1,3-Dichlorobenzene	0.398	U	0.398	U	NE
1,4-Dichlorobenzene	0.301	U	0.301	U	NE
2,4,5-Trichlorophenol	0.942	U	0.942	U	NE
2-Butanone	5.17		2.31	U	NE
2-Hexanone	1.45	U	1.45	U	NE
2-Methylnaphthalene	0.485	U	0.485	U	NE
3,3'-Dichlorobenzidine	0.495	U	0.495	U	NE
4-Bromophenylphenylether	1.18	U	1.18	U	NE
4-Chloroaniline	1.07	U	1.07	U	NE
4-Chlorophenylphenylether	0.816	U	0.816	U	NE
4-Methyl-2-pentanone	1.78	U	1.78	U	NE
Acetone	27.7		5.41		NE
Benzene	0.33	U	0.33	U	NE
Bromodichloromethane	0.38	U	0.38	U	NE
Bromoform	0.5	U	0.5	U	NE
Bromomethane	0.5	U	0.5	U	NE
Butylbenzylphthalate	0.66	U	0.66	U	NE
Carbazole	0.485	U	0.485	U	NE
Carbon disulfide	1.91	U	1.91	U	NE
Carbon tetrachloride	0.29	U	0.29	U	NE
Chlorobenzene	0.32	U	0.32	U	NE
Chloroethane	0.5	U	0.5	U	NE
Chloroform	0.36	U	0.36	U	NE
Chloromethane	0.5	U	0.5	U	NE
cis-1,2-Dichloroethylene	0.3	U	0.3	U	NE
cis-1,3-Dichloropropylene	0.3	U	0.3	U	NE
Dibromochloromethane	0.29	U	0.29	U	NE
Dimethylphthalate	0.515	U	0.515	U	NE
Diphenylamine	0.767	U	0.767	U	NE
Ethylbenzene	0.21	U	0.21	U	NE
m,p-Cresols	0.573	U	0.573	U	NE
Methylene chloride	3.3	U	3.3	U	NE

See notes at end of table.

TABLE A-8. Permitted Sanitary Outfalls of Volatile Organic Compounds, December 2002 (concluded)

(All results reported in micrograms per liter [µg/L] unless otherwise noted.)

Permit No: / Station: / Date Collected: / Sample ID:	SNL Lagoon #1 12/10/2002 060600		SNL Lagoon #2 12/10/2002 060601		Regulatory Limit 10 CFR 20
Analyte					
m-Nitroaniline	0.971	U	0.971	U	NE
o-Cresol	0.437	U	0.437	U	NE
o-Nitroaniline	0.621	U	0.621	U	NE
p-Nitroaniline	0.65	U	0.65	U	NE
Styrene	0.25	U	0.25	U	NE
Tetrachloroethylene	0.33	U	0.33	U	NE
Toluene	0.39	U	0.39	U	NE
trans-1,2-Dichloroethylene	0.37	U	0.37	U	NE
trans-1,3-Dichloropropylene	0.29	U	0.29	U	NE
Trichloroethylene	0.36	U	0.36	U	NE
Vinyl acetate	1.32	U	1.32	U	NE
Vinyl chloride	0.55	U	0.55	U	NE
Xylenes (total)	0.25	U	0.25	U	NE

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.
NE = not established.

TABLE A-9. Permitted Sanitary Outfalls, CY 2002
(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit COA
2069A	**WW001**	Aluminum	4	0.110	0.068	0.0474	0.207	900
		Arsenic	4	0.017	0.005	0.0127	0.0244	0.051
		Boron	4	0.449	0.470	0.132	1.14	NE
		Cadmium	4	0.000	0.000	0.000313	0.000445	0.5
		Chromium	4	0.001	0.001	0.000781	0.00207	4.1
		Copper	4	0.039	0.031	0.0169	0.0839	5.3
		Cyanide, Total	4	0.009	0.004	0.00523	0.0133	0.45
		Fluoride	4	0.811	0.143	0.648	0.994	36
		Lead	4	0.003	0.001	0.00172	0.00403	1
		Molybdenum	4	0.399	0.394	0.144	0.987	2
		Nickel	4	0.001	0.000	0.000743	0.00181	2
		Selenium	4	0.003	0.001	0.00281	0.00394	0.46
		Silver	4	0.001	0.000	0.000197	0.000844	5
		Zinc	4	0.141	0.047	0.111	0.21	2.2
2069F-4	**WW006**	Aluminum	4	0.144	0.035	0.102	0.18	900
		Arsenic	4	0.013	0.001	0.0122	0.0151	0.051
		Boron	4	0.235	0.048	0.185	0.299	NE
		Cadmium	4	0.000	0.000	0.000313	0.000569	0.5
		Chromium	4	0.002	0.000	0.00162	0.00242	4.1
		Copper	4	0.026	0.017	0.0129	0.0489	5.3
		Cyanide, Total	4	0.007	0.004	0.00248	0.0108	0.45
		Fluoride	4	0.642	0.318	0.253	1.03	36
		Lead	4	0.003	0.001	0.00172	0.00389	1
		Molybdenum	4	0.075	0.036	0.0269	0.107	2
		Nickel	4	0.003	0.003	0.00069	0.00649	2
		Selenium	4	0.003	0.000	0.00281	0.00309	0.46
		Silver	4	0.001	0.001	0.000835	0.00205	5
		Zinc	4	0.063	0.028	0.035	0.101	2.2
2069G-2	**WW007**	Aluminum	4	0.421	0.422	0.0343	1.02	900
		Arsenic	4	0.003	0.001	0.00224	0.00457	0.051
		Boron	4	0.008	0.003	0.00488	0.0119	NE
		Cadmium	4	0.000	0.000	0.000251	0.000313	0.5
		Chromium	4	0.001	0.000	0.000781	0.00143	4.1
		Copper	4	0.002	0.001	0.00139	0.00267	5.3
		Cyanide, Total	4	0.002	0.000	0.00172	0.00172	0.45
		Fluoride	4	11.875	2.152	9.2	13.9	36
		Lead	4	0.003	0.001	0.00172	0.00344	1
		Molybdenum	4	0.001	0.000	0.000594	0.00143	2
		Nickel	4	0.001	0.000	0.00069	0.00111	2
		Selenium	4	0.003	0.000	0.00281	0.00309	0.46
		Silver	4	0.001	0.000	0.000197	0.000835	5
		Zinc	4	0.002	0.001	0.000883	0.00281	2.2

TABLE A-9. Permitted Sanitary Outfalls, CY 2002 (concluded)
(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit COA
2069I-3	**WW008**	Aluminum	4	0.424	0.520	0.0979	1.2	900
		Arsenic	4	0.013	0.001	0.0116	0.0142	0.051
		Boron	4	0.064	0.012	0.0491	0.0767	NE
		Cadmium	4	0.000	0.000	0.000251	0.000313	0.5
		Chromium	4	0.001	0.000	0.000781	0.00158	4.1
		Copper	4	0.013	0.005	0.0076	0.019	5.3
		Cyanide, Total	4	0.003	0.001	0.00172	0.00469	0.45
		Fluoride	4	6.755	0.866	5.96	7.95	36
		Lead	4	0.004	0.002	0.00207	0.0068	1
		Molybdenum	4	0.059	0.010	0.0533	0.0733	2
		Nickel	4	0.001	0.000	0.00069	0.00122	2
		Selenium	4	0.003	0.000	0.00281	0.00319	0.46
		Silver	4	0.001	0.000	0.000197	0.000835	5
		Zinc	4	0.065	0.016	0.049	0.0849	2.2
2069K	**WW011**	Aluminum	4	0.077	0.033	0.0343	0.107	900
		Arsenic	4	0.011	0.002	0.00827	0.0142	0.051
		Boron	4	0.166	0.052	0.128	0.239	NE
		Cadmium	4	0.000	0.000	0.000251	0.000571	0.5
		Chromium	4	0.002	0.001	0.000781	0.00235	4.1
		Copper	4	0.020	0.006	0.0134	0.0254	5.3
		Fluoride	4	0.537	0.114	0.444	0.702	36
		Lead	4	0.004	0.001	0.00264	0.00538	1
		Molybdenum	4	0.446	0.472	0.0448	1.04	2
		Nickel	4	0.002	0.001	0.000743	0.00309	2
		Selenium	4	0.003	0.000	0.00281	0.00313	0.46
		Silver	4	0.001	0.000	0.000197	0.000835	5
		Zinc	4	0.101	0.029	0.0571	0.118	2.2

NOTES: COA = City of Albuquerque
NE = Not established
Std Dev = Standard Deviation

TABLE A-10. Permitted Sanitary Outfalls, CY 2002
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069A	**WW001**	Actinium-228	2	0.000	0.000	0	0	300,000
		Americium-241	2	0.164	0.970	-0.522	0.85	200
		Antimony-124	2	-0.508	0.865	-1.12	0.104	NE
		Antimony-125	2	-3.370	1.117	-4.16	-2.58	NE
		Barium-133	2	-1.925	0.488	-2.27	-1.58	NE
		Beryllium-7	2	4.235	18.760	-9.03	17.5	NE
		Bismuth-211	2	0.000	0.000	0	0	NE
		Bismuth-212	2	1.500	2.121	0	3	NE
		Bismuth-214	2	5.600	7.920	0	11.2	NE
		Cadmium-109	2	19.860	20.987	5.02	34.7	NE
		Cerium-139	2	-0.764	0.214	-0.915	-0.612	NE
		Cerium-141	2	2.132	3.179	-0.116	4.38	NE
		Cerium-144	2	4.635	0.544	4.25	5.02	30,000
		Cesium-134	2	-0.025	0.518	-0.391	0.342	9,000
		Cesium-137	2	-0.105	1.619	-1.25	1.04	10,000
		Chromium-51	2	-2.810	5.515	-6.71	1.09	5,000,000
		Cobalt-57	2	0.018	0.341	-0.223	0.259	NE
		Cobalt-60	2	0.730	1.032	0	1.46	30,000
		Europium-152	2	-4.440	3.012	-6.57	-2.31	NE
		Europium-154	2	-5.060	9.673	-11.9	1.78	NE
		Gross Alpha	2	3.435	3.033	1.29	5.58	NE
		Gross Beta	2	20.900	1.414	19.9	21.9	NE
		Iron-59	2	-2.245	1.167	-3.07	-1.42	100,000
		Lead-211	2	-16.845	34.160	-41	7.31	NE
		Lead-212	2	5.400	7.637	0	10.8	20,000
		Lead-214	2	4.885	6.908	0	9.77	1,000,000
		Manganese-54	2	-1.296	1.915	-2.65	0.0588	NE
		Mercury-203	2	1.230	0.113	1.15	1.31	NE
		Neptunium-237	2	-1.040	3.564	-3.56	1.48	NE
		Neptunium-239	2	-2.555	2.128	-4.06	-1.05	NE
		Niobium-95	2	-0.530	2.758	-2.48	1.42	NE
		Potassium-40	2	0.000	0.000	0	0	40,000
		Protactinium-231	2	-32.800	20.648	-47.4	-18.2	NE
		Protactinium-233	2	-1.581	1.442	-2.6	-0.561	NE
		Protactinium-234	2	3.951	6.137	-0.389	8.29	NE
		Radium-223	2	-6.700	9.475	-13.4	0	NE
		Radium-224	2	0.000	0.000	0	0	NE
		Radium-226	2	5.600	7.920	0	11.2	600
		Radium-228	2	0.000	0.000	0	0	600
		Radon-219	2	-1.700	28.284	-21.7	18.3	NE
		Rhodium-106	2	-10.785	18.830	-24.1	2.53	NE
		Ruthenium-103	2	0.792	0.521	0.423	1.16	300,000
		Ruthenium-106	2	-9.515	9.313	-16.1	-2.93	30,000
		Selenium-75	2	0.184	0.260	0	0.367	NE
		Sodium-22	2	-1.824	3.502	-4.3	0.652	NE
		Strontium-85	2	-21.100	2.687	-23	-19.2	NE

See notes at end of table.

TABLE A-10. Permitted Sanitary Outfalls, CY 2002 (continued)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069A *(concluded)*	**WW001**	Thallium-208	2	2.155	0.304	1.94	2.37	NE
		Thorium-227	2	-18.850	8.415	-24.8	-12.9	NE
		Thorium-231	2	-3.615	5.112	-7.23	0	300
		Thorium-232	1	5.420		5.42	5.42	500,000
		Thorium-234	2	8.200	11.597	0	16.4	50000
		Tin-113	2	-0.468	1.248	-1.35	0.415	NE
		Tritium	2	-15.450	59.185	-57.3	26.4	10,000,000
		Uranium-235	2	3.575	5.056	0	7.15	3,000
		Uranium-238	2	8.200	11.597	0	16.4	3,000
		Yttrium-88	2	-0.429	1.317	-1.36	0.503	100,000
		Zinc-65	2	-0.970	3.564	-3.49	1.55	NE
		Zirconium-95	2	2.812	3.010	0.683	4.94	200,000

See notes at end of table.

TABLE A-10. Permitted Sanitary Outfalls, CY 2002 (continued)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069F-4	**WW006**	Actinium-228	2	0.705	0.997	0	1.41	300,000
		Americium-241	2	-3.965	5.607	-7.93	0	200
		Antimony-124	2	-0.143	0.202	-0.286	0	NE
		Antimony-125	2	-0.845	0.234	-1.01	-0.679	NE
		Barium-133	2	1.141	1.526	0.0619	2.22	NE
		Beryllium-7	2	-0.350	7.722	-5.81	5.11	NE
		Bismuth-211	2	7.990	6.802	3.18	12.8	NE
		Bismuth-212	2	0.000	0.000	0	0	NE
		Bismuth-214	2	0.353	0.499	0	0.705	NE
		Cadmium-109	2	-18.445	13.513	-28	-8.89	NE
		Cerium-139	2	-0.514	0.715	-1.02	-0.00865	NE
		Cerium-141	2	-0.023	0.033	-0.046	0	NE
		Cerium-144	2	8.620	1.471	7.58	9.66	30,000
		Cesium-134	2	-0.780	0.721	-1.29	-0.27	9,000
		Cesium-137	2	0.389	0.550	0	0.778	10,000
		Chromium-51	2	3.081	3.210	0.811	5.35	5,000,000
		Cobalt-57	2	0.375	0.530	0	0.749	NE
		Cobalt-60	2	-0.008	0.378	-0.275	0.259	30000
		Europium-152	2	-2.515	0.841	-3.11	-1.92	NE
		Europium-154	2	-0.235	3.769	-2.9	2.43	NE
		Gross Alpha	2	3.447	4.375	0.353	6.54	NE
		Gross Beta	2	45.700	28.567	25.5	65.9	NE
		Iron-59	2	1.765	2.425	0.05	3.48	100,000
		Lead-211	2	-12.829	19.476	-26.6	0.943	NE
		Lead-212	2	0.431	0.610	0	0.862	20,000
		Lead-214	2	1.995	1.252	1.11	2.88	1,000,000
		Manganese-54	2	0.488	0.689	0	0.975	NE
		Mercury-203	2	0.214	0.874	-0.404	0.832	NE
		Neptunium-237	2	-6.265	7.262	-11.4	-1.13	NE
		Neptunium-239	2	-0.061	0.086	-0.122	0	NE
		Niobium-95	2	-1.499	2.010	-2.92	-0.0778	NE
		Potassium-40	2	0.000	0.000	0	0	40,000
		Protactinium-231	2	-20.400	5.515	-24.3	-16.5	NE
		Protactinium-233	2	-0.720	2.574	-2.54	1.1	NE
		Protactinium-234	2	-4.475	6.329	-8.95	0	NE
		Radium-223	2	-6.235	7.304	-11.4	-1.07	NE
		Radium-224	2	-13.700	51.619	-50.2	22.8	NE
		Radium-226	2	4.128	4.840	0.705	7.55	600
		Radium-228	2	0.705	0.997	0	1.41	600
		Radon-219	2	1.770	2.503	0	3.54	NE
		Rhodium-106	2	-12.576	17.570	-25	-0.152	NE
		Ruthenium-103	2	-1.500	0.467	-1.83	-1.17	300,000
		Ruthenium-106	2	-12.795	12.028	-21.3	-4.29	30,000
		Selenium-75	2	0.345	1.563	-0.761	1.45	NE
		Sodium-22	2	-0.090	1.329	-1.03	0.85	NE

See notes at end of table.

TABLE A-10. Permitted Sanitary Outfalls, CY 2002 (continued)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069F-4 *(concluded)*	**WW006**	Strontium-85	2	-21.500	1.980	-22.9	-20.1	NE
		Thallium-208	2	0.430	0.607	0	0.859	NE
		Thorium-227	2	5.345	16.483	-6.31	17	NE
		Thorium-231	2	2.914	4.180	-0.0411	5.87	300
		Thorium-232	1	0.000		0	0	500,000
		Thorium-234	2	4.945	6.993	0	9.89	50,000
		Tin-113	2	-0.489	1.656	-1.66	0.682	NE
		Tritium	2	31.200	81.883	-26.7	89.1	10,000,000
		Uranium-235	2	7.070	6.548	2.44	11.7	3,000
		Uranium-238	2	4.945	6.993	0	9.89	3,000
		Yttrium-88	2	-0.786	0.161	-0.899	-0.672	100,000
		Zinc-65	2	-1.925	0.856	-2.53	-1.32	NE
		Zirconium-95	2	1.157	1.674	-0.027	2.34	200,000

See notes at end of table.

TABLE A-10. Permitted Sanitary Outfalls, CY 2002 (continued)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069I-3	**WW008**	Actinium-228	2	2.476	2.792	0.501	4.45	300,000
		Americium-241	2	-6.230	3.861	-8.96	-3.5	200
		Antimony-124	2	1.391	1.130	0.592	2.19	NE
		Antimony-125	2	-1.855	4.448	-5	1.29	NE
		Barium-133	2	-0.240	1.867	-1.56	1.08	NE
		Beryllium-7	2	-6.815	3.755	-9.47	-4.16	NE
		Bismuth-211	2	3.225	4.561	0	6.45	NE
		Bismuth-212	2	6.932	9.289	0.364	13.5	NE
		Bismuth-214	2	5.455	2.807	3.47	7.44	NE
		Cadmium-109	2	10.870	12.063	2.34	19.4	NE
		Cerium-139	2	0.778	0.006	0.773	0.782	NE
		Cerium-141	2	2.080	0.240	1.91	2.25	NE
		Cerium-144	2	-0.150	4.158	-3.09	2.79	30,000
		Cesium-134	2	-0.609	0.480	-0.948	-0.269	9,000
		Cesium-137	2	-0.310	0.072	-0.361	-0.259	10,000
		Chromium-51	2	-16.350	2.758	-18.3	-14.4	5,000,000
		Cobalt-57	2	0.108	0.136	0.0112	0.204	NE
		Cobalt-60	2	0.340	0.036	0.314	0.365	30,000
		Europium-152	2	0.704	0.149	0.598	0.809	NE
		Europium-154	2	-2.750	0.113	-2.83	-2.67	NE
		Gross Alpha	2	3.400	1.273	2.5	4.3	NE
		Gross Beta	2	11.350	0.354	11.1	11.6	NE
		Iron-59	2	2.035	0.898	1.4	2.67	100,000
		Lead-211	2	-18.100	10.041	-25.2	-11	NE
		Lead-212	2	0.196	0.276	0	0.391	20,000
		Lead-214	2	1.790	2.531	0	3.58	1,000,000
		Manganese-54	2	-0.164	0.724	-0.676	0.348	NE
		Mercury-203	2	1.590	0.636	1.14	2.04	NE
		Neptunium-237	2	-6.100	8.627	-12.2	0	NE
		Neptunium-239	2	0.630	12.191	-7.99	9.25	NE
		Niobium-95	2	0.903	1.085	0.136	1.67	NE
		Potassium-40	2	10.750	15.203	0	21.5	40,000
		Protactinium-231	2	24.100	9.192	17.6	30.6	NE
		Protactinium-233	2	0.651	0.833	0.062	1.24	NE
		Protactinium-234	2	0.768	0.978	0.0764	1.46	NE
		Radium-223	2	18.370	21.680	3.04	33.7	NE
		Radium-224	2	2.210	3.125	0	4.42	NE
		Radium-226	2	5.455	2.807	3.47	7.44	600
		Radium-228	2	2.476	2.792	0.501	4.45	600
		Radon-219	2	-9.130	0.891	-9.76	-8.5	NE
		Rhodium-106	2	5.770	0.184	5.64	5.9	NE
		Ruthenium-103	2	-1.309	1.148	-2.12	-0.497	300,000
		Ruthenium-106	2	2.215	4.759	-1.15	5.58	30,000
		Selenium-75	2	-0.998	0.357	-1.25	-0.745	NE
		Sodium-22	2	-1.290	0.368	-1.55	-1.03	NE

See notes at end of table.

TABLE A-10. Permitted Sanitary Outfalls, CY 2002 (continued)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069I-3 *(concluded)*	**WW008**	Strontium-85	2	-14.590	7.792	-20.1	-9.08	NE
		Thallium-208	2	0.083	0.117	0	0.166	NE
		Thorium-227	2	6.675	11.349	-1.35	14.7	NE
		Thorium-231	2	0.930	3.069	-1.24	3.1	300
		Thorium-232	1	0.382		0.382	0.382	500,000
		Thorium-234	2	0.000	0.000	0	0	50,000
		Tin-113	2	0.161	1.114	-0.627	0.949	NE
		Tritium	2	11.900	58.831	-29.7	53.5	10,000,000
		Uranium-235	2	3.195	4.518	0	6.39	3,000
		Uranium-238	2	0.000	0.000	0	0	3,000
		Yttrium-88	2	0.202	0.685	-0.283	0.686	100,000
		Zinc-65	2	-3.618	5.419	-7.45	0.214	NE
		Zirconium-95	2	-0.994	0.164	-1.11	-0.878	200,000

See notes at end of table

TABLE A-10. Permitted Sanitary Outfalls, CY 2002 (continued)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069K	**WW011**	Actinium-228	2	0.000	0.000	0	0	300,000
		Americium-241	2	-1.925	3.797	-4.61	0.76	200
		Antimony-124	2	-0.328	0.345	-0.572	-0.0835	NE
		Antimony-125	2	-4.105	3.033	-6.25	-1.96	NE
		Barium-133	2	0.256	0.177	0.13	0.381	NE
		Beryllium-7	2	-9.815	20.202	-24.1	4.47	NE
		Bismuth-211	2	0.000	0.000	0	0	NE
		Bismuth-212	2	10.495	0.997	9.79	11.2	NE
		Bismuth-214	2	1.185	1.676	0	2.37	NE
		Cadmium-109	2	-14.385	32.407	-37.3	8.53	NE
		Cerium-139	2	0.718	0.838	0.125	1.31	NE
		Cerium-141	2	-0.815	4.801	-4.21	2.58	NE
		Cerium-144	2	4.301	7.113	-0.729	9.33	30,000
		Cesium-134	2	-0.270	1.980	-1.67	1.13	9,000
		Cesium-137	2	-0.302	0.311	-0.522	-0.0828	10,000
		Chromium-51	2	10.210	1.824	8.92	11.5	5,000,000
		Cobalt-57	2	0.232	0.328	0	0.464	NE
		Cobalt-60	2	-0.113	0.523	-0.483	0.257	30,000
		Europium-152	2	-0.580	2.376	-2.26	1.1	NE
		Europium-154	2	-0.626	0.982	-1.32	0.069	NE
		Gross Alpha	2	3.525	2.256	1.93	5.12	NE
		Gross Beta	2	21.000	11.738	12.7	29.3	NE
		Iron-59	2	-4.570	1.853	-5.88	-3.26	100,000
		Lead-211	2	-22.923	32.919	-46.2	0.354	NE
		Lead-212	2	2.350	3.323	0	4.7	20,000
		Lead-214	2	0.000	0.000	0	0	1,000,000
		Manganese-54	2	0.163	1.120	-0.629	0.955	NE
		Mercury-203	2	-0.198	0.279	-0.395	0	NE
		Neptunium-237	2	1.454	1.479	0.408	2.5	NE
		Neptunium-239	2	-3.665	1.492	-4.72	-2.61	NE
		Niobium-95	2	1.990	1.117	1.2	2.78	NE
		Potassium-40	2	8.050	11.384	0	16.1	40,000
		Protactinium-231	2	19.600	1.838	18.3	20.9	NE
		Protactinium-233	2	1.023	1.778	-0.234	2.28	NE
		Protactinium-234	2	-7.335	23.851	-24.2	9.53	NE
		Radium-223	2	-4.275	17.713	-16.8	8.25	NE
		Radium-224	2	-90.500	127.986	-181	0	NE
		Radium-226	2	6.160	5.360	2.37	9.95	600
		Radium-228	2	0.000	0.000	0	0	600
		Radon-219	2	-4.250	6.010	-8.5	0	NE
		Rhodium-106	2	9.425	8.309	3.55	15.3	NE
		Ruthenium-103	2	-0.231	0.326	-0.461	0	300,000
		Ruthenium-106	2	8.485	3.415	6.07	10.9	30,000
		Selenium-75	2	-0.620	3.719	-3.25	2.01	NE
		Sodium-22	2	-0.243	0.352	-0.492	0.00551	NE

See notes at end of table.

TABLE A-10. Permitted Sanitary Outfalls, CY 2002 (concluded)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069K *(concluded)*	**WW011**	Strontium-85	2	-12.680	6.534	-17.3	-8.06	NE
		Thallium-208	2	0.635	0.898	0	1.27	NE
		Thorium-227	2	-8.185	5.961	-12.4	-3.97	NE
		Thorium-231	2	-0.745	9.496	-7.46	5.97	300
		Thorium-232	1	4.570		4.57	4.57	500,000
		Thorium-234	2	0.000	0.000	0	0	50000
		Tin-113	2	0.867	0.754	0.334	1.4	NE
		Tritium	2	66.000	52.326	29	103	10,000,000
		Uranium-235	2	3.225	4.561	0	6.45	3,000
		Uranium-238	2	0.000	0.000	0	0	3,000
		Yttrium-88	2	-0.225	0.318	-0.45	0	100,000
		Zinc-65	2	0.460	0.991	-0.241	1.16	NE
		Zirconium-95	2	-0.381	1.653	-1.55	0.788	200,000

NOTES: NE = Not established
CFR = Code of Federal Regulations
Std Dev = Standard Deviation

TABLE A-11. Permitted Sanitary Outfalls of Volatile Organic Compounds, CY 2002
(All results reported in micrograms per liter [μg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum
2069A	**WW001**	1,1,1-Trichloroethane	2	0.355	0.021	0.34	0.37
		1,1,2,2-Tetrachloroethane	2	0.290	0.283	0.09	0.49
		1,1,2-Trichloroethane	2	0.380	0.085	0.32	0.44
		1,1-Dichloroethane	2	0.310	0.141	0.21	0.41
		1,1-Dichloroethylene	2	0.350	0.085	0.29	0.41
		1,2-Dichloroethane	2	0.240	0.071	0.19	0.29
		1,2-Dichloropropane	2	0.265	0.021	0.25	0.28
		2-Butanone	2	2.910	0.849	2.31	3.51
		2-Hexanone	2	1.115	0.474	0.78	1.45
		4-Methyl-2-pentanone	2	1.275	0.714	0.77	1.78
		Acetone	2	102.050	93.267	36.1	168
		Benzene	2	0.710	0.537	0.33	1.09
		Bromodichloromethane	2	0.280	0.141	0.18	0.38
		Bromoform	2	18.114	25.153	0.328	35.9
		Bromomethane	2	0.640	0.198	0.5	0.78
		Carbon disulfide	2	1.585	0.460	1.26	1.91
		Carbon tetrachloride	2	0.295	0.007	0.29	0.3
		Chlorobenzene	2	0.275	0.064	0.23	0.32
		Chloroethane	2	0.705	0.290	0.5	0.91
		Chloroform	2	0.297	0.090	0.233	0.36
		Chloromethane	2	0.415	0.120	0.33	0.5
		cis-1,2-Dichloroethylene	2	0.305	0.007	0.3	0.31
		cis-1,3-Dichloropropylene	2	0.310	0.014	0.3	0.32
		Dibromochloromethane	2	0.404	0.302	0.19	0.617
		Ethylbenzene	2	0.190	0.028	0.17	0.21
		Methylene chloride	2	1.825	2.086	0.35	3.3
		Styrene	2	0.250	0.000	0.25	0.25
		Tetrachloroethylene	2	0.290	0.057	0.25	0.33
		Toluene	2	0.471	0.115	0.39	0.552
		trans-1,2-Dichloroethylene	2	0.340	0.042	0.31	0.37
		trans-1,3-Dichloropropylene	2	0.240	0.071	0.19	0.29
		Trichloroethylene	2	0.335	0.035	0.31	0.36
		Vinyl chloride	2	0.470	0.113	0.39	0.55
		Xylenes (total)	2	0.280	0.042	0.25	0.31

See notes at end of table.

TABLE A-11. Permitted Sanitary Outfalls of Volatile Organic Compounds, CY 2002 (continued)
(All results reported in micrograms per liter [µg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum
2069F-4	**WW006**	1,1,1-Trichloroethane	2	0.355	0.021	0.34	0.37
		1,1,2,2-Tetrachloroethane	2	0.290	0.283	0.09	0.49
		1,1,2-Trichloroethane	2	0.380	0.085	0.32	0.44
		1,1-Dichloroethane	2	0.310	0.141	0.21	0.41
		1,1-Dichloroethylene	2	0.350	0.085	0.29	0.41
		1,2-Dichloroethane	2	0.240	0.071	0.19	0.29
		1,2-Dichloropropane	2	0.265	0.021	0.25	0.28
		2-Butanone	2	4.080	2.503	2.31	5.85
		2-Hexanone	2	1.115	0.474	0.78	1.45
		4-Methyl-2-pentanone	2	1.275	0.714	0.77	1.78
		Acetone	2	84.900	8.344	79	90.8
		Benzene	2	0.305	0.035	0.28	0.33
		Bromodichloromethane	2	0.280	0.141	0.18	0.38
		Bromoform	2	0.335	0.233	0.17	0.5
		Bromomethane	2	0.640	0.198	0.5	0.78
		Carbon disulfide	2	1.585	0.460	1.26	1.91
		Carbon tetrachloride	2	0.295	0.007	0.29	0.3
		Chlorobenzene	2	0.275	0.064	0.23	0.32
		Chloroethane	2	0.705	0.290	0.5	0.91
		Chloroform	2	0.275	0.120	0.19	0.36
		Chloromethane	2	0.415	0.120	0.33	0.5
		cis-1,2-Dichloroethylene	2	0.305	0.007	0.3	0.31
		cis-1,3-Dichloropropylene	2	0.310	0.014	0.3	0.32
		Dibromochloromethane	2	0.240	0.071	0.19	0.29
		Ethylbenzene	2	0.190	0.028	0.17	0.21
		Methylene chloride	2	1.825	2.086	0.35	3.3
		Styrene	2	0.250	0.000	0.25	0.25
		Tetrachloroethylene	2	0.290	0.057	0.25	0.33
		Toluene	2	0.654	0.373	0.39	0.917
		trans-1,2-Dichloroethylene	2	0.340	0.042	0.31	0.37
		trans-1,3-Dichloropropylene	2	0.240	0.071	0.19	0.29
		Trichloroethylene	2	0.335	0.035	0.31	0.36
		Vinyl chloride	2	0.470	0.113	0.39	0.55
		Xylenes (total)	2	0.280	0.042	0.25	0.31

See notes at end of table.

TABLE A-11. Permitted Sanitary Outfalls of Volatile Organic Compounds, CY 2002 (continued)
(All results reported in micrograms per liter [μg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum
2069I-3	**WW008**	1,1,1-Trichloroethane	2	0.355	0.021	0.34	0.37
		1,1,2,2-Tetrachloroethane	2	0.290	0.283	0.09	0.49
		1,1,2-Trichloroethane	2	0.380	0.085	0.32	0.44
		1,1-Dichloroethane	2	0.310	0.141	0.21	0.41
		1,1-Dichloroethylene	2	0.350	0.085	0.29	0.41
		1,2-Dichloroethane	2	0.240	0.071	0.19	0.29
		1,2-Dichloropropane	2	0.265	0.021	0.25	0.28
		2-Butanone	2	2.710	0.566	2.31	3.11
		2-Hexanone	2	1.115	0.474	0.78	1.45
		4-Methyl-2-pentanone	2	1.275	0.714	0.77	1.78
		Acetone	2	89.100	52.184	52.2	126
		Benzene	2	0.305	0.035	0.28	0.33
		Bromodichloromethane	2	0.280	0.141	0.18	0.38
		Bromoform	2	0.335	0.233	0.17	0.5
		Bromomethane	2	0.640	0.198	0.5	0.78
		Carbon disulfide	2	1.585	0.460	1.26	1.91
		Carbon tetrachloride	2	0.295	0.007	0.29	0.3
		Chlorobenzene	2	0.275	0.064	0.23	0.32
		Chloroethane	2	0.705	0.290	0.5	0.91
		Chloroform	2	0.275	0.120	0.19	0.36
		Chloromethane	2	0.415	0.120	0.33	0.5
		cis-1,2-Dichloroethylene	2	0.305	0.007	0.3	0.31
		cis-1,3-Dichloropropylene	2	0.310	0.014	0.3	0.32
		Dibromochloromethane	2	0.240	0.071	0.19	0.29
		Ethylbenzene	2	0.190	0.028	0.17	0.21
		Methylene chloride	2	1.825	2.086	0.35	3.3
		Styrene	2	0.250	0.000	0.25	0.25
		Tetrachloroethylene	2	0.290	0.057	0.25	0.33
		Toluene	2	0.283	0.151	0.176	0.39
		trans-1,2-Dichloroethylene	2	0.340	0.042	0.31	0.37
		trans-1,3-Dichloropropylene	2	0.240	0.071	0.19	0.29
		Trichloroethylene	2	0.335	0.035	0.31	0.36
		Vinyl chloride	2	0.470	0.113	0.39	0.55
		Xylenes (total)	2	0.280	0.042	0.25	0.31

See notes at end of table.

TABLE A-11. Permitted Sanitary Outfalls of Volatile Organic Compounds, CY 2002 (concluded)
(All results reported in micrograms per liter [μg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum
2069K	**WW011**	1,1,1-Trichloroethane	2	0.355	0.021	0.34	0.37
		1,1,2,2-Tetrachloroethane	2	0.290	0.283	0.09	0.49
		1,1,2-Trichloroethane	2	0.380	0.085	0.32	0.44
		1,1-Dichloroethane	2	0.310	0.141	0.21	0.41
		1,1-Dichloroethylene	2	0.350	0.085	0.29	0.41
		1,2-Dichloroethane	2	0.240	0.071	0.19	0.29
		1,2-Dichloropropane	2	0.265	0.021	0.25	0.28
		2-Butanone	2	3.100	0.636	2.65	3.55
		2-Hexanone	2	1.115	0.474	0.78	1.45
		4-Methyl-2-pentanone	2	1.275	0.714	0.77	1.78
		Acetone	2	202.500	74.246	150	255
		Benzene	2	0.305	0.035	0.28	0.33
		Bromodichloromethane	2	0.280	0.141	0.18	0.38
		Bromoform	2	0.335	0.233	0.17	0.5
		Bromomethane	2	0.640	0.198	0.5	0.78
		Carbon disulfide	2	1.585	0.460	1.26	1.91
		Carbon tetrachloride	2	0.295	0.007	0.29	0.3
		Chlorobenzene	2	0.275	0.064	0.23	0.32
		Chloroethane	2	0.705	0.290	0.5	0.91
		Chloroform	2	0.275	0.120	0.19	0.36
		Chloromethane	2	0.415	0.120	0.33	0.5
		cis-1,2-Dichloroethylene	2	0.305	0.007	0.3	0.31
		cis-1,3-Dichloropropylene	2	0.310	0.014	0.3	0.32
		Dibromochloromethane	2	0.240	0.071	0.19	0.29
		Ethylbenzene	2	0.266	0.136	0.17	0.362
		Methylene chloride	2	137.675	194.207	0.35	275
		Styrene	2	0.250	0.000	0.25	0.25
		Tetrachloroethylene	2	0.290	0.057	0.25	0.33
		Toluene	2	0.793	0.605	0.365	1.22
		trans-1,2-Dichloroethylene	2	0.340	0.042	0.31	0.37
		trans-1,3-Dichloropropylene	2	0.240	0.071	0.19	0.29
		Trichloroethylene	2	0.335	0.035	0.31	0.36
		Vinyl chloride	2	0.470	0.113	0.39	0.55
		Xylenes (total)	2	0.975	0.940	0.31	1.64

NOTES: Std Dev = Standard Deviation

APPENDIX B

2002 Groundwater Contaminant
Concentration Trends

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B.1 INTRODUCTION

Appendix B provides statistical information and graphical representation of groundwater contaminants that exceeded the regulatory limit for the specific analyte at once during fiscal year 2002 (FY02). The FY02 data is presented in the context of historical values for the groundwater analyte concentrations at specific well locations. The summary statistics are provided to evaluate the significance of the exceedence of the regulatory limit during the FY02 reporting period in light of the monitoring history for the analyte. In addition to the average (Avg), median (Med), and minimum/maximum values of the historical monitoring data, measures of the scatter of the data are provided as standard deviation (Std Dev, SD) and the coefficient of variation (CV). The CV statistic is a normalization of the Std Dev of a data set by the Avg value of the set. This scales the Std Dev and this allows for comparison of the amount of scatter among different data sets for the same analyte as obtained from different monitor wells. The concentration values are plotted on graphs to provide a visual representation to determine the significance of the current contaminant values in context of the historical data for the well. The +1 SD and -1 SD lines are plotted on the graphs to illustrate extent of Std Dev from the Avg value of the data set. Trend lines are constructed on the graph using linear or second order polynomial regression analysis. Each data set was tested for linear or non-linear fit with the better of the two used to illustrate the data trend. The significance that can be attributed to these trend lines is related to the number of data points and the scatter of the data. Under ideal conditions, the trend lines can be used to project future or expected data values. The maximum contaminant level (MCL) or other regulatory criteria exceeded are shown on the graphs.

Perchloroethylene (PCE)

Groundwater samples collected from monitor wells TA2-W-26 and TAV-MW7 exceeded the MCl for perchloroethylene of 5 µg/L in FY02. Perchloroethylene is also known as tetrachloroethene. Table B-1 lists the statistical summaries for PCE in groundwater samples obtained from monitor well TA2-W-26 and TAV-MW7. Figure B-1 is a plot of the data collected since 1998 from well TA2-W-26. PCE concentrations values in TA2-W-26 are on an increasing trend. PCE data from TAV-MW7 is shown in Figure B-2. TAV-MW7 is a relatively new well installed in April 2001. The trend for PCE concentration in TAV-MW7 appears to be toward lower values.

Trichloroethene (TCE)

Five Environmental Restoration (ER) Project wells contained TCE concentrations above the maximum contaminant level (MCL) of 5 µg/L during at least one sampling event in FY02. Table B-2 shows the summary statistics of TCE concentrations for monitoring wells TA2-W-26, WYO-4, LWDS-MW1, TAV-MW1, and TAV-MW8 in which the standard was exceeded.

Figures B-3 through B-6 show the history of TCE concentrations for wells TA2-W-26, LWDS-MW1, TAV-MW1, and TAV-MW8. Wells with a data history of less than three points are not plotted. TA2-W-26, and WYO-4 are TAG wells. Both wells are completed in the shallow groundwater system of north-central KAFB. The trend for the TCE in TA2-W-26 appears to be toward decreasing concentrations as shown in Figure B-3, although the data does demonstrate significant irregularity. WYO-4 was installed in July of 2001. The WYO-4 data is insufficient to trend. LWDS-MW1, TAV-MW1, and TAV-MW8 are located in TA-V. The trend for TCE concentrations in LWDS-MW1 continues toward decreasing values as illustrated in Figure B-4. The graph for TAV-MW1 has only one sampling data point that exceeded the MCL in FY02. As is demonstrated in Figure B-5, there is no history of other samples from this well exceeding the TCE MCL. TAV-MW8 was installed in April 2001. The data is limited as shown on Figure B-6. The trend is toward increasing concentrations of TCE.

Nitrate

During FY02, groundwater samples from seven ER Project wells had nitrate concentrations in at least one sampling period that exceeded the MCL of 10 mg/L. Table B-3 shows the summary statistics of nitrate concentrations from samples collected from wells in the three ER operable units, Canyons, TAG, and TA-V that were involved.

For the TAG investigational unit, the monitor wells with elevated nitrates are grouped in Table B-3 into those completed in a shallow groundwater zone and one well completed in the regional aquifer. Figures B-7 through B-12 show the history of nitrate concentrations of the wells listed in Table B-3.

TABLE B-1. Summary Statistics of Wells with PCE Concentrations Greater Than the MCL of 5 µg/L in FY 2002

Project Name	Well ID	Analyte	Sample Size	Avg	Med	Std Dev	Min	Max	Range	CV	-1 Std Dev	+1 Std Dev
TAG	TA2-W-26	PCE*	10	4.55	4.6	2.1	1.9	8.1	6.2	0.47	2.43	6.67
TAV	TAV-MW7	PCE	6	4.16	4.55	2.4	0.6	7.5	6.938	0.58	1.76	6.55

NOTE: PCE = Perchloroethylene
Med = median
Min = minimum
Max = maximum
Std Dev = standard deviation
TAV = Technical Area V
µg/L = microgram per liter
MCL = maximum contaminant level
CV = coefficient of variance
Avg = average
TAG = Tijeras Arroyo Groundwater
*data recorded in database as Tetrachloroethene

TABLE B-2. Summary Statistics of Wells with TCE Concentrations Greater Than the MCL of 5 µg/L in FY 2002

Project Name	Well ID	Analyte	Sample Size	Avg	Med	Std Dev	Min	Max	Range	CV	-1 Std Dev	+1 Std Dev
TAG	TA2-W-26	TCE	12	7.64	7.45	1.20	5.4	9.2	3.8	0.16	6.44	8.83
	WYO-4	TCE	2	4.45	4.45	0.64	4	4.9	0.9	0.14	3.81	5.09
TA-V	LWDS-MW1	TCE	15	18.83	18.9	2.58	15	23	8	0.14	16.25	21.42
	TAV-MW1	TCE	14	3.06	2.81	1.01	1.9	5.7	3.8	0.33	2.05	4.06
	TAV-MW8	TCE	5	4.72	5.56	2.19	1.12	6.82	5.7	0.46	2.53	6.90

NOTE: TCE = Trichloroethene
Med = median
Min = minimum
Max = maximum
Std Dev = standard deviation
TA-V = Technical Area V
µg/L = microgram per liter
MCL = maximum contaminant level
CV = coefficient of variance
Avg = average
TAG = Tijeras Arroyo Groundwater

TABLE B-3. Summary Statistics of Wells with Nitrate Concentrations Greater Than the MCL of 10 mg/L in FY 2002

Project Name		Well ID	Analyte	Sample Size	Avg	Med	Std Dev	Min	Max	Range	CV	-1 Std Dev	+1 Std Dev
Canyons		CYN-MW1D	Nitrate as N	12	20.51	21.55	4.34	11.7	27	15.3	0.21	16.17	24.84
		CYN-MW3	Nitrate as N	12	13.33	13	2.70	9.8	22	12.2	0.20	10.63	16.04
TAG	Shallow	TA2-SW1-320	Nitrate as N	11	30.82	30.82	6.19	22	44	22	0.20	24.62	37.01
		TJA-7	Nitrate as N	5	35.4	39	6.43	27	41	14	0.18	28.97	41.83
		TA1-W-08	Nitrate as N	2	9.40	--	--	7.8	11	--	--	--	--
	Regional	TJA-4	Nitrate as N	11	30.39	29	7.08	25	49.3	24.3	0.23	23.31	37.47
TA-V		LWDS-MW1	Nitrate as N	15	13.50	12.7	3.03	7.7	19	11.3	0.22	10.47	16.53

NOTE: mg/L = milligram per liter
MCL = maximum contaminant level
CV = coefficient of variance
Avg = average
TAG = Tijeras Arroyo Groundwater
-- = insufficient data available for summary statistics
Med = median
Min = minimum
Max = maximum
Std Dev = standard deviation
TA-V = Technical Area V

Figures B-7 and B-8 illustrate the data for the two monitor wells at the Canyon site, CYN-MW1D and CYN-MW3. The trend of nitrate concentrations at CYN-MW1D shows increasing values over the last three years. The nitrate concentration in CYN-MW3 appears to be increasing only moderately, although the average concentration at 13.3 mg/L exceeds the MCL of 10 mg/L.

For at least one groundwater sampling event in FY02, the nitrate concentration for TA1-SW1-320, TA1-W-08, and TJA-7 exceeded the MCL. Figure B-9 is a graph of the nitrate data for TA2-SW1-320. Average nitrate values are at approximately 31 mg/L with a slightly increasing trend in concentration. Over the past two years, nitrate concentrations in the well have consistently decreased. The nitrate data for TJA-7 is plotted in Figure B-10. The overall trend for nitrate concentrations is negative; however, the data show significant scatter and the present calculation may not be a good predictor of future nitrate values. TA1-W-08 was installed in August of 2001. The two available data points do not warrant graphing. The only regional well in the TAG area with elevated nitrates is TJA-4. Figure B-11 is a plot of nitrate concentration in this well for the past three years. The trend line shows increasing values on nitrate concentrations.

In the TA-V ER investigational area, only the LWDS-MW1 monitor well had levels of nitrate that exceeded the MCL for nitrate in FY02.

This well is associated with a seepage pit within TA-V. As illustrated in Figure B-12, nitrate concentrations in this well are trending downward.

Chromium

Five ER Project groundwater monitoring wells had sample results for chromium in excess of the MCL of 0.1 mg/L in FY02. The summary statistics for the chromium data for these wells are presented in Table B-4. The concentration values in the table and the graphs are for total chromium.

Four of the wells are located at the former SNL/NM Chemical Waste Landfill (CWL), which is currently being remediated. Figures B-13 through B-15 illustrate the history of chromium sample concentrations from wells CWL-BW3, CWL-MW4, and CWL-MW2A. Since there is only one data point for CWL-BW2, no graph was prepared. Figure B-13 shows the chromium concentrations in well CWL-BW3. Chromium values peaked in November of 1999 and have been declining since then. The data for CWL-MW4 are illustrated in Figure B-14. In this well, the total chromium concentration peaked in February of 2002 and is in decline. The chromium values for CWL-MW2A, as illustrated in Figure B-15, are increasing.

The only other well that had a chromium exceedance in FY02 is MWL-MW2. This well is associated with the SNL/NM Mixed Waste Landfill (MWL) ER site. As illustrated in Figure B-16, chromium values appear to be increasing in this well.

It is worth noting that all of the wells where elevated chromium was observed are constructed with stainless steel screens. Given that the wells with elevated chromium are at two different sites, and two of the wells with elevated chromium are background wells, it can inferred that the source of the chromium is the corrosion of the stainless steel well screens, a phenomenon that has been observed at other locations and demonstrated in laboratory experiments.

Beryllium

Beryllium concentrations in excess of the MCL of 4 µg/L occurred only at the Coyote Spring location. The statistical summary beryllium concentrations at this spring are presented in Table B-5. Beryllium concentrations, as illustrated by the graph in Figure B-17, have been fairly consistent over the past three years. Beryllium is considered to be of natural origin in the spring water. Several wells associated with deep groundwater sources associated with faults also have detected beryllium concentrations, but do not exceed the MCL value.

Uranium-234 (U-234)

Only one well sampled at SNL/NM in FY02 exceeded the U.S. Department of Energy (DOE) drinking water guideline of 20 pCi/L of uranium –234. Table B-6 shows the statistical summary of uranium-234 data from the TRE-1 monitoring well. TRE-1 is one of the wells in the SNL/NM groundwater surveillance network. The U-234 concentration in TRE-1, as illustrated in Figure B-18, appears to be stable at an activity of 21 to 23 pCi/L. The U.S. Environmental Protection Agency (EPA) drinking water MCL is a mass based concentration of 30 µg/L , which is equivalent to 27 pCi/L using an average mass-to-activity ratio of 1.11 as assumed by the EPA. The well is located east of the Tijeras Fault Zone where uranium concentrations in groundwater are naturally elevated. The U-234 activity for these wells is consistent with background activities for U-234 in the geologic setting of KAFB.

TABLE B-4. Summary Statistics for Wells with Chromium Concentrations Greater Than the MCL of 0.1 mg/L in FY 2002

Project Name	Well ID	Analyte	Sample Size	Avg	Med	Std Dev	Min	Max	Range	CV	-1 Std Dev	+1 Std Dev
CWL	CWL-BW2	Chromium	1	1.95	--	--	1.95	1.95	--	--	--	--
	CWL-BW3	Chromium	4	0.09	0.08	0.07	0.0092	0.188	0.1788	0.84	0.01	0.16
	CWL-MW4	Chromium	5	0.04	0.01	0.08	0.00179	0.177	0.17521	1.84	-0.03	0.12
	CWL-MW2A	Chromium	7	0.12	0.07	0.11	0.00704	0.328	0.32096	0.94	0.01	0.23
MWL	MWL-MW2	Chromium	5	0.04	0.02	0.07	0.003	0.162	0.159	1.48	-0.02	0.11

NOTE: µg/L = microgram per liter
MCL = maximum contaminant level
CV = coefficient of variance
Avg = average
CWL = Chemical Waste Landfill
MWL = Mixed Waste Landfill
Med = median
Min = minimum
Max = maximum
Std Dev = standard deviation
-- = insufficient data available for summary statistics

TABLE B-5. Summary Statistics for Well with Beryllium Concentrations Greater Than the MCL of 0.004 mg/L in FY 2002

Project Name	Well ID	Analyte	Sample Size	Avg	Med	Std Dev	Min	Max	Range	CV	-1 Std Dev	+1 Std Dev
GW Surv	Coyote Springs	Beryllium	5	0.01	0.01	0.00	0.00614	0.00744	0.0013	0.08	0.01	0.01

NOTE: mg/L = milligrams per liter
MCL = maximum contaminant level
CV = coefficient of variance
Avg = average
GW Surv.= Groundwater Surveillance
Med = median
Min = minimum
Max = maximum
Std Dev = standard deviation

TABLE B-6. Summary Statistics of Wells with Uranium-234 Activity Greater Than the MCL of 20 pCi/L in FY 2002

Project Name	Well ID	Analyte	Sample Size	Avg	Med	Std Dev	Min	Max	Range	CV	-1 Std Dev	+1 Std Dev
GWPP	TRE-1	Uranium-234	3	22.00	22.1	0.85	21.1	22.8	1.7	0.04	21.15	22.85

NOTE: pCi/L = picocurie per liter
CV = coefficient of variance
Avg = average
MCL = maximum contaminant level
GWPP = Groundwater Protection Program
Med = median
Min = minimum
Max = maximum
Std Dev = standard deviation

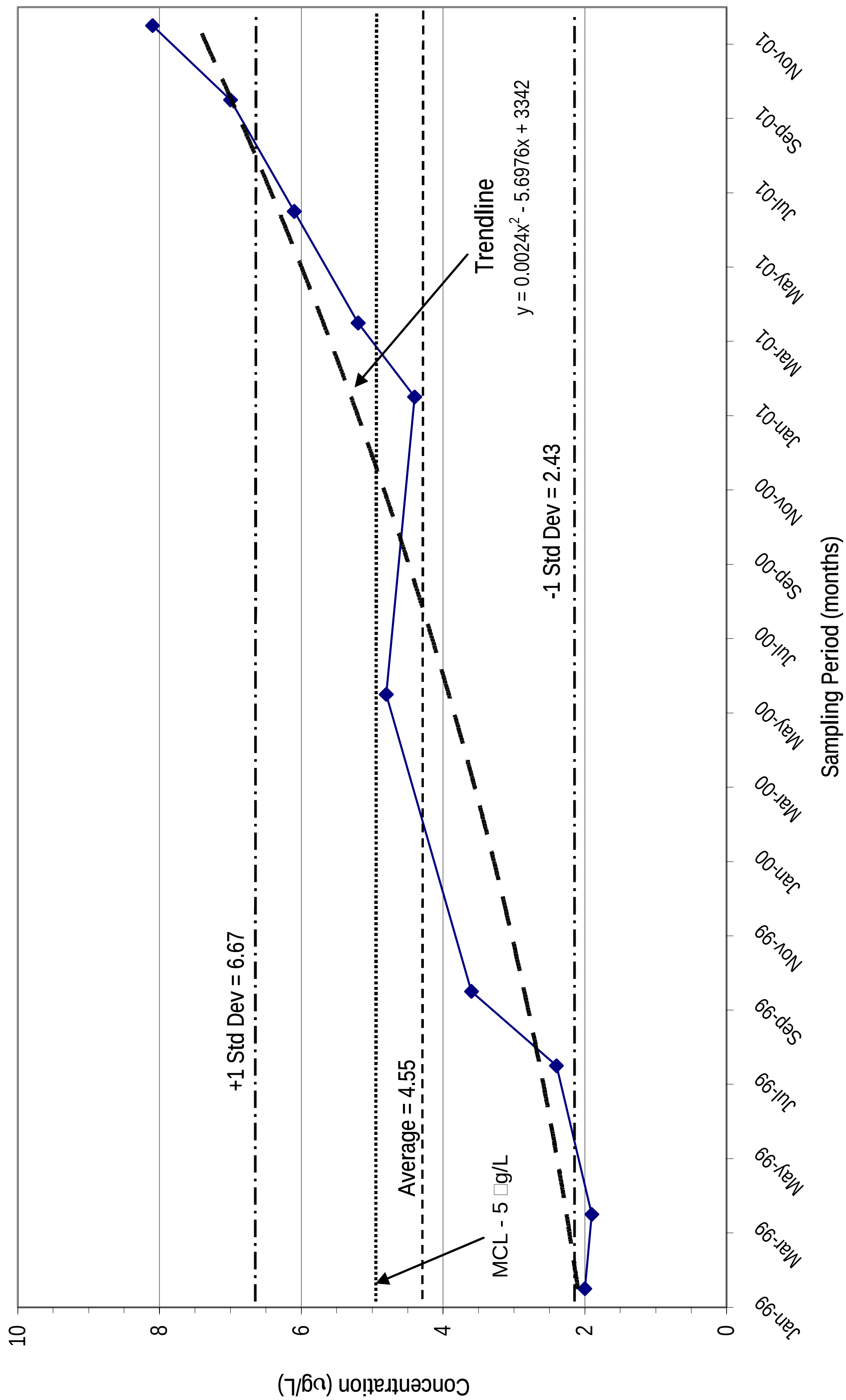

FIGURE B-1. PCE Concentrations, TA2-W-26

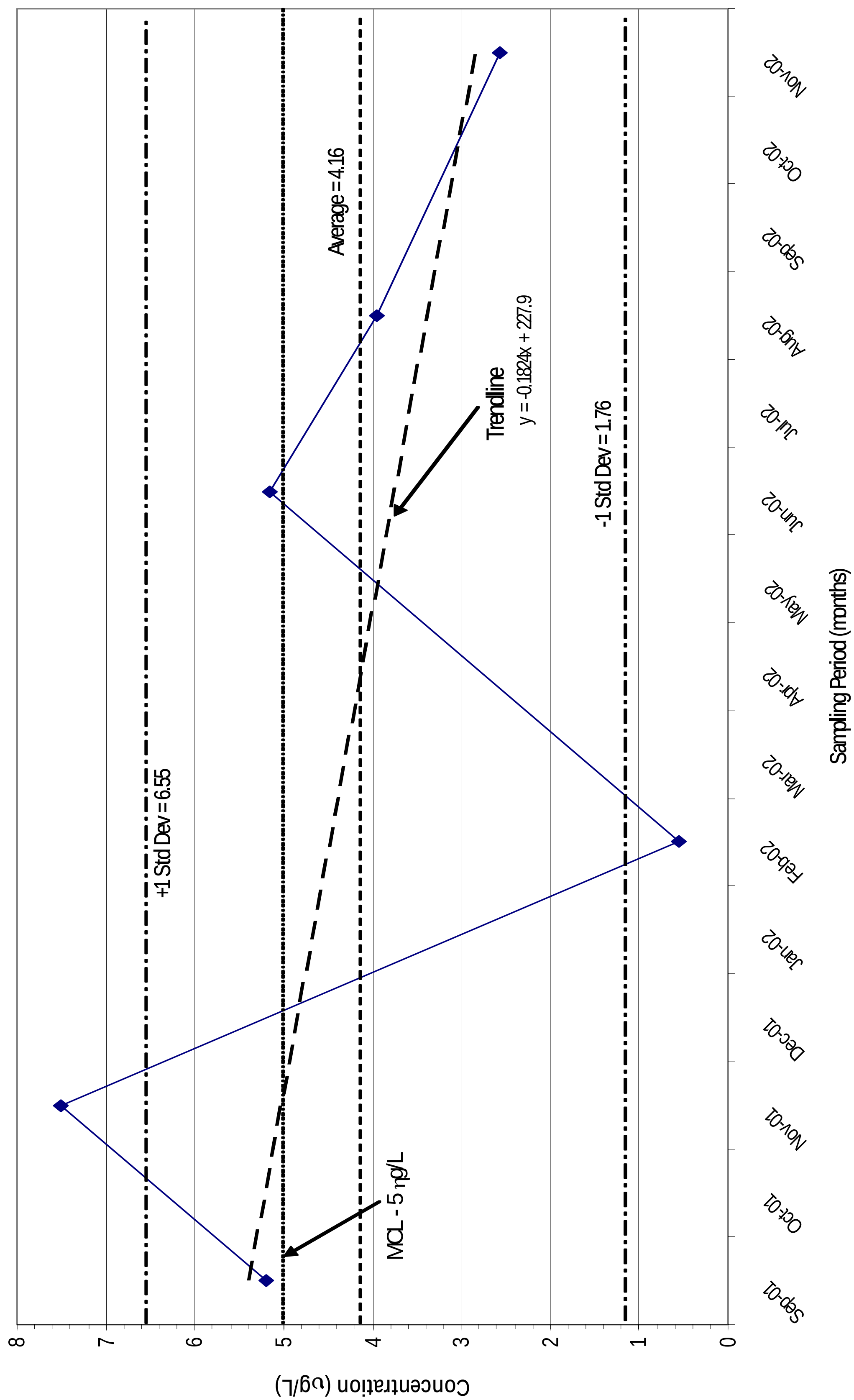

FIGURE B-2. PCE Concentrations, TAV-MW7

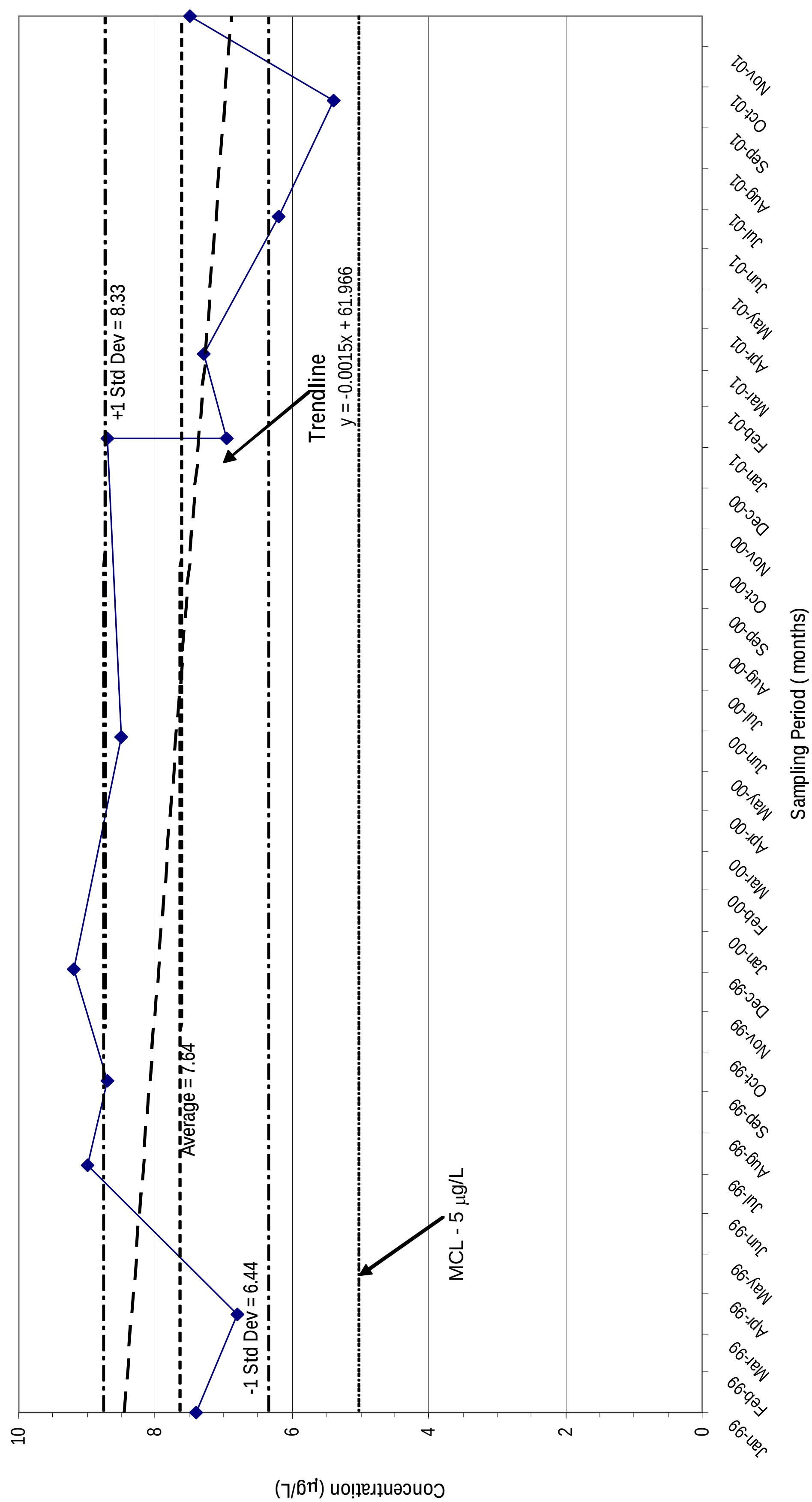

FIGURE B-3. TCE Concentrations, TA2-W-26

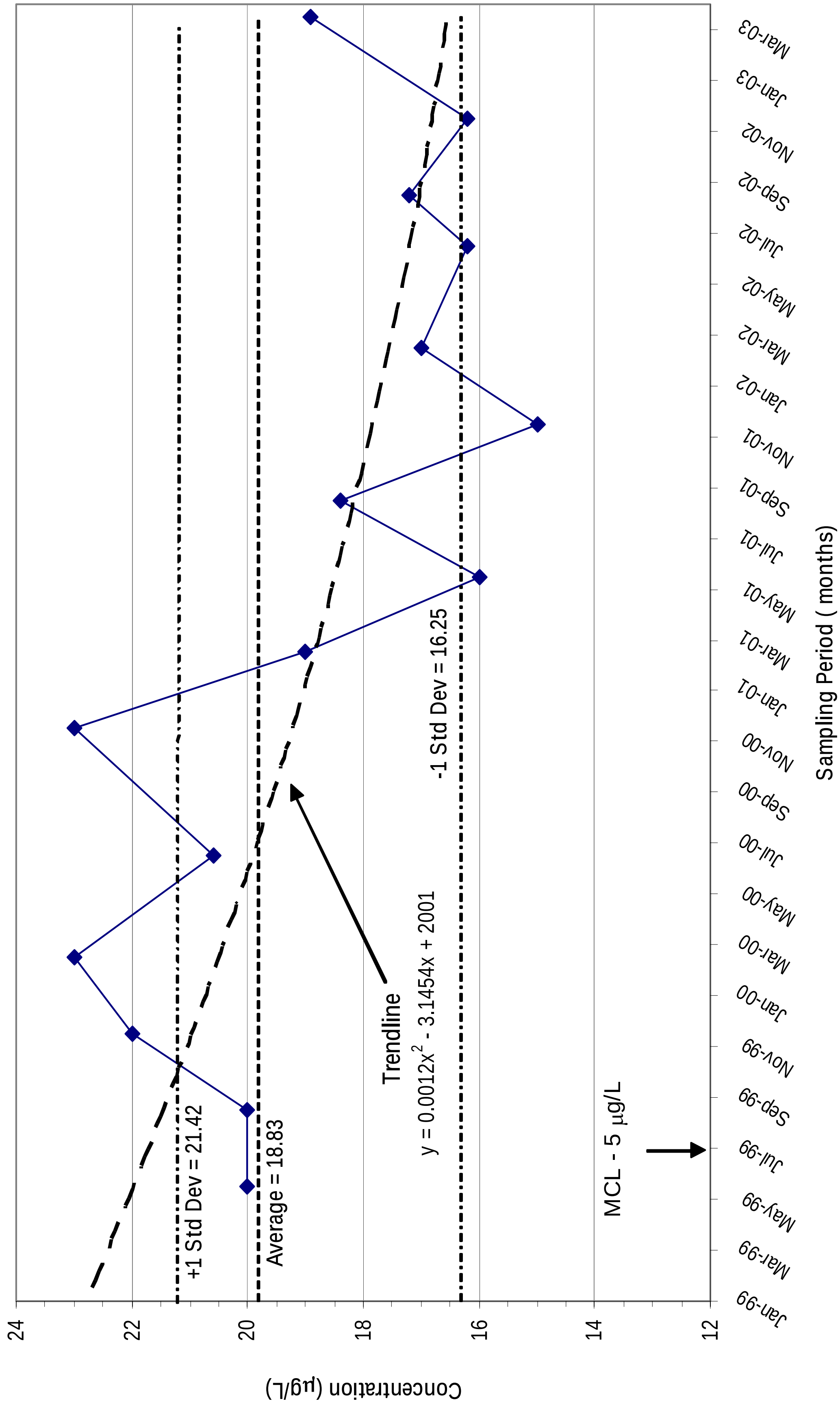

FIGURE B-4. TCE Concentrations, LWDS-MW1

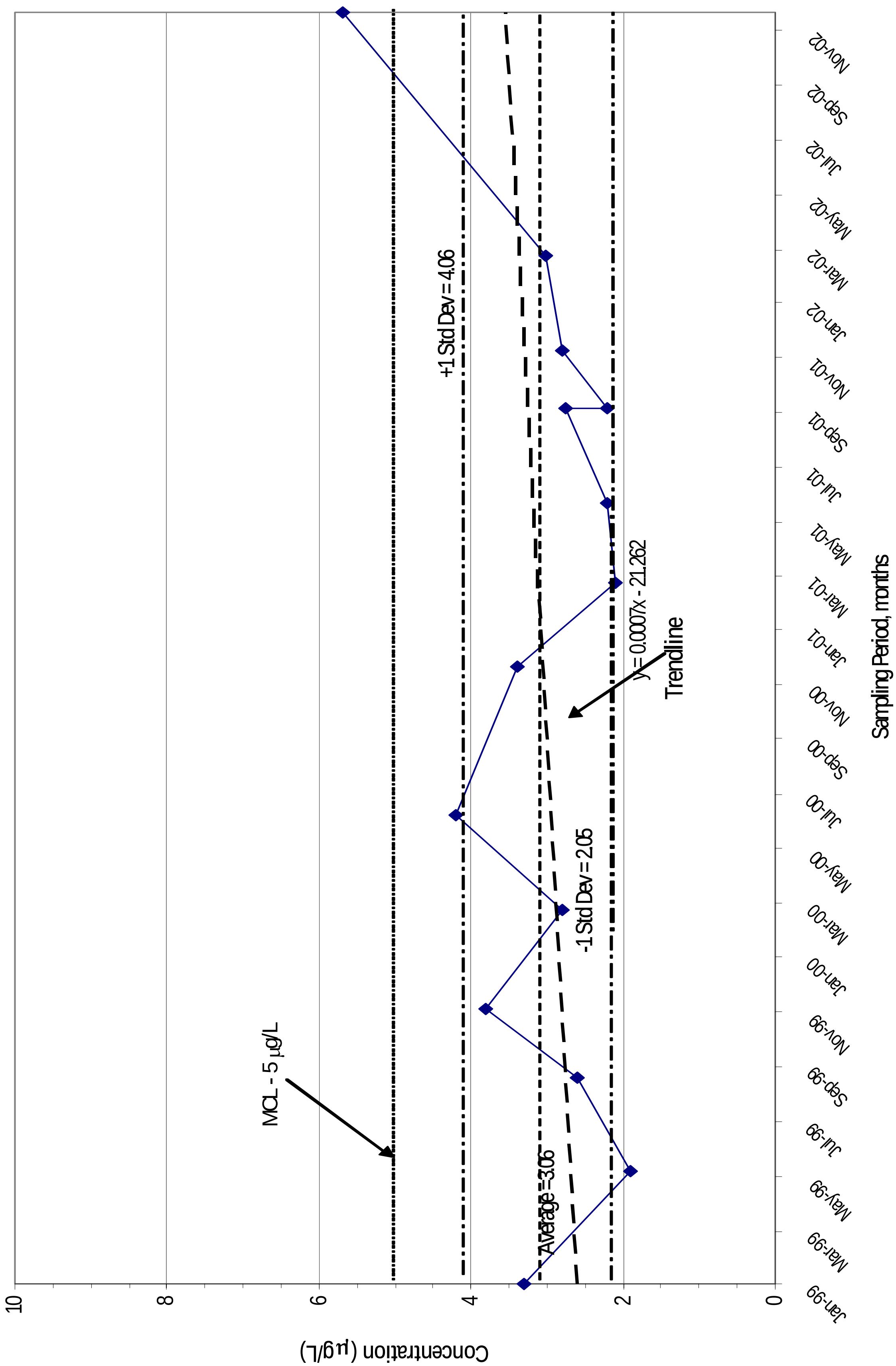

FIGURE B-5. TCE Concentrations, TAV-MW1

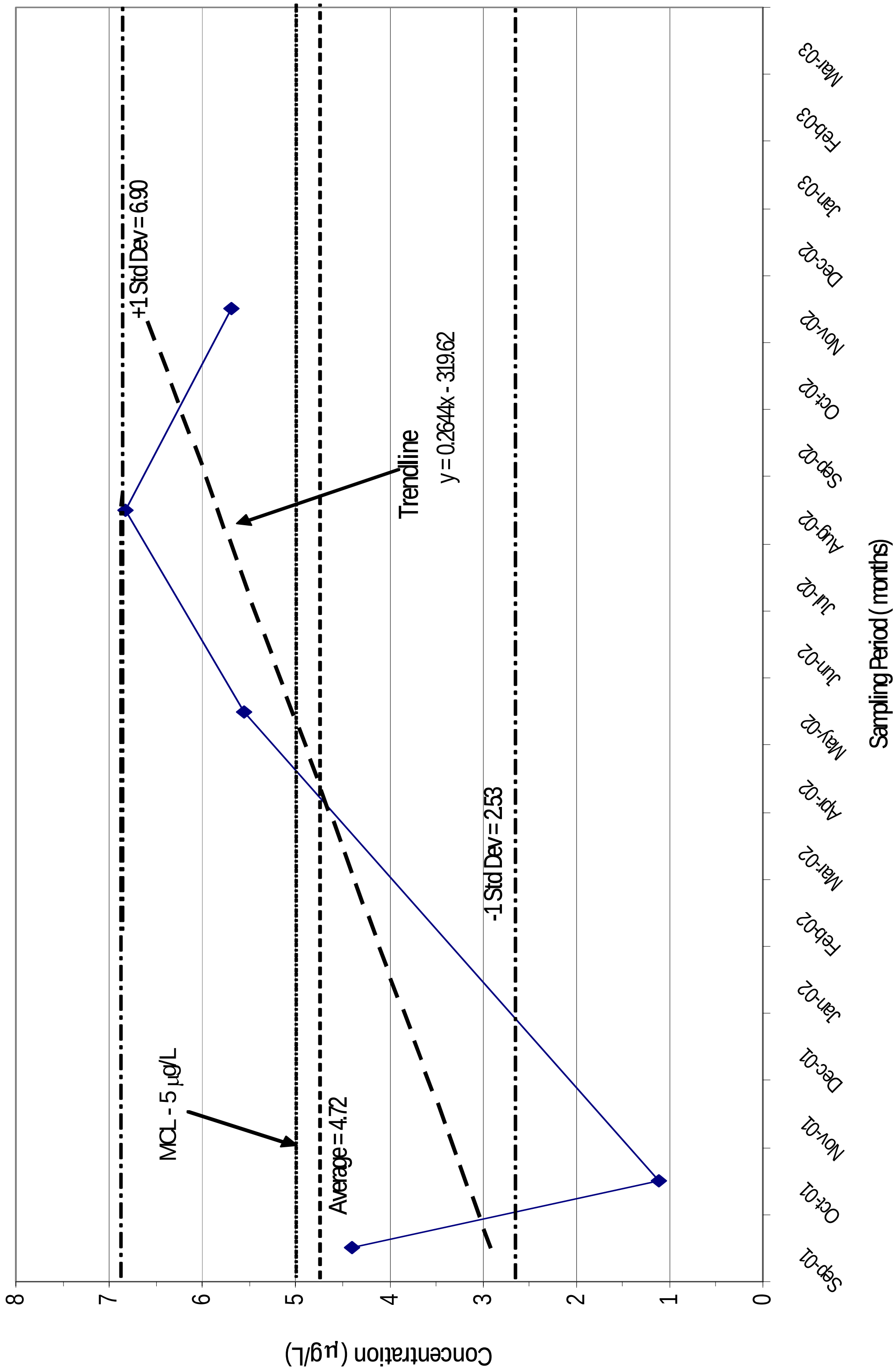

FIGURE B-6. TCE Concentrations, TAV-MW8

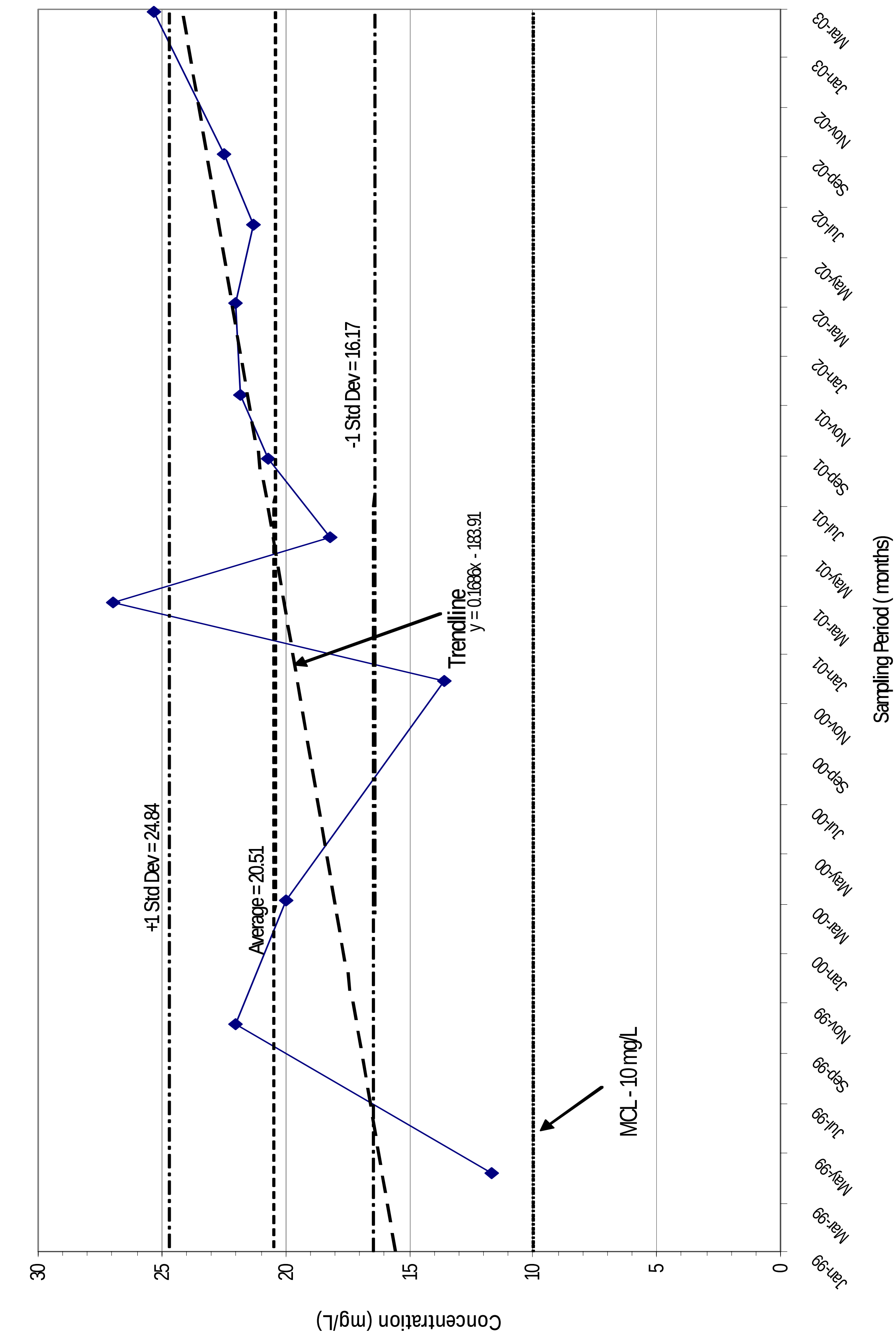

FIGURE B-7. Nitrate Concentrations, CYN-MW1D

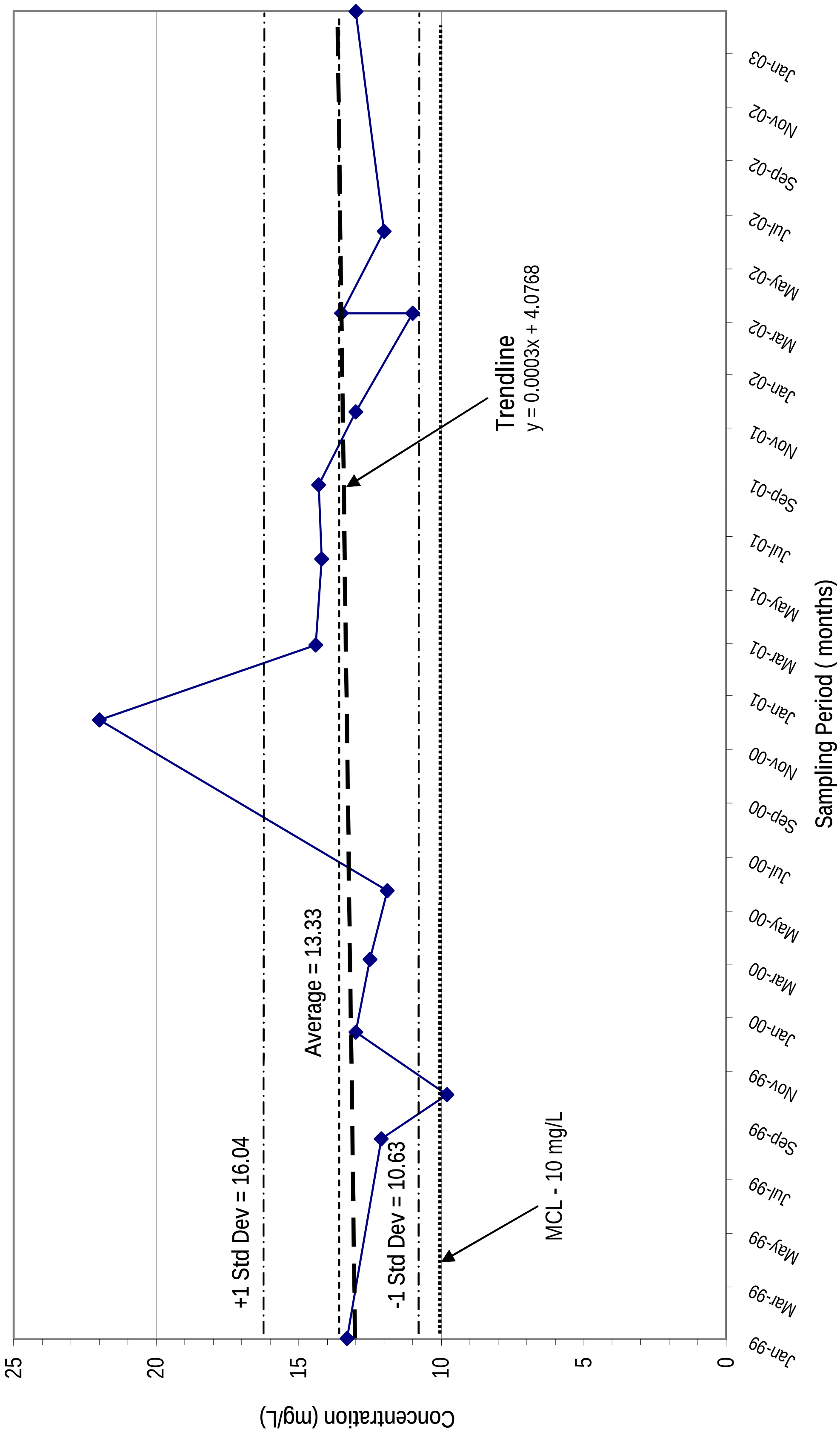

FIGURE B-8. Nitrate Concentrations, CYN-MW3

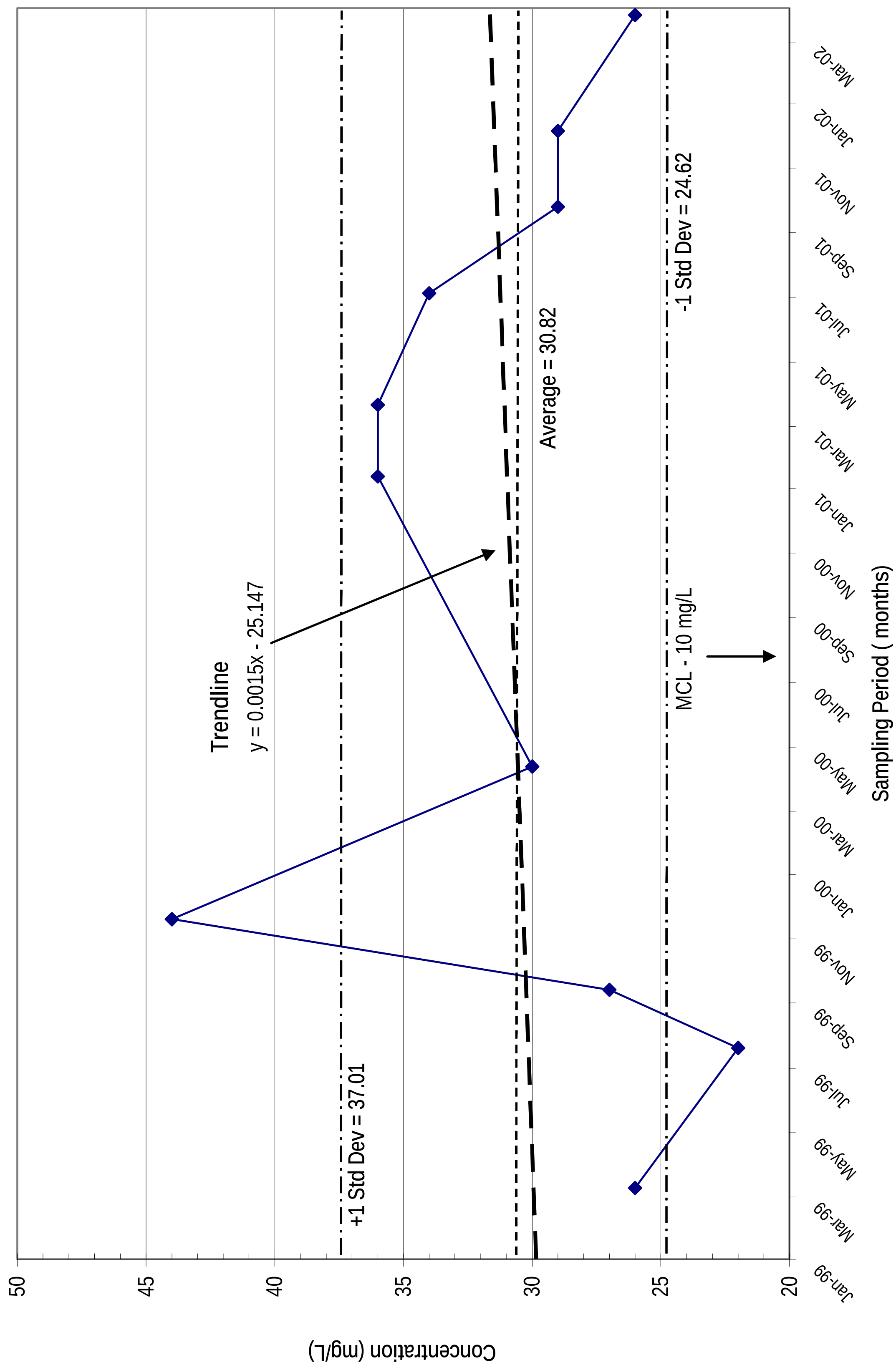

FIGURE B-9. Nitrate Concentrations at TA2-SW1-320

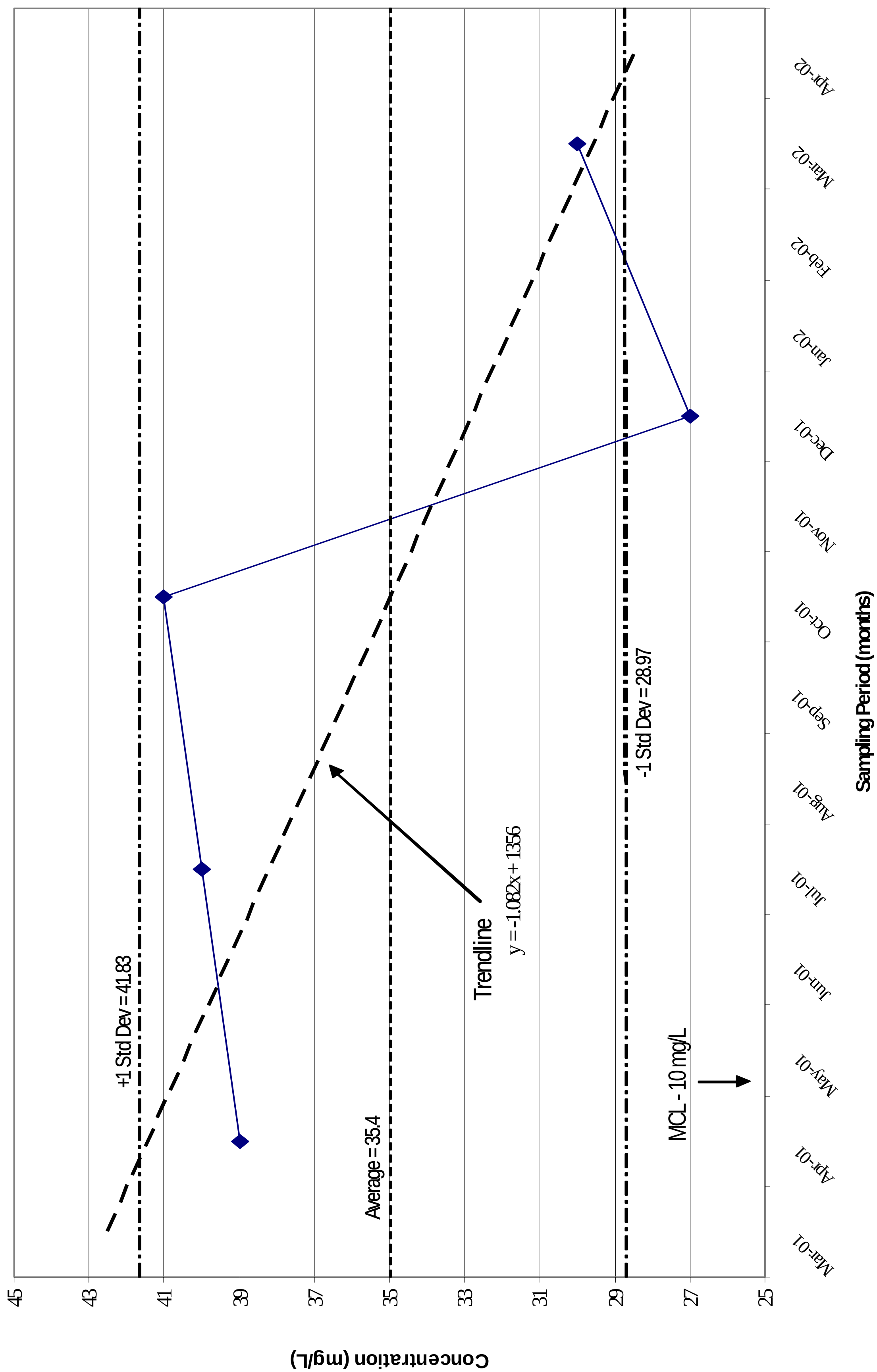

FIGURE B-10. Nitrate Concentrations at TJA-7

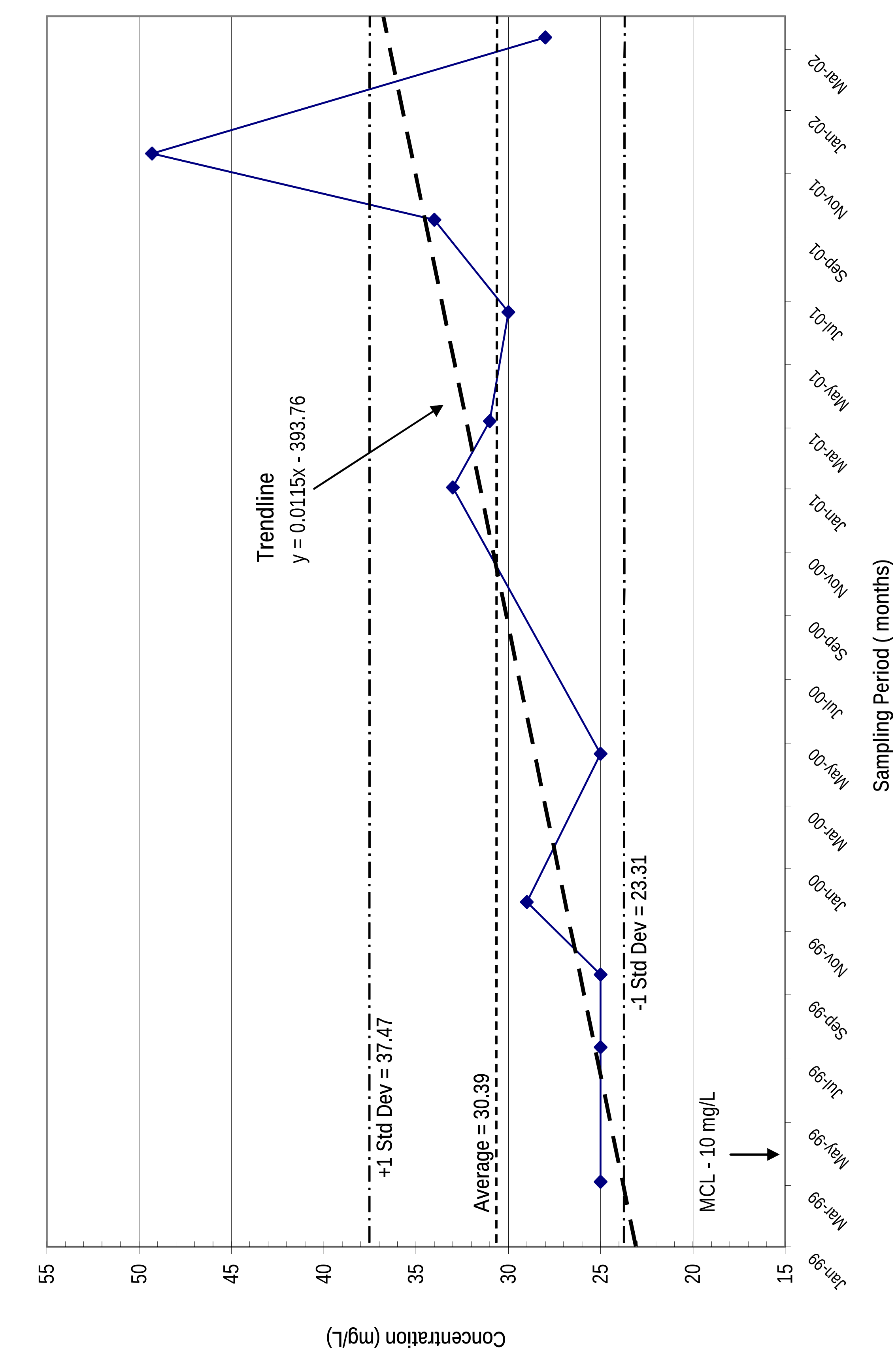

FIGURE B-11. Nitrate Concentrations, TJA-4

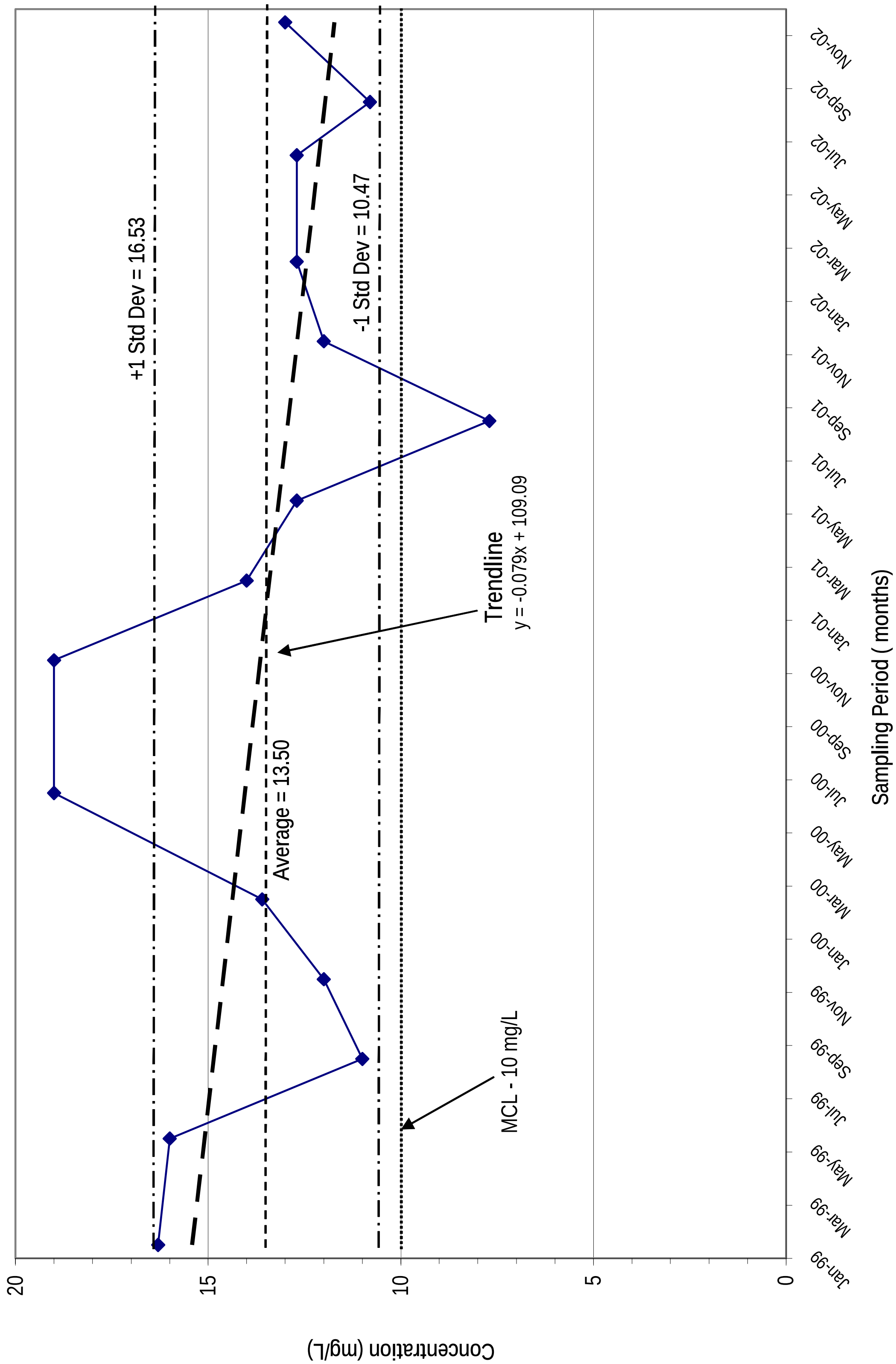

FIGURE B-12. Nitrate Concentrations at LWDS-MW1

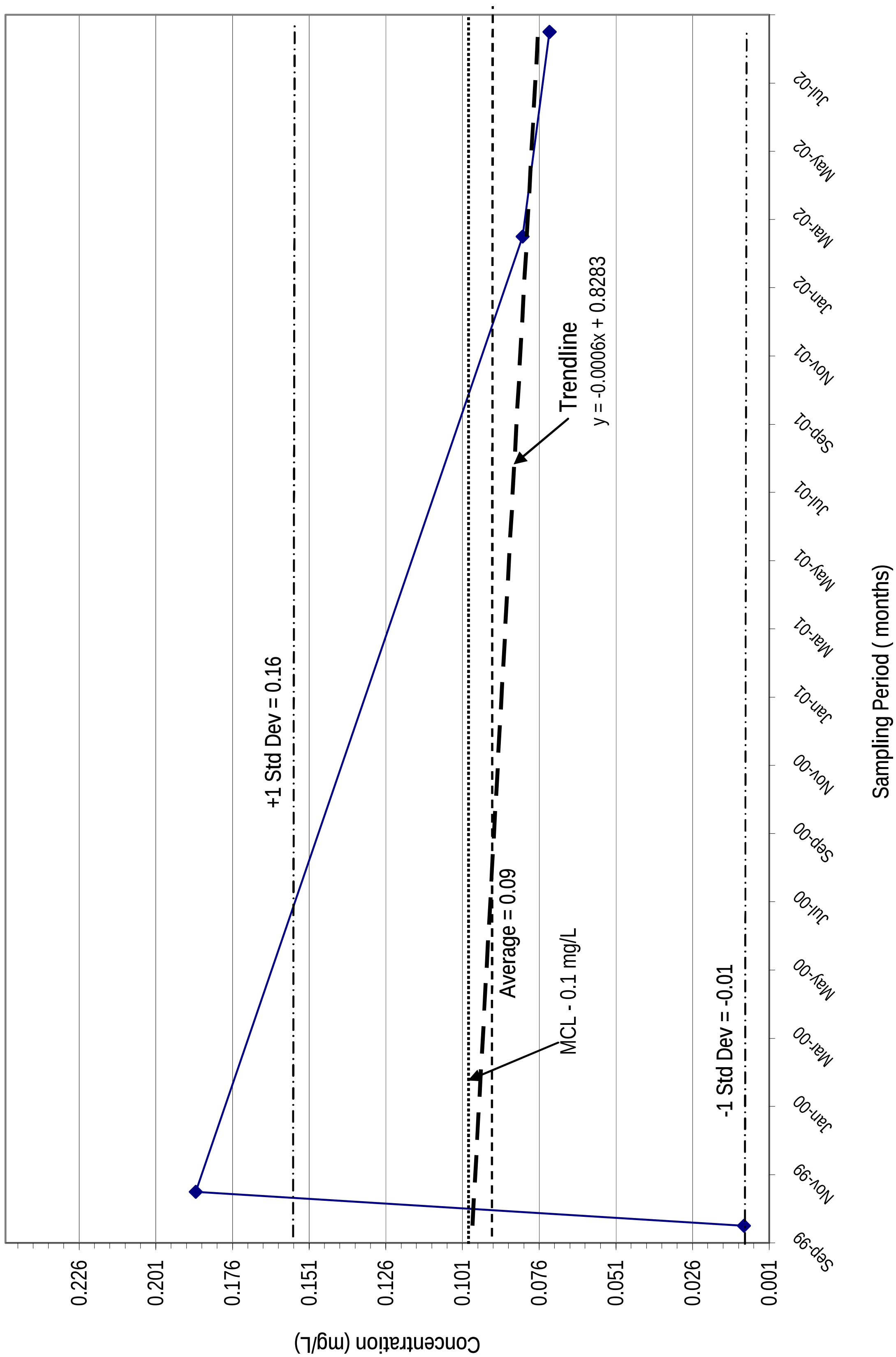

FIGURE B-13. Chromium Concentrations, CWL-BW3

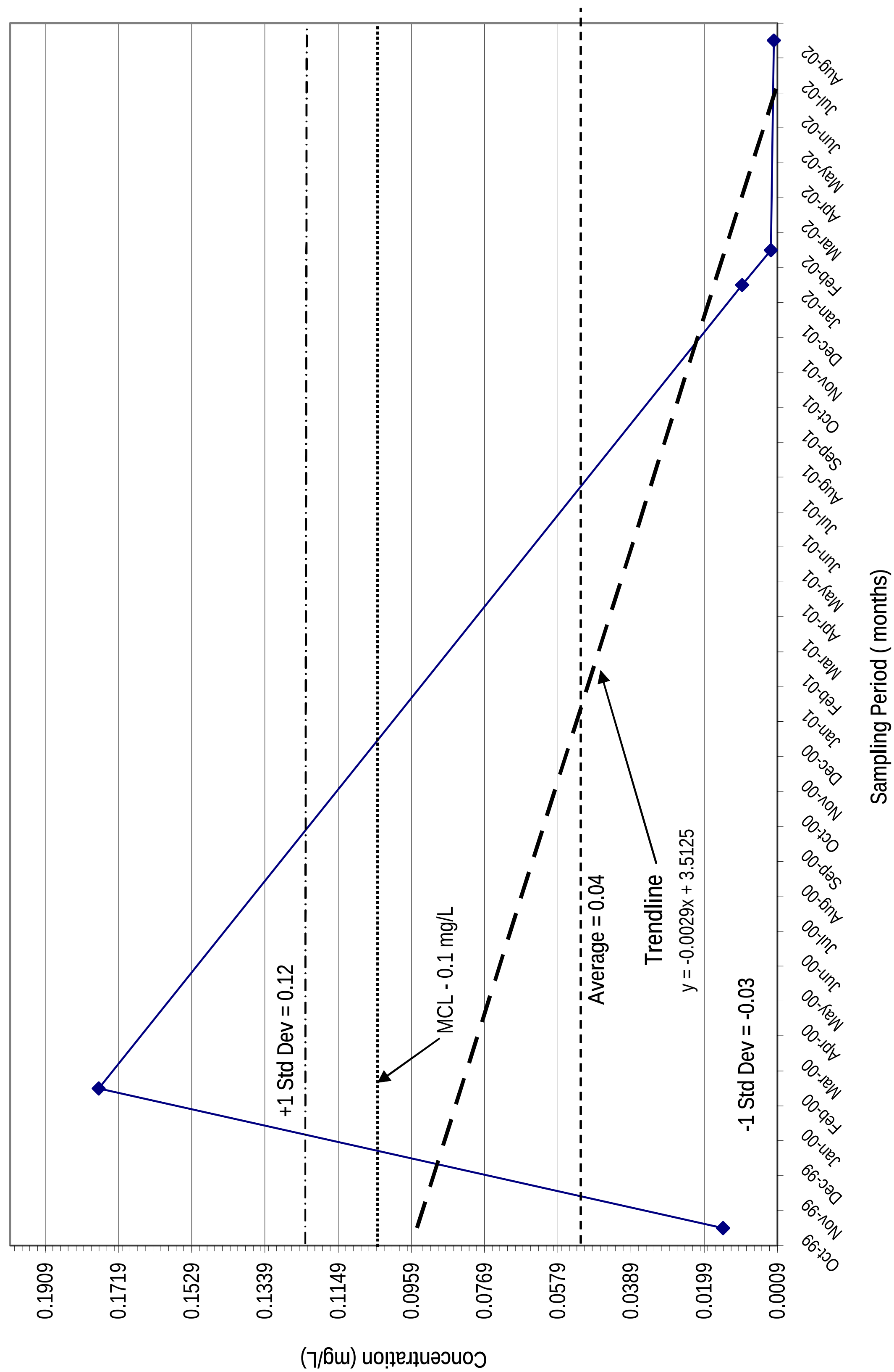

FIGURE B-14. Total Chromium Concentrations, CWL-MW4

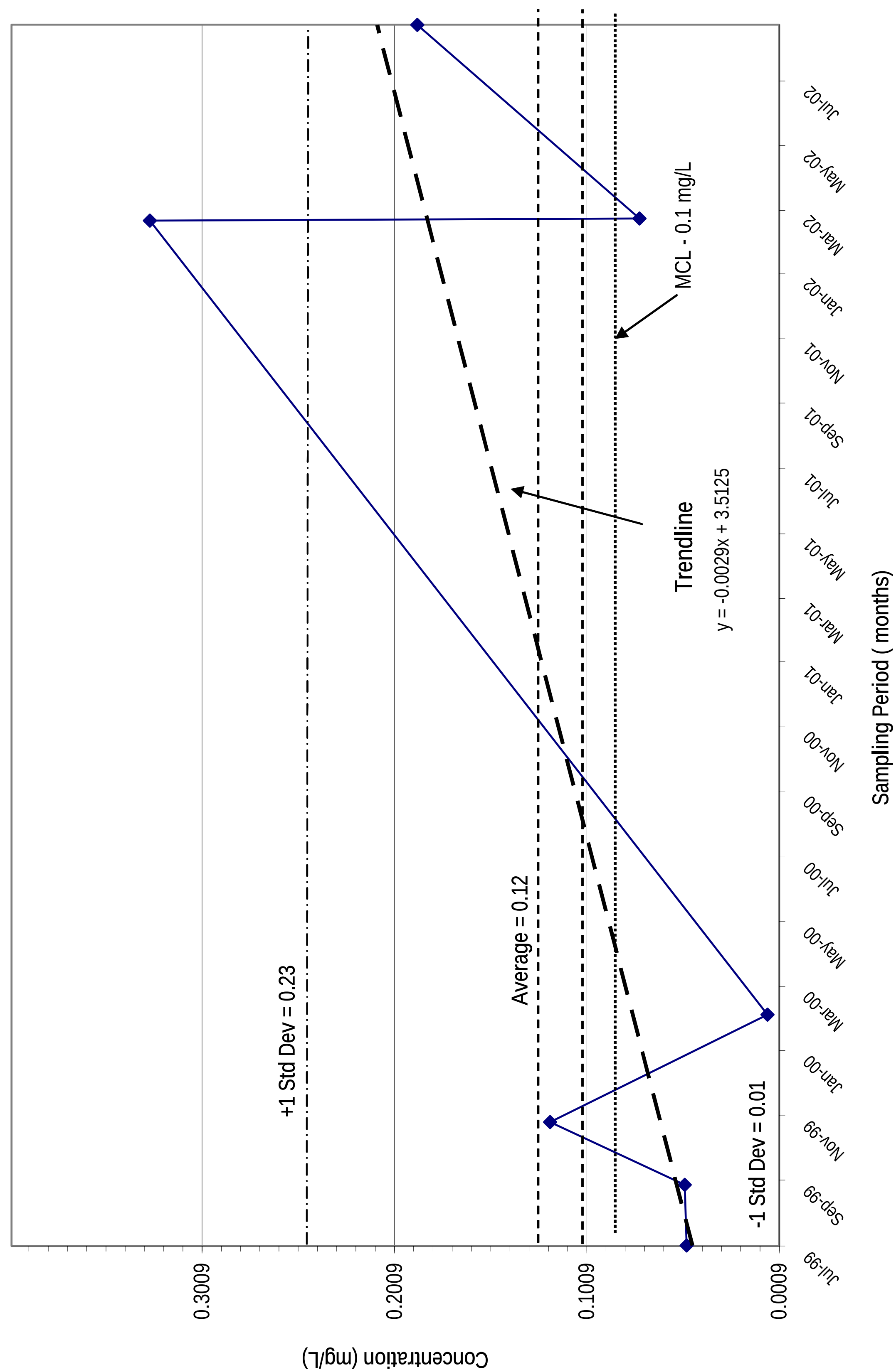

FIGURE B-15. Total Chromium Concentrations, CWL-MW2A

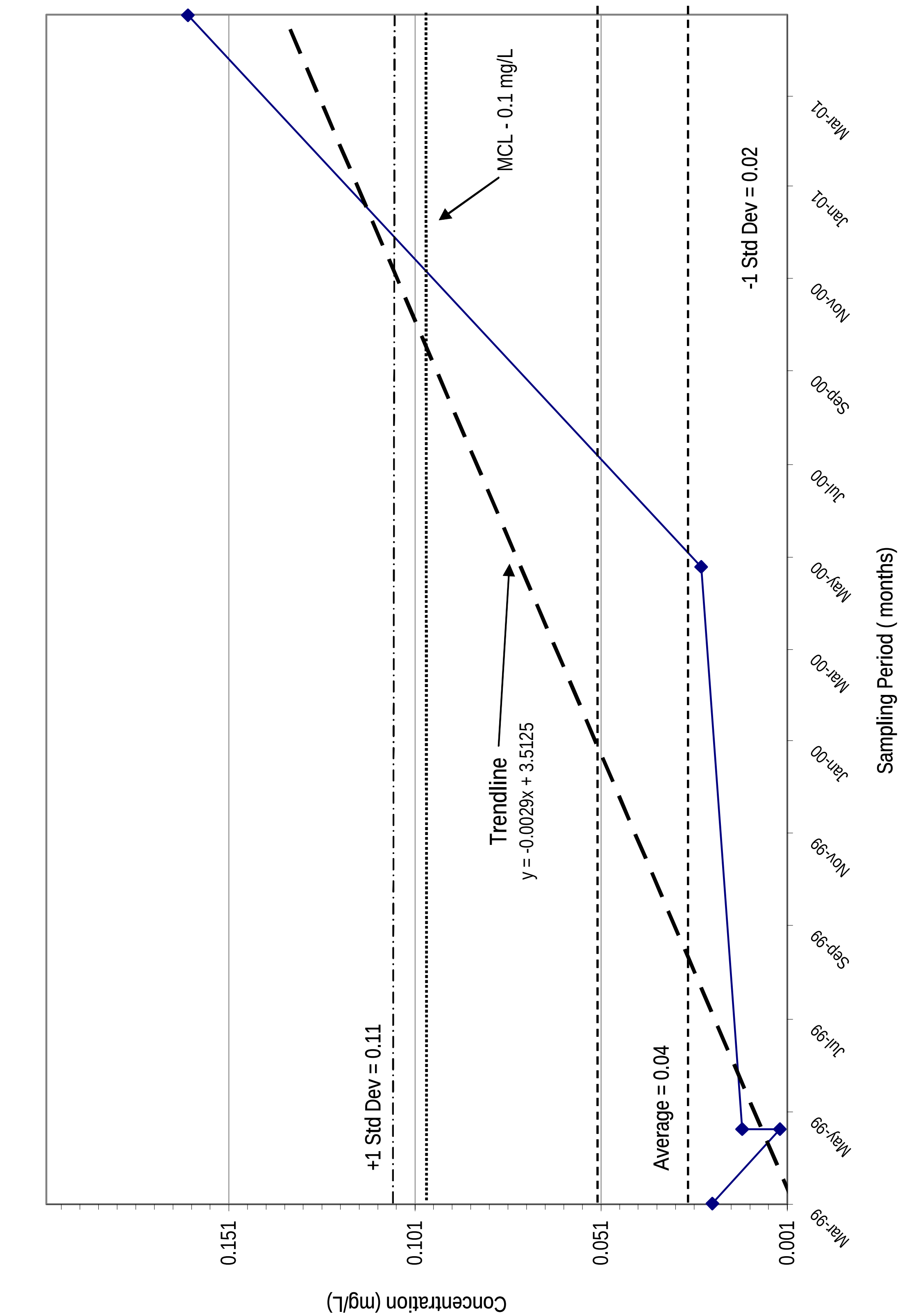

FIGURE B-16. Total Chromium Concentrations, MWL-MW2

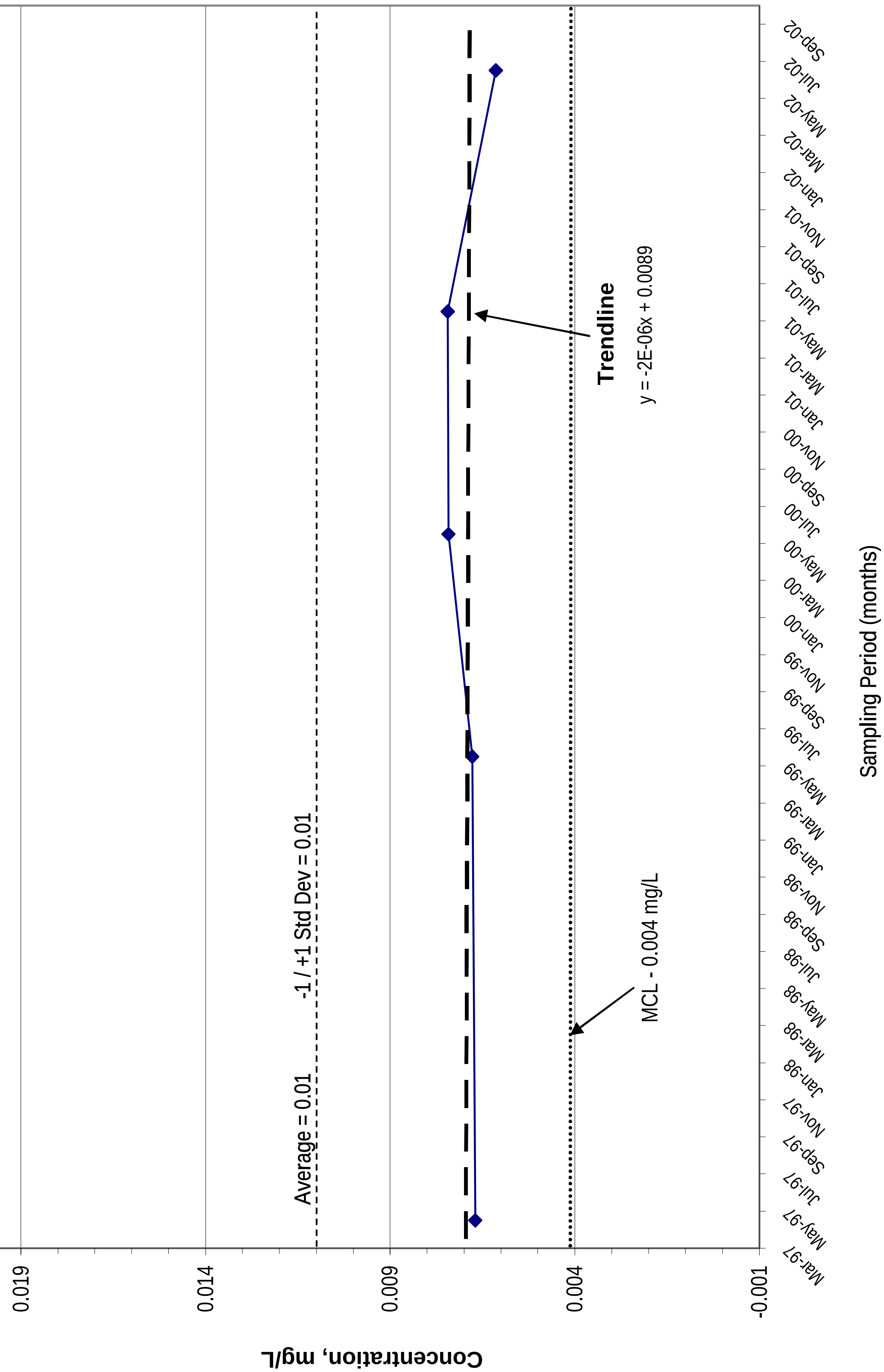

FIGURE B-17. Beryllium Concentrations, Coyote Springs

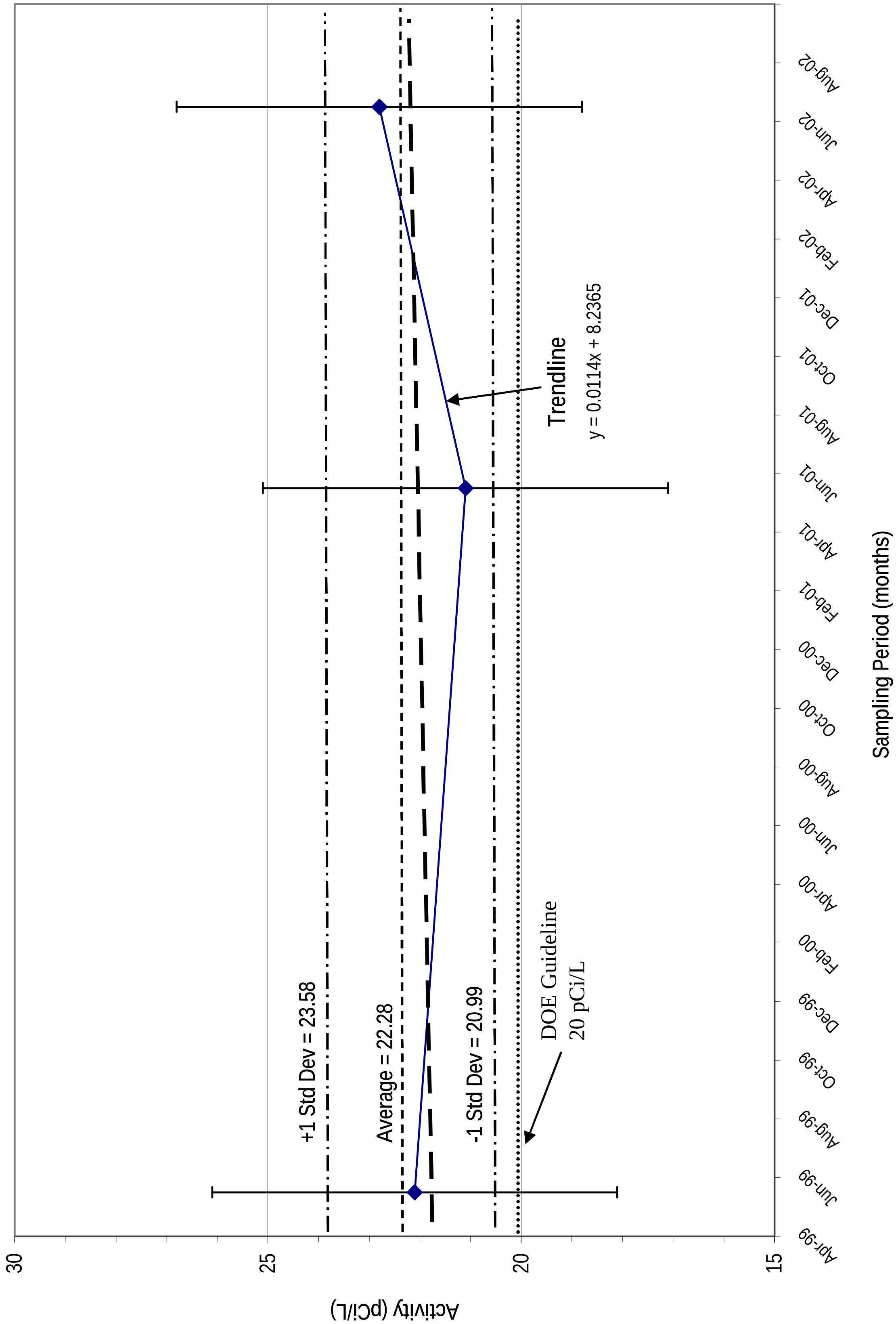

FIGURE B-18. Uranium-243 Activity, TRE-1

APPENDIX C

2002 Terrestrial Surveillance Results

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C.1 Radiological Parameters:

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 as a result of fallout from past atmospheric nuclear weapons testing. It is also a possible contaminant associated with research and development (R&D).

Note on 2002 Tritium Analysis Results: Tritium is determined by distilling the moisture from a sample, and analyzing the extracted moisture by liquid scintillation counting. In 2002, due to insufficient soil moisture in many samples, the analytical laboratory was required to add distilled water to the extracted water to obtain sufficient sample volume to conduct the analysis. This action resulted in significantly higher detection limits for these samples, and per laboratory procedures, the results were reported in different units than normal (pCi/gram of soil rather than pCi/liter extracted moisture). Due to the higher detection limits, none of these samples had detectable tritium. These samples are reported on a different table in this appendix than the samples that were analyzed normally, and the results have not been used in any statistical analyses for CY02.

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 - Thermoluminescent dosimeters (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 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 36 on-site, perimeter and off-site locations.

Non-Radiological parameters:

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 method.

Definitions:
The following terminology is utilized in the tables in this appendix:

<u>Definitions for Radiological Analysis Tables</u>
Decision Level (or Critical Level): The activity concentration above which a sample is considered to have activity above the instrument background at a prescribed level of confidence. The decision level is calculated such that there is a five percent probability of reporting a false positive result for a sample containing no activity.

Detection Limit (or Minimum Detectable Activity): The true activity concentration in a sample that, if present, can be detected (i.e., above the decision level) at a prescribed level of confidence. The detection limit is calculated such that there is a five percent probability of reporting a false negative result for a sample containing activity at the detection limit.

<u>Definitions for Metals Tables</u>
Decision Level (or Method Detection Limit): The lowest concentration at which a substance can be detected in a sample at a prescribed level of confidence.

Detection Limit (or Practical Quantification Limit): The lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

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TABLE C-1. Radiological Results by Location for Calendar Year 2002, Soil

Location Type	Location	Cesium-137 (pCi/g)				Tritium (pCi/mL)				Total Uranium (μg/g)		
		Activity (± 2 σ)		Decision Level	Detection Limit	Activity (± 2 σ)		Decision Level	Detection Limit	Concentration	Decision Level	Detection Limit
Community	9	0.361 ± 0.052		0.0144	0.0301	0.115 ± 0.117	U	0.0902	0.193	0.485	0.00594	0.0396
	10	0.282 ± 0.0471		0.0145	0.0302	0.119 ± 0.122	U	0.0936	0.201	0.57	0.00592	0.0394
	25	0.13 ± 0.0249		0.0136	0.0283	0.143 ± 0.12	U	0.0902	0.193	0.585	0.00598	0.0398
	62	0.364 ± 0.0502		0.0131	0.0272	0.0858 ± 0.115	U	0.0901	0.193	0.935	0.00594	0.0396
Perimeter	58	0.111 ± 0.0262		0.0108	0.0225	-0.0864 ± 0.133	U	0.114	0.233	0.611	0.00598	0.0398
	60	0.0323 ± 0.0228		0.0102	0.0211	0.02 ± 0.146	U	0.122	0.25	0.62	0.006	0.04
	63	0.604 ± 0.0666		0.0139	0.0287	0.218 ± 0.137	U	0.109	0.229	0.72	0.00592	0.0394
	65E	0.204 ± 0.0452		0.0174	0.0358	-0.0625 ± 0.13	U	0.11	0.226	1	0.00588	0.0392
	80	0.811 ± 0.0959		0.0119	0.0248	-0.194 ± 0.138	U	0.12	0.245	0.719	0.00595	0.0397
On-Site	2SW	0.213 ± 0.0331		0.00853	0.0177	0.285 ± 0.147		0.105	0.222	0.452	0.00588	0.0392
	3	0.551 ± 0.0692		0.0109	0.0226	0.159 ± 0.117	U	0.0954	0.2	0.629	0.00595	0.0397
	20	0.611 ± 0.0732		0.0127	0.0266	-0.0277 ± 0.103	U	0.102	0.216	1.67	0.00596	0.0398
	32E	0.0602 ± 0.051		0.0153	0.0317	0.199 ± 0.14	U	0.105	0.222	0.601	0.00586	0.0391
	32S	0.0747 ± 0.0301		0.0137	0.0282	0.113 ± 0.132	U	0.104	0.22	0.775	0.00585	0.039
	34	0.507 ± 0.0633		0.012	0.0248	0.0988 ± 0.117	U	0.0989	0.208	0.706	0.00593	0.0395
	35	0.493 ± 0.0627		0.0107	0.0223	0.192 ± 0.101		0.0736	0.155	0.399	0.006	0.04
	46	0.123 ± 0.0266		0.0131	0.0269	0.0296 ± 0.115	U	0.109	0.231	0.669	0.00588	0.0392
	49	0.467 ± 0.0564		0.0109	0.0224	0.0902 ± 0.122	U	0.111	0.235	0.765	0.00588	0.0392
	53	0.143 ± 0.0338		0.0114	0.0235	0.0843 ± 0.129	U	0.103	0.219	0.364	0.00596	0.0398
	57	0.0815 ± 0.0226		0.0111	0.0229	0.0286 ± 0.111	U	0.105	0.224	0.774	0.00598	0.0398
	76	0.19 ± 0.0293		0.00983	0.0204	0.145 ± 0.123	U	0.107	0.227	0.454	0.00585	0.039
	78	0.525 ± 0.0647		0.0121	0.0252	0.0826 ± 0.133	U	0.107	0.224	0.377	0.00593	0.0395

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For radiochemical analytes the result is less than the decision level.

TABLE C-1. Radiological Results by Location for Calendar Year 2002, Soil *(concluded)*

Location Type	Location	Cesium-137 (pCi/g)				Tritium (pCi/g)				Total Uranium (µg/g)		
		Activity (± 2 σ)		Decision Level	Detection Limit	Activity (± 2 σ)		Decision Level	Detection Limit	Concentration	Decision Level	Detection Limit
Community	8	0.00624 ± 0.0136	U	0.0119	0.0246	-1.43 ± 2.5	U	2.16	4.32	0.608	0.00588	0.0392
	11	0.0552 ± 0.0205		0.00942	0.0195	0.488 ± 1.31	U	1.08	2.16	0.515	0.006	0.04
Perimeter	4	0.0374 ± 0.0203		0.00907	0.0188	-1.23 ± 1.2	U	1.05	2.1	0.333	0.00596	0.0398
	5	0.408 ± 0.0481		0.00835	0.0173	-1.01 ± 1.24	U	1.08	2.15	0.255	0.006	0.04
	12	1.43 ± 0.169		0.0118	0.0244	-0.576 ± 1.33	U	1.13	2.27	0.548	0.00588	0.0392
	16	0.0628 ± 0.0207		0.00947	0.0195	-1.3 ± 1.29	U	1.13	2.26	0.609	0.00593	0.0395
	59	0.0702 ± 0.0159		0.0077	0.0159	-1.43 ± 1.26	U	1.11	2.22	0.537	0.00593	0.0395
	61	-0.00796 ± 0.0123	U	0.0101	0.0209	-1.66 ± 1.43	U	1.26	2.52	0.55	0.00598	0.0398
	64	0.71 ± 0.075		0.0135	0.0278	-0.845 ± 1.31	U	1.13	2.25	0.686	0.00593	0.0395
	81	0.431 ± 0.0552		0.00845	0.0174	-1.77 ± 1.22	U	1.08	2.17	0.355	0.00588	0.0392
On-Site	1	0.222 ± 0.0422		0.0116	0.0241	-0.717 ± 1.4	U	1.21	2.41	0.678	0.00586	0.0391
	2NE	0.155 ± 0.0352		0.0123	0.0259	0.353 ± 1.1	U	0.908	1.82	0.755	0.00593	0.0395
	2NW	0.24 ± 0.0434		0.0112	0.0235	0.216 ± 0.958	U	0.796	1.59	0.315	0.00598	0.0398
	2SE	0.364 ± 0.0588		0.0136	0.0283	0.534 ± 1.06	U	0.871	1.74	0.506	0.00595	0.0397
	6	0.518 ± 0.0654		0.00793	0.0164	-0.125 ± 1.2	U	1.02	2.03	0.376	0.00596	0.0398
	7	0.288 ± 0.0437		0.0135	0.0284	0.42 ± 1.23	U	1.01	2.02	0.399	0.00598	0.0398
	33	0.303 ± 0.0423		0.013	0.0273	-0.425 ± 1.17	U	1	2.01	0.897	0.00599	0.0399
	41	0.154 ± 0.0326		0.0152	0.0318	-0.0305 ± 1.28	U	1.08	2.16	0.354	0.00599	0.0399
	42	0.0731 ± 0.0247		0.0133	0.0278	-0.436 ± 1.26	U	1.07	2.15	0.415	0.00595	0.0397
	43	0.0998 ± 0.0278		0.0144	0.03	-0.0469 ± 1.97	U	1.66	3.32	0.377	0.00599	0.0399
	45	0.254 ± 0.0467		0.0162	0.0334	-0.0581 ± 1.22	U	1.03	2.05	0.382	0.00594	0.0396
	51	0.0695 ± 0.0228		0.0109	0.0228	-0.514 ± 1.2	U	1.03	2.05	0.412	0.006	0.04
	52	0.0742 ± 0.0366		0.0144	0.03	-0.449 ± 1.21	U	1.03	2.07	0.799	0.00599	0.0399
	54	0.187 ± 0.0374		0.0145	0.0303	0.816 ± 1.23	U	0.995	1.99	0.5	0.00599	0.0399
	55	0.502 ± 0.0608		0.0121	0.025	-0.797 ± 1.25	U	1.08	2.16	0.503	0.00594	0.0396
	56	0.057 ± 0.0176		0.0101	0.0211	-0.286 ± 1.19	U	1.01	2.02	0.395	0.00592	0.0394
	66	0.166 ± 0.0363		0.0136	0.0282	-0.281 ± 1.17	U	0.993	1.99	0.503	0.00592	0.0394
	77	0.445 ± 0.085		0.0119	0.0249	-0.603 ± 1.21	U	1.04	2.08	0.428	0.00596	0.0398

NOTES: pCi/g = picocurie per gram
U = The analyte was analyzed for, but not detected, below this concentration. For radiochemical analytes the result is less than the decision level.
Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.

TABLE C-2. Radiological Results by Location for Calendar Year 2002, Sediment

Location Type	Location	Cesium-137 (pCi/g)				Tritium (pCi/mL)				Total Uranium (µg/g)		
		Activity (± 2 σ)		Decision Level	Detection Limit	Activity (± 2 σ)		Decision Level	Detection Limit	Concentration	Decision Level	Detection Limit
Community	8	0.102 ± 0.0276		0.0123	0.0255	0.114 ± 0.117	U	0.0899	0.193	0.715	0.006	0.04
	11	0.0689 ± 0.0248		0.0137	0.0285	0.0288 ± 0.11	U	0.0906	0.194	0.494	0.006	0.04
	68	0.0272 ± 0.0175		0.00968	0.0202	0.0861 ± 0.115	U	0.0904	0.194	0.934	0.00599	0.0399
Perimeter	60	0.00522 ± 0.013	U	0.00964	0.0199	-0.0441 ± 0.135	U	0.114	0.233	0.844	0.00593	0.0395
	65E	0.0162 ± 0.0186	U	0.00916	0.0189	-0.0051 ± 0.135	U	0.113	0.232	0.835	0.00587	0.0391
	73	0.0242 ± 0.0148		0.00915	0.0189	-0.0521 ± 0.129	U	0.109	0.223	0.793	0.00594	0.0396
On-Site	74	0.0235 ± 0.0264	U	0.0128	0.0267	0.0807 ± 0.0917	U	0.0723	0.153	0.904	0.00589	0.0393
	75	0.132 ± 0.0294		0.0107	0.0223	0.186 ± 0.098		0.0713	0.151	0.745	0.00588	0.0392

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
µg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For radiochemical analytes the result is less than the decision level.

TABLE C-2. Radiological Results by Location for Calendar Year 2002, Sediment *(concluded)*

Location Type	Location	Cesium-137 (pCi/g) Activity (± 2 σ)		Cesium-137 Decision Level	Cesium-137 Detection Limit	Tritium (pCi/g) Activity (± 2 σ)		Tritium Decision Level	Tritium Detection Limit	Total Uranium (µg/g) Concentration	Total Uranium Decision Level	Total Uranium Detection Limit
On-Site	72	0.0913 ± 0.0212		0.0101	0.0208	-0.544 ± 1.09	U	0.937	1.87	1.06	0.00591	0.0394
	79	0.227 ± 0.033		0.0111	0.0231	-0.38 ± 1.21	U	1.03	2.06	1.46	0.00587	0.0391

NOTES: pCi/g = picocurie per gram
U = The analyte was analyzed for, but not detected, below this concentration. For radiochemical analytes the result is less than the decision level.
Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.

TABLE C-3. Radiological Results by Location for Calendar Year 2002, Vegetation

Location Type	Location	Cesium-137 (pCi/g)				Tritium (pCi/mL)				Total Uranium (µg/g)			
		Activity (± 2 σ)		Decision Level	Detection Limit	Activity (± 2 σ)		Decision Level	Detection Limit	Concentration		Decision Level	Detection Limit
Community	8	-0.00433 ± 0.0241	U	0.0186	0.0383	0 ± 0.141	U	0.118	0.25	0.00564	U	0.00564	0.0376
	11	-0.00103 ± 0.0124	U	0.0101	0.0209	-0.0291 ± 0.125	U	0.107	0.227	0.00559	U	0.00559	0.0372
	25	0 ± 0.0289	U	0.0237	0.0486	-0.0296 ± 0.128	U	0.109	0.231	0.00543	U	0.00543	0.0362
On-Site	33	0.000624 ± 0.0164	U	0.0135	0.0282	0 ± 0.102	U	0.0855	0.18	0.0288	J	0.00595	0.0397
	45	0.0738 ± 0.0201		0.0106	0.0219	0.0814 ± 0.102	U	0.0815	0.171	0.00755	J	0.00596	0.0398
	51	0.0301 ± 0.021		0.0127	0.0266	-0.0276 ± 0.0971	U	0.0828	0.174	0.0158	J	0.00599	0.0399

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
µg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For radiochemical analytes the result is less than the decision level.
J = Estimated value, the analyte concentration fell above the decision level and below the detection limit.

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TABLE C-4. Non-radiological Results for Community by Location for Calendar Year 2002, Soil
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	8				9				10			
		Result		Decision Level	Detection Limit	Result		Detection Limit	Detection Limit	Result		Decision Level	Detection Limit
Community	Aluminum	6850	B	0.755	4.76	16600	B	0.728	4.59	16900	B	0.763	4.81
	Antimony	0.327	U	0.327	0.952	0.562	J	0.315	0.917	0.33	U	0.33	0.962
	Arsenic	2.9		0.197	0.476	4.88		0.189	0.459	3.39		0.198	0.481
	Barium	132		0.0635	0.476	167		0.0612	0.459	110		0.0641	0.481
	Beryllium	0.381	J	0.0476	0.476	0.733		0.0459	0.459	0.749		0.0481	0.481
	Cadmium	0.115	J	0.0455	0.476	0.165	J	0.0439	0.459	0.107	J	0.046	0.481
	Calcium	14500	B	1.24	9.52	34800	B	1.2	9.17	5640	B	1.25	9.62
	Chromium	8.15		0.153	0.476	18.2		0.148	0.459	17.9		0.155	0.481
	Cobalt	3.46		0.076	0.476	6.06		0.0732	0.459	5.49		0.0767	0.481
	Copper	7.3		0.193	0.476	14.7		0.186	0.459	9.13		0.195	0.481
	Iron	9990		1.49	4.76	16400		1.44	4.59	17100		1.51	4.81
	Lead	13.9		0.27	0.476	20.1		0.26	0.459	10		0.273	0.481
	Magnesium	2990		0.557	1.9	4900		0.537	1.83	3150		0.562	1.92
	Manganese	229		0.125	0.952	317		0.12	0.917	394		0.126	0.962
	Mercury	0.0055	J	0.000953	0.0097	0.0109		0.000965	0.00982	0.00874	J	0.000917	0.00933
	Nickel	5.99		0.0813	0.476	12.6		0.0783	0.459	12.2		0.0821	0.481
	Potassium	1880		3.41	9.52	2640		3.28	9.17	2510		3.44	9.62
	Selenium	0.272	J	0.154	0.476	0.239	J	0.149	0.459	0.352	J	0.156	0.481
	Silver	0.383	J	0.0859	0.476	0.0828	U	0.0828	0.459	0.0867	U	0.0867	0.481
	Sodium	192		3.46	9.52	66.5		3.33	9.17	46.3		3.49	9.62
	Thallium	0.952	U	0.952	0.952	0.917	U	0.917	0.917	0.962	U	0.962	0.962
	Vanadium	21.2		0.0865	0.476	35.1		0.0833	0.459	34.6		0.0873	0.481
	Zinc	96.2		0.16	0.476	49.2		0.154	0.459	35.8		0.162	0.481

See notes at end of table.

TABLE C-4. Non-radiological Results for Community by Location for Calendar Year 2002 , Soil (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	11				25				62			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
Community	Aluminum	4910	B	0.755	4.76	10100	B	0.728	4.59	17900	B	0.77	4.85
	Antimony	0.327	U	0.327	0.952	0.315	U	0.315	0.917	0.487	J	0.333	0.971
	Arsenic	2.35		0.197	0.476	4.72		0.189	0.459	3.68		0.2	0.485
	Barium	165		0.0635	0.476	134		0.0612	0.459	170		0.0648	0.485
	Beryllium	0.279	J	0.0476	0.476	0.53		0.0459	0.459	0.844		0.0485	0.485
	Cadmium	0.0539	J	0.0455	0.476	0.26	J	0.0439	0.459	0.238	J	0.0464	0.485
	Calcium	12400	B	1.24	9.52	50200	B	5.98	45.9	31000	B	1.27	9.71
	Chromium	7.22		0.153	0.476	12.1		0.148	0.459	20.8		0.156	0.485
	Cobalt	2.96		0.076	0.476	4.3		0.0732	0.459	8.13		0.0775	0.485
	Copper	4.67		0.193	0.476	9.7		0.186	0.459	12.4		0.197	0.485
	Iron	8740		1.49	4.76	11200		1.44	4.59	17500		1.52	4.85
	Lead	5.84		0.27	0.476	18.6		0.26	0.459	9.91		0.275	0.485
	Magnesium	2290		0.557	1.9	3380		0.537	1.83	4390		0.568	1.94
	Manganese	305		0.125	0.952	300		0.12	0.917	468		0.127	0.971
	Mercury	0.00592	J	0.000907	0.00923	0.00584	J	0.000953	0.00969	0.0141		0.000864	0.00878
	Nickel	5.03		0.0813	0.476	10.8		0.0783	0.459	16.8		0.0829	0.485
	Potassium	1240		3.41	9.52	2500		3.28	9.17	4430		17.4	48.5
	Selenium	0.168	J	0.154	0.476	0.336	J	0.149	0.459	0.333	J	0.157	0.485
	Silver	0.0859	U	0.0859	0.476	0.0828	U	0.0828	0.459	0.0876	U	0.0876	0.485
	Sodium	188		3.46	9.52	99.3		3.33	9.17	70.4		3.53	9.71
	Thallium	0.952	U	0.952	0.952	1.03		0.917	0.917	0.971	U	0.971	0.971
	Vanadium	20.6		0.0865	0.476	21.2		0.0833	0.459	32.6		0.0882	0.485
	Zinc	20.9		0.16	0.476	41.4		0.154	0.459	47.2		0.163	0.485

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2002, Soil
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	4				5				12			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
Perimeter	Aluminum	8070		0.741	4.67	8710		0.778	4.9	17300		0.793	5
	Antimony	0.321	U	0.321	0.935	0.337	U	0.337	0.98	0.479	J	0.343	1
	Arsenic	3.08		0.193	0.467	2.04		0.202	0.49	3.88		0.206	0.5
	Barium	79.9		0.0623	0.467	59		0.0654	0.49	170		0.0667	0.5
	Beryllium	0.331	J	0.0467	0.467	0.362	J	0.049	0.49	0.685		0.05	0.5
	Cadmium	0.0709	J	0.0447	0.467	0.0752	J	0.0469	0.49	0.196	J	0.0478	0.5
	Calcium	58900		3.05	23.4	1300		1.28	9.8	11300		1.3	10
	Chromium	8.87		0.151	0.467	8.56		0.158	0.49	15.5		0.161	0.5
	Cobalt	2.52		0.0746	0.467	2.67		0.0782	0.49	6.74		0.0798	0.5
	Copper	5.23		0.19	0.467	5.45		0.199	0.49	17.5		0.203	0.5
	Iron	8130		1.46	4.67	8890		1.54	4.9	17200		1.57	5
	Lead	6.19		0.265	0.467	8.14		0.278	0.49	20.7		0.284	0.5
	Magnesium	2990		0.547	1.87	2020		0.573	1.96	5020		0.585	2
	Manganese	131		0.122	0.935	164		0.128	0.98	372		0.131	1
	Mercury	0.0075	J	0.00092	0.0094	0.0074	J	0.00093	0.0095	0.022		0.00095	0.0097
	Nickel	5.8		0.0798	0.467	5.18		0.0837	0.49	11.5		0.0854	0.5
	Potassium	2330		3.34	9.35	1880		3.51	9.8	3600		17.9	50
	Selenium	0.365	BJ	0.151	0.467	0.362	BJ	0.159	0.49	0.691	B	0.162	0.5
	Silver	0.0843	U	0.0843	0.467	0.0884	U	0.0884	0.49	0.09	U	0.0902	0.5
	Sodium	51.5		3.39	9.35	37		3.56	9.8	84.6		3.63	10
	Thallium	1.09		0.935	0.935	0.98	U	0.98	0.98	1	U	1	1
	Vanadium	17.6		0.0849	0.467	15.5		0.089	0.49	31.6		0.0908	0.5
	Zinc	21.5	B	0.157	0.467	26.5	B	0.165	0.49	54.1	B	0.168	0.5

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2002 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	16 Result		16 Decision Level	16 Detection Limit	58 Result		58 Decision Level	58 Detection Limit	59 Result		59 Decision Level	59 Detection Limit
Perimeter	Aluminum	10600		0.778	4.9	11000		0.77	4.85	8270		0.77	4.85
	Antimony	0.337	U	0.337	0.98	0.333	U	0.333	0.971	0.333	U	0.333	0.971
	Arsenic	2.13		0.202	0.49	2.97		0.2	0.485	3.35		0.2	0.485
	Barium	95.2		0.0654	0.49	150		0.0648	0.485	184		0.0648	0.485
	Beryllium	0.496		0.049	0.49	0.48	J	0.0485	0.485	0.359	J	0.0485	0.485
	Cadmium	0.0469	U	0.0469	0.49	0.501		0.0464	0.485	0.122	J	0.0464	0.485
	Calcium	6800		1.28	9.8	32600		1.27	9.71	54300		3.17	24.3
	Chromium	8.46		0.158	0.49	10.2		0.156	0.485	8.09		0.156	0.485
	Cobalt	5.18		0.0782	0.49	4.4		0.0775	0.485	2.89		0.0775	0.485
	Copper	9.14		0.199	0.49	11.6		0.197	0.485	8.86		0.197	0.485
	Iron	16400		1.54	4.9	14600		1.52	4.85	9560		1.52	4.85
	Lead	7.12		0.278	0.49	18.3		0.275	0.485	23.3		0.275	0.485
	Magnesium	4060		0.573	1.96	4160		0.568	1.94	3950		0.568	1.94
	Manganese	300		0.128	0.98	214		0.127	0.971	138		0.127	0.971
	Mercury	0.012		0.00091	0.0092	0.0097		0.0009	0.0092	0.009	J	0.00088	0.009
	Nickel	7.27		0.0837	0.49	7.35		0.0829	0.485	5.63		0.0829	0.485
	Potassium	2560		3.51	9.8	2540		3.47	9.71	1660		3.47	9.71
	Selenium	0.502	B	0.159	0.49	0.201	BJ	0.157	0.485	0.487	B	0.157	0.485
	Silver	0.0884	U	0.0884	0.49	0.0876	U	0.0876	0.485	0.088	U	0.0876	0.485
	Sodium	52.5		3.56	9.8	76.7		3.53	9.71	73.8		3.53	9.71
	Thallium	0.98	U	0.98	0.98	0.971	U	0.971	0.971	1.01		0.971	0.971
	Vanadium	28.4		0.089	0.49	29.4		0.0882	0.485	24.4		0.0882	0.485
	Zinc	38.5	B	0.165	0.49	44.4	B	0.163	0.485	28.8	B	0.163	0.485

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2002 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	60				61				63			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
Perimeter	Aluminum	13900		0.763	4.81	4810		0.734	4.63	14400		0.755	4.76
	Antimony	0.33	U	0.33	0.962	0.318	U	0.318	0.926	0.327	U	0.327	0.952
	Arsenic	3.04		0.198	0.481	2.33		0.191	0.463	3.63		0.197	0.476
	Barium	132		0.0641	0.481	222		0.0618	0.463	154		0.0635	0.476
	Beryllium	0.629		0.0481	0.481	0.223	J	0.0463	0.463	0.651		0.0476	0.476
	Cadmium	0.128	J	0.046	0.481	0.202	J	0.0443	0.463	0.203	J	0.0455	0.476
	Calcium	29100		1.25	9.62	14900		1.21	9.26	25300	B	1.24	9.52
	Chromium	14		0.155	0.481	5.88		0.149	0.463	15.1		0.153	0.476
	Cobalt	5.47		0.0767	0.481	2.03		0.0739	0.463	5.61		0.076	0.476
	Copper	11.9		0.195	0.481	10.8		0.188	0.463	11.1		0.193	0.476
	Iron	16800		1.51	4.81	7110		1.45	4.63	14900		1.49	4.76
	Lead	9.76		0.273	0.481	11.5		0.263	0.463	13.6		0.27	0.476
	Magnesium	4900		0.562	1.92	2050		0.541	1.85	4320		0.557	1.9
	Manganese	332		0.126	0.962	129		0.121	0.926	350		0.125	0.952
	Mercury	0.0077	J	0.0009	0.0092	0.0036	J	0.00085	0.0087	0.0122		0.000981	0.00998
	Nickel	10.6		0.0821	0.481	4.1		0.0791	0.463	11.6		0.0813	0.476
	Potassium	4330		17.2	48.1	1130		3.31	9.26	2990		8.52	23.8
	Selenium	0.546	B	0.156	0.481	0.369	BJ	0.15	0.463	0.719	B	0.154	0.476
	Silver	0.0867	U	0.0867	0.481	0.0835	U	0.0835	0.463	0.0859	U	0.0859	0.476
	Sodium	80.3		3.49	9.62	210		3.36	9.26	76		3.46	9.52
	Thallium	0.962	U	0.962	0.962	0.926	U	0.926	0.926	0.952	U	0.952	0.952
	Vanadium	30.1		0.0873	0.481	16.4		0.0841	0.463	26.3		0.0865	0.476
	Zinc	43.2	B	0.162	0.481	30.8	B	0.156	0.463	43.8		0.16	0.476

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2002 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	64 Result		64 Decision Level	64 Detection Limit	65E Result		65E Decision Level	65E Detection Limit	80 Result		80 Decision Level	80 Detection Limit
Perimeter	Aluminum	13500		0.785	4.95	17700		0.793	5	14800		0.763	4.81
	Antimony	0.34	U	0.34	0.99	0.343	U	0.343	1	0.33	U	0.33	0.962
	Arsenic	2.6		0.204	0.495	4.18		0.206	0.5	3.84		0.198	0.481
	Barium	105		0.066	0.495	176		0.0667	0.5	161		0.0641	0.481
	Beryllium	0.574		0.0495	0.495	0.786		0.05	0.5	0.632		0.0481	0.481
	Cadmium	0.16	J	0.0473	0.495	0.154	J	0.0478	0.5	0.374	J	0.046	0.481
	Calcium	5260		1.29	9.9	31500		1.3	10	77100		6.27	48.1
	Chromium	9.82		0.16	0.495	14.3		0.161	0.5	17.2		0.155	0.481
	Cobalt	7.3		0.079	0.495	8.49		0.0798	0.5	5.08		0.0767	0.481
	Copper	14		0.201	0.495	17.7		0.203	0.5	13		0.195	0.481
	Iron	22700		1.55	4.95	23600		1.57	5	14100		1.51	4.81
	Lead	15.3		0.281	0.495	18.1		0.284	0.5	15.2		0.273	0.481
	Magnesium	7030		0.579	1.98	8130		0.585	2	5290		0.562	1.92
	Manganese	558		0.13	0.99	542		0.131	1	331		0.126	0.962
	Mercury	0.017		0.00097	0.0099	0.0185		0.00097	0.0098	0.0232		0.00094	0.0096
	Nickel	8.66		0.0846	0.495	13		0.0854	0.5	12.8		0.0821	0.481
	Potassium	3660		17.7	49.5	5660		17.9	50	3790		17.2	48.1
	Selenium	0.8	B	0.16	0.495	0.355	BJ	0.162	0.5	0.683	B	0.156	0.481
	Silver	0.089	U	0.0893	0.495	0.0902	U	0.0902	0.5	0.0867	U	0.0867	0.481
	Sodium	83.4		3.6	9.9	102		3.63	10	78.6		3.49	9.62
	Thallium	0.99	U	0.99	0.99	1	U	1	1	1.15		0.962	0.962
	Vanadium	35.3		0.0899	0.495	41.1		0.0908	0.5	26.1		0.0873	0.481
	Zinc	75.7	B	0.167	0.495	76.6	B	0.168	0.5	52.1	B	0.162	0.481

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2002 , Soil (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	81			
		Result		Decision Level	Detection Limit
Perimeter	Aluminum	11100		0.741	4.67
	Antimony	0.321	U	0.321	0.935
	Arsenic	2.92		0.193	0.467
	Barium	69.8		0.0623	0.467
	Beryllium	0.485		0.0467	0.467
	Cadmium	0.101	J	0.0447	0.467
	Calcium	1990		1.22	9.35
	Chromium	10.4		0.151	0.467
	Cobalt	3.29		0.0746	0.467
	Copper	7.3		0.19	0.467
	Iron	11000		1.46	4.67
	Lead	9.83		0.265	0.467
	Magnesium	2710		0.547	1.87
	Manganese	198		0.122	0.935
	Mercury	0.0129		0.000953	0.00969
	Nickel	6.9		0.0798	0.467
	Potassium	2600		3.34	9.35
	Selenium	0.525	B	0.151	0.467
	Silver	0.0843	U	0.0843	0.467
	Sodium	51.9		3.39	9.35
	Thallium	0.935	U	0.935	0.935
	Vanadium	19.2		0.0849	0.467
	Zinc	32.7	B	0.157	0.467

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	1 Result		1 Decision Level	1 Detection Limit	2NE Result		2NE Decision Level	2NE Detection Limit	2NW Result		2NW Decision Level	2NW Detection Limit
On-Site	Aluminum	13000	B	0.77	4.85	8160	B	0.793	5	8170	B	0.778	4.9
	Antimony	0.333	U	0.333	0.971	0.343	U	0.343	1	0.337	U	0.337	0.98
	Arsenic	3.06		0.2	0.485	1.99		0.206	0.5	1.84		0.202	0.49
	Barium	147		0.0648	0.485	61.8		0.0667	0.5	62.7		0.0654	0.49
	Beryllium	0.602		0.0485	0.485	0.359	J	0.05	0.5	0.352	J	0.049	0.49
	Cadmium	0.167	J	0.0464	0.485	0.195	J	0.0478	0.5	0.0612	J	0.0469	0.49
	Calcium	29600	B	1.27	9.71	5640		1.3	10	4200		1.28	9.8
	Chromium	12.6	B	0.156	0.485	8.49		0.161	0.5	8.7		0.158	0.49
	Cobalt	6.05	B	0.0775	0.485	2.55		0.0798	0.5	2.65		0.0782	0.49
	Copper	12.7		0.197	0.485	5.89		0.203	0.5	5.41		0.199	0.49
	Iron	16600		1.52	4.85	9280		1.57	5	9670		1.54	4.9
	Lead	11.9		0.275	0.485	8.36		0.284	0.5	7.29		0.278	0.49
	Magnesium	5290	B	0.568	1.94	2060		0.585	2	1960		0.573	1.96
	Manganese	398		0.127	0.971	133		0.131	1	145		0.128	0.98
	Mercury	0.0093	J	0.00094	0.0096	0.008	J	0.00097	0.0099	0.0052	J	0.001	0.01
	Nickel	10.8		0.0829	0.485	5.53		0.0854	0.5	5.15		0.0837	0.49
	Potassium	4580		8.68	24.3	1690		3.58	10	1610		3.51	9.8
	Selenium	0.79		0.157	0.485	0.462	BJ	0.162	0.5	0.396	BJ	0.159	0.49
	Silver	0.23	BJ	0.0876	0.485	0.09	U	0.0902	0.5	0.0884	U	0.0884	0.49
	Sodium	68.4		3.53	9.71	39.4		3.63	10	38.5		3.56	9.8
	Thallium	0.971	U	0.971	0.971	1	U	1	1	0.98	U	0.98	0.98
	Vanadium	30.5	B	0.0882	0.485	17		0.0908	0.5	17.5		0.089	0.49
	Zinc	53.3	B	0.163	0.485	25.2		0.168	0.5	24		0.165	0.49

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	2SE				2SW				3			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	10200	B	0.785	4.95	6620	B	0.785	4.95	10300		0.678	4.27
	Antimony	0.34	U	0.34	0.99	0.34	U	0.34	0.99	0.365	J	0.293	0.855
	Arsenic	2.55		0.204	0.495	1.83		0.204	0.495	3.69		0.176	0.427
	Barium	80		0.066	0.495	68.8		0.066	0.495	79		0.057	0.427
	Beryllium	0.443	J	0.0495	0.495	0.314	J	0.0495	0.495	0.461		0.0427	0.427
	Cadmium	0.429	J	0.0473	0.495	0.097	J	0.0473	0.495	0.157	J	0.0409	0.427
	Calcium	11100		1.29	9.9	2950		1.29	9.9	2920	B	1.11	8.55
	Chromium	9.45		0.16	0.495	7.94		0.16	0.495	16.6		0.138	0.427
	Cobalt	2.87		0.079	0.495	2.44		0.079	0.495	5.7		0.0682	0.427
	Copper	6.49		0.201	0.495	4.97		0.201	0.495	10.2		0.174	0.427
	Iron	10400		1.55	4.95	9000		1.55	4.95	14700		1.34	4.27
	Lead	8.65		0.281	0.495	7.82		0.281	0.495	16.6		0.242	0.427
	Magnesium	2510		0.579	1.98	1680		0.579	1.98	4320		0.5	1.71
	Manganese	144		0.13	0.99	139		0.13	0.99	289		0.112	0.855
	Mercury	0.0108		0.00092	0.0094	0.006	J	0.00093	0.0095	0.013		0.0009	0.0094
	Nickel	6.83		0.0846	0.495	4.8		0.0846	0.495	13.1		0.073	0.427
	Potassium	1910		3.54	9.9	1380		3.54	9.9	2270		3.06	8.55
	Selenium	0.492	BJ	0.16	0.495	0.314	BJ	0.16	0.495	0.499	B	0.139	0.427
	Silver	0.189	J	0.0893	0.495	0.089	U	0.0893	0.495	0.0771	U	0.0771	0.427
	Sodium	42.8		3.6	9.9	55.7		3.6	9.9	57.3		3.1	8.55
	Thallium	0.99	U	0.99	0.99	0.99	U	0.99	0.99	0.855	U	0.855	0.855
	Vanadium	19.2		0.0899	0.495	16.2		0.0899	0.495	23.5		0.0776	0.427
	Zinc	26.3		0.167	0.495	23.6		0.167	0.495	42.9		0.144	0.427

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	6				7				20			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	10800	B	0.778	4.9	10000	B	0.76	4.81	8600		2.83	17.9
	Antimony	0.337	U	0.337	0.98	0.33	U	0.33	0.962	983		1.23	3.57
	Arsenic	2.32		0.202	0.49	2.03		0.2	0.481	77.1		0.737	1.79
	Barium	74.3		0.0654	0.49	79.1		0.06	0.481	89		0.238	1.79
	Beryllium	0.477	J	0.049	0.49	0.484		0.05	0.481	0.398	J	0.179	1.79
	Cadmium	0.141	J	0.0469	0.49	0.0809	J	0.05	0.481	2.89		0.171	1.79
	Calcium	3640	B	1.28	9.8	3010	B	1.25	9.62	16900	B	4.66	35.7
	Chromium	11	B	0.158	0.49	10.8	B	0.16	0.481	10.9		0.575	1.79
	Cobalt	4	B	0.0782	0.49	3.66	B	0.08	0.481	4.32		0.285	1.79
	Copper	26.8		0.199	0.49	7.42		0.2	0.481	11.8		0.725	1.79
	Iron	10700		1.54	4.9	11000		1.51	4.81	12400		5.6	17.9
	Lead	11.4		0.278	0.49	10.1		0.27	0.481	34300		5.07	8.93
	Magnesium	2400	B	0.573	1.96	2620	B	0.56	1.92	3570		2.09	7.14
	Manganese	167		0.128	0.98	220		0.13	0.962	235		0.467	3.57
	Mercury	0.0104		0.000938	0.00954	0.0122		0	0.0098	0.0118		0.000886	0.00901
	Nickel	12		0.0837	0.49	7.23		0.08	0.481	8.74		0.305	1.79
	Potassium	2070		3.51	9.8	2110		3.44	9.62	2430		12.8	35.7
	Selenium	0.412	J	0.159	0.49	0.408	J	0.16	0.481	0.923	BJ	0.579	1.79
	Silver	0.688	B	0.0884	0.49	0.511	B	0.09	0.481	1.18	J	0.322	1.79
	Sodium	39.8		3.56	9.8	49.4		3.49	9.62	46.1		13	35.7
	Thallium	0.98	U	0.98	0.98	0.962	U	0.96	0.962	3.57	U	3.57	3.57
	Vanadium	19.8	B	0.089	0.49	20	B	0.09	0.481	20.8		0.324	1.79
	Zinc	33.8	B	0.165	0.49	31.1	B	0.16	0.481	36.4		0.601	1.79

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	32E Result		32E Decision Level	32E Detection Limit	32S Result		32S Decision Level	32S Detection Limit	33 Result		33 Decision Level	33 Detection Limit
On-Site	Aluminum	6210	B	0.77	4.85	7990	B	0.778	4.9	11100		0.763	4.81
	Antimony	0.333	U	0.333	0.971	0.337	U	0.337	0.98	0.33	U	0.33	0.962
	Arsenic	2.21		0.2	0.485	2.39		0.202	0.49	5.06		0.198	0.481
	Barium	62.3		0.0648	0.485	115		0.0654	0.49	126		0.0641	0.481
	Beryllium	0.37	J	0.0485	0.485	0.369	J	0.049	0.49	0.786		0.0481	0.481
	Cadmium	0.124	J	0.0464	0.485	1.26		0.0469	0.49	0.241	J	0.046	0.481
	Calcium	53200		3.17	24.3	23800		1.28	9.8	49000	B	3.13	24
	Chromium	8.6		0.156	0.485	10.5		0.158	0.49	13.3		0.155	0.481
	Cobalt	3.52		0.0775	0.485	3.81		0.0782	0.49	5.2		0.0767	0.481
	Copper	69.9		0.197	0.485	11.3		0.199	0.49	11.7		0.195	0.481
	Iron	12400		1.52	4.85	17300		1.54	4.9	13800		1.51	4.81
	Lead	6.28		0.275	0.485	13.7		0.278	0.49	13.2		0.273	0.481
	Magnesium	3010		0.568	1.94	3030		0.573	1.96	4640		0.562	1.92
	Manganese	232		0.127	0.971	193		0.128	0.98	297		0.126	0.962
	Mercury	0.00827	J	0.000959	0.00976	0.0116		0.00088	0.00896	0.0141		0.000973	0.0099
	Nickel	6.55		0.0829	0.485	6.7		0.0837	0.49	11.1		0.0821	0.481
	Potassium	1290		3.47	9.71	1940		3.51	9.8	2980		8.6	24
	Selenium	0.337	BJ	0.157	0.485	0.619	B	0.159	0.49	0.588	B	0.156	0.481
	Silver	0.0876	U	0.0876	0.485	0.161	J	0.0884	0.49	0.0867	U	0.0867	0.481
	Sodium	66.9		3.53	9.71	57.1		3.56	9.8	319		3.49	9.62
	Thallium	0.974		0.971	0.971	0.98	U	0.98	0.98	0.962	U	0.962	0.962
	Vanadium	23.4		0.0882	0.485	33.5		0.089	0.49	25.1		0.0873	0.481
	Zinc	27.5		0.163	0.485	80.5		0.165	0.49	60.7		0.162	0.481

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	34				35				41			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	15100		0.763	4.81	8010	B	0.785	4.95	10500	B	0.721	4.55
	Antimony	0.33	U	0.33	0.962	0.34	U	0.34	0.99	0.312	U	0.312	0.909
	Arsenic	5.87		0.198	0.481	2.08		0.204	0.495	2.48		0.188	0.455
	Barium	155		0.0641	0.481	62.7		0.066	0.495	75		0.0606	0.455
	Beryllium	0.806		0.0481	0.481	0.365	J	0.0495	0.495	0.525		0.0455	0.455
	Cadmium	0.0971	J	0.046	0.481	0.0673	J	0.0473	0.495	0.0602	J	0.0435	0.455
	Calcium	16500	B	1.25	9.62	2060	B	1.29	9.9	11600	B	1.19	9.09
	Chromium	17.3		0.155	0.481	8.36	B	0.16	0.495	10.2	B	0.146	0.455
	Cobalt	6.98		0.0767	0.481	2.61	B	0.079	0.495	3.38	B	0.0725	0.455
	Copper	12.2		0.195	0.481	5.77		0.201	0.495	7.3		0.185	0.455
	Iron	19100		1.51	4.81	8420		1.55	4.95	10400		1.42	4.55
	Lead	14		0.273	0.481	8.16		0.281	0.495	10.9		0.258	0.455
	Magnesium	3930		0.562	1.92	2000	B	0.579	1.98	2930	B	0.532	1.82
	Manganese	329		0.126	0.962	164		0.13	0.99	170		0.119	0.909
	Mercury	0.0123		0.000944	0.0096	0.0122		0.000887	0.00902	0.00829	J	0.00092	0.00936
	Nickel	14.3		0.0821	0.481	5.47		0.0846	0.495	7.3		0.0776	0.455
	Potassium	3280		8.6	24	1890		3.54	9.9	2610		3.25	9.09
	Selenium	0.783	B	0.156	0.481	0.338	J	0.16	0.495	0.561		0.147	0.455
	Silver	0.0867	U	0.0867	0.481	0.283	BJ	0.0893	0.495	0.174	BJ	0.082	0.455
	Sodium	61.5		3.49	9.62	40		3.6	9.9	42.3		3.3	9.09
	Thallium	0.962	U	0.962	0.962	0.99	U	0.99	0.99	0.909	U	0.909	0.909
	Vanadium	32.3		0.0873	0.481	15	B	0.0899	0.495	19.8	B	0.0825	0.455
	Zinc	42.2		0.162	0.481	25	B	0.167	0.495	35.8	B	0.153	0.455

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	42				43				45			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	9060	B	0.755	4.76	9540	B	0.793	5	8500	B	0.778	4.9
	Antimony	0.327	U	0.327	0.952	0.343	U	0.343	1	0.337	U	0.337	0.98
	Arsenic	3.04		0.197	0.476	2.53		0.206	0.5	2.79		0.202	0.49
	Barium	77.8		0.0635	0.476	68.2		0.0667	0.5	68.3		0.0654	0.49
	Beryllium	0.552		0.0476	0.476	0.44	J	0.05	0.5	0.381	J	0.049	0.49
	Cadmium	0.0722	J	0.0455	0.476	0.0478	U	0.0478	0.5	0.0677	J	0.0469	0.49
	Calcium	29500	B	1.24	9.52	8190	B	1.3	10	4310	B	1.28	9.8
	Chromium	9.55	B	0.153	0.476	10.4	B	0.161	0.5	8.3	B	0.158	0.49
	Cobalt	3.63	B	0.076	0.476	3.19	B	0.0798	0.5	2.46	B	0.0782	0.49
	Copper	7.29		0.193	0.476	6.72		0.203	0.5	5.64		0.199	0.49
	Iron	9810		1.49	4.76	10400		1.57	5	8910		1.54	4.9
	Lead	6.53		0.27	0.476	6.73		0.284	0.5	8.17		0.278	0.49
	Magnesium	3010	B	0.557	1.9	2540	B	0.585	2	2290	B	0.573	1.96
	Manganese	160		0.125	0.952	154		0.131	1	147		0.128	0.98
	Mercury	0.00399	J	0.000976	0.00993	0.0052	J	0.000965	0.00982	0.0141		0.000924	0.0094
	Nickel	7.08		0.0813	0.476	6.71		0.0854	0.5	5.6		0.0837	0.49
	Potassium	2330		3.41	9.52	2310		3.58	10	2160		3.51	9.8
	Selenium	0.378	J	0.154	0.476	0.576		0.162	0.5	0.547		0.159	0.49
	Silver	0.262	BJ	0.0859	0.476	0.26	BJ	0.0902	0.5	0.235	BJ	0.0884	0.49
	Sodium	45.7		3.46	9.52	42.3		3.63	10	40.8		3.56	9.8
	Thallium	0.952	U	0.952	0.952	1	U	1	1	0.98	U	0.98	0.98
	Vanadium	19.6	B	0.0865	0.476	20.9	B	0.0908	0.5	15.9	B	0.089	0.49
	Zinc	26.5	B	0.16	0.476	30.4	B	0.168	0.5	25.8	B	0.165	0.49

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	46 Result		46 Decision Level	46 Detection Limit	49 Result		49 Decision Level	49 Detection Limit	51 Result		51 Decision Level	51 Detection Limit
On-Site	Aluminum	9770		0.696	4.39	10200		0.785	4.95	12200	B	0.763	4.81
	Antimony	0.301	U	0.301	0.877	0.34	U	0.34	0.99	0.487	J	0.33	0.962
	Arsenic	2.65		0.181	0.439	2.42		0.204	0.495	3.62		0.198	0.481
	Barium	89.6		0.0585	0.439	101		0.066	0.495	118		0.0641	0.481
	Beryllium	0.441		0.0439	0.439	0.457	J	0.0495	0.495	0.611		0.0481	0.481
	Cadmium	0.127	J	0.0419	0.439	0.157	J	0.0473	0.495	0.0568	J	0.046	0.481
	Calcium	24600	B	1.14	8.77	15800	B	1.29	9.9	27500	B	1.25	9.62
	Chromium	9.58		0.141	0.439	10.6		0.16	0.495	36.4	B	0.155	0.481
	Cobalt	4.03		0.07	0.439	4.68		0.079	0.495	3.81	B	0.0767	0.481
	Copper	8.8		0.178	0.439	9		0.201	0.495	10		0.195	0.481
	Iron	13600		1.37	4.39	14000		1.55	4.95	11600		1.51	4.81
	Lead	7.9		0.249	0.439	12.1		0.281	0.495	10.9		0.273	0.481
	Magnesium	3570		0.513	1.75	3970		0.579	1.98	3490	B	0.562	1.92
	Manganese	205		0.115	0.877	262		0.13	0.99	159		0.126	0.962
	Mercury	0.0126		0.000899	0.00915	0.0231		0.000905	0.0092	0.00866	J	0.000972	0.00988
	Nickel	7.23		0.0749	0.439	8.04		0.0846	0.495	8.76		0.0821	0.481
	Potassium	2850		7.84	21.9	2640		3.54	9.9	2270		3.44	9.62
	Selenium	0.273	BJ	0.142	0.439	0.412	BJ	0.16	0.495	0.445	J	0.156	0.481
	Silver	0.0791	U	0.0791	0.439	0.0893	U	0.0893	0.495	0.225	BJ	0.0867	0.481
	Sodium	57.8		3.19	8.77	58		3.6	9.9	60.1		3.49	9.62
	Thallium	0.877	U	0.877	0.877	0.99	U	0.99	0.99	0.962	U	0.962	0.962
	Vanadium	25.7		0.0796	0.439	24.4		0.0899	0.495	24	B	0.0873	0.481
	Zinc	41.5		0.148	0.439	37.4		0.167	0.495	73.4	B	0.162	0.481

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	52				53				54			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	24600	B	0.785	4.95	7640	B	0.741	4.67	13000	B	0.763	4.81
	Antimony	0.34	U	0.34	0.99	0.321	U	0.321	0.935	0.33	U	0.33	0.962
	Arsenic	6.25		0.204	0.495	1.73		0.193	0.467	3		0.198	0.481
	Barium	258		0.066	0.495	55.6		0.0623	0.467	109		0.0641	0.481
	Beryllium	1.15		0.0495	0.495	0.334	J	0.0467	0.467	0.561		0.0481	0.481
	Cadmium	0.302	J	0.0473	0.495	0.107	J	0.0447	0.467	1.33		0.046	0.481
	Calcium	54900	B	3.23	24.8	1550		1.22	9.35	15800	B	1.25	9.62
	Chromium	20.6	B	0.16	0.495	8.29		0.151	0.467	11.5	B	0.155	0.481
	Cobalt	7.38	B	0.079	0.495	2.73		0.0746	0.467	4	B	0.0767	0.481
	Copper	19.2		0.201	0.495	5.79		0.19	0.467	10.9		0.195	0.481
	Iron	20100		1.55	4.95	9160		1.46	4.67	11500		1.51	4.81
	Lead	17.1		0.281	0.495	8.8		0.265	0.467	19.4		0.273	0.481
	Magnesium	7160	B	0.579	1.98	1680		0.547	1.87	3130	B	0.562	1.92
	Manganese	341		0.13	0.99	168		0.122	0.935	192		0.126	0.962
	Mercury	0.0188		0.000939	0.00955	0.0075	J	0.000879	0.00894	0.0107		0.00098	0.00997
	Nickel	16.5		0.0846	0.495	5.06		0.0798	0.467	11.4		0.0821	0.481
	Potassium	4880		8.85	24.8	1580		3.34	9.35	2510		3.44	9.62
	Selenium	0.64		0.16	0.495	0.447	BJ	0.151	0.467	0.521		0.156	0.481
	Silver	0.544	B	0.0893	0.495	0.0843	U	0.0843	0.467	0.427	BJ	0.0867	0.481
	Sodium	119		3.6	9.9	34.4		3.39	9.35	55.1		3.49	9.62
	Thallium	1.03		0.99	0.99	0.935	U	0.935	0.935	0.962	U	0.962	0.962
	Vanadium	39.7	B	0.0899	0.495	16.5		0.0849	0.467	21.8	B	0.0873	0.481
	Zinc	92.9	B	0.167	0.495	23		0.157	0.467	49.8	B	0.162	0.481

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	55				56				57			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	9010		0.547	3.45	7050	B	0.793	5	8730		0.567	3.57
	Antimony	0.237	U	0.237	0.69	0.343	U	0.343	1	0.245	U	0.245	0.714
	Arsenic	3.2		0.142	0.345	2.93		0.206	0.5	3.33		0.147	0.357
	Barium	75.5		0.046	0.345	91.4		0.0667	0.5	164		0.0476	0.357
	Beryllium	0.438		0.0345	0.345	0.356	J	0.05	0.5	0.395		0.0357	0.357
	Cadmium	0.151	J	0.033	0.345	0.199	J	0.0478	0.5	0.0859	J	0.0341	0.357
	Calcium	10300	B	0.899	6.9	29500	B	1.3	10	33700	B	0.932	7.14
	Chromium	8.61		0.111	0.345	15.8	B	0.161	0.5	8.84		0.115	0.357
	Cobalt	3.06		0.055	0.345	5.23	B	0.0798	0.5	4.67		0.057	0.357
	Copper	6.28		0.14	0.345	19.9		0.203	0.5	8.05		0.145	0.357
	Iron	9660		1.08	3.45	10500		1.57	5	13900		1.12	3.57
	Lead	9.11		0.196	0.345	11.1		0.284	0.5	11.5		0.203	0.357
	Magnesium	3210		1.01	3.45	2550	B	0.585	2	4350		0.418	1.43
	Manganese	185		0.0902	0.69	132		0.131	1	218		0.0934	0.714
	Mercury	0.0571		0.000935	0.00951	0.0143		0.000956	0.00972	0.0081	J	0.000919	0.00935
	Nickel	6.78		0.0589	0.345	11.7		0.0854	0.5	6.73		0.061	0.357
	Potassium	2520		6.17	17.2	1280		3.58	10	2280		6.39	17.9
	Selenium	0.26	BJ	0.112	0.345	0.537		0.162	0.5	0.218	BJ	0.116	0.357
	Silver	0.0622	U	0.0622	0.345	0.256	BJ	0.0902	0.5	0.0644	U	0.0644	0.357
	Sodium	48		2.5	6.9	92		3.63	10	82.9		2.59	7.14
	Thallium	0.69	U	0.69	0.69	1	U	1	1	0.714	U	0.714	0.714
	Vanadium	15.4		0.0626	0.345	23	B	0.0908	0.5	30.4		0.0649	0.357
	Zinc	28.8		0.116	0.345	82.1	B	0.168	0.5	52.8		0.12	0.357

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	66 Result		66 Decision Level	66 Detection Limit	76 Result		76 Decision Level	76 Detection Limit	77 Result		77 Decision Level	77 Detection Limit
On-Site	Aluminum	9400	B	0.785	4.95	10400		0.69	4.35	10300		0.696	4.39
	Antimony	0.34	U	0.34	0.99	0.299	U	0.299	0.87	0.301	U	0.301	0.877
	Arsenic	2.7		0.204	0.495	2.9		0.179	0.435	3.88		0.181	0.439
	Barium	76		0.066	0.495	63.6		0.058	0.435	84.9		0.0585	0.439
	Beryllium	0.605		0.0495	0.495	0.482		0.0435	0.435	0.468		0.0439	0.439
	Cadmium	0.0741	J	0.0473	0.495	0.0955	J	0.0416	0.435	0.13	J	0.0419	0.439
	Calcium	12400	B	1.29	9.9	3630	B	1.13	8.7	10600	B	1.14	8.77
	Chromium	8.86	B	0.16	0.495	9.69		0.14	0.435	10.4		0.141	0.439
	Cobalt	3.17	B	0.079	0.495	3.42		0.0694	0.435	3.43		0.07	0.439
	Copper	6.98		0.201	0.495	6.63		0.177	0.435	6.72		0.178	0.439
	Iron	9040		1.55	4.95	11300		1.36	4.35	11200		1.37	4.39
	Lead	7.11		0.281	0.495	8.84		0.247	0.435	10.7		0.249	0.439
	Magnesium	2750	B	0.579	1.98	2740		0.509	1.74	3090		1.28	4.39
	Manganese	171		0.13	0.99	165		0.114	0.87	192		0.115	0.877
	Mercury	0.00855	J	0.000892	0.00908	0.00723	J	0.000945	0.00962	0.0096		0.000906	0.00922
	Nickel	6.71		0.0846	0.495	7.23		0.0743	0.435	7.45		0.0749	0.439
	Potassium	2120		3.54	9.9	2110		3.11	8.7	2650		7.84	21.9
	Selenium	0.545		0.16	0.495	0.403	BJ	0.141	0.435	0.233	BJ	0.142	0.439
	Silver	0.271	BJ	0.0893	0.495	0.0784	U	0.0784	0.435	0.0791	U	0.0791	0.439
	Sodium	50.1		3.6	9.9	39.6		3.16	8.7	50.9		3.19	8.77
	Thallium	0.99	U	0.99	0.99	0.87	U	0.87	0.87	0.877	U	0.877	0.877
	Vanadium	17.8	B	0.0899	0.495	19.3		0.079	0.435	19.7		0.0796	0.439
	Zinc	26.3	B	0.167	0.495	28		0.146	0.435	30.6		0.148	0.439

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Soil (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	78			
		Result		Decision Level	Detection Limit
On-Site	Aluminum	7130		0.741	4.67
	Antimony	0.321	U	0.321	0.935
	Arsenic	2.46		0.193	0.467
	Barium	60		0.0623	0.467
	Beryllium	0.36	J	0.0467	0.467
	Cadmium	0.132	J	0.0447	0.467
	Calcium	2230	B	1.22	9.35
	Chromium	8.41		0.151	0.467
	Cobalt	3.39		0.0746	0.467
	Copper	8.53		0.19	0.467
	Iron	10200		1.46	4.67
	Lead	8.84		0.265	0.467
	Magnesium	2470		0.547	1.87
	Manganese	203		0.122	0.935
	Mercury	0.0109		0.000948	0.00965
	Nickel	6.64		0.0798	0.467
	Potassium	1820		3.34	9.35
	Selenium	0.201	BJ	0.151	0.467
	Silver	0.0843	U	0.0843	0.467
	Sodium	36.1		3.39	9.35
	Thallium	0.935	U	0.935	0.935
	Vanadium	15.8		0.0849	0.467
	Zinc	29.5		0.157	0.467

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-7. Non-radiological Results for Community by Location for Calendar Year 2002 , Vegetation
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	8				11				25			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
Community	Aluminum	149	B	0.741	4.67	72.1	B	0.755	4.76	105	B	0.755	4.76
	Antimony	0.321	U	0.321	0.935	0.327	U	0.327	0.952	0.327	U	0.327	0.952
	Arsenic	0.323	J	0.193	0.467	0.197	U	0.197	0.476	0.221	J	0.197	0.476
	Barium	8.77		0.0623	0.467	7.97		0.0635	0.476	13.4		0.0635	0.476
	Beryllium	0.0467	U	0.0467	0.467	0.0476	U	0.0476	0.476	0.0476	U	0.0476	0.476
	Cadmium	0.0697	J	0.0447	0.467	0.0455	U	0.0455	0.476	0.0632	J	0.0455	0.476
	Calcium	1550	B	1.22	9.35	2030	B	1.24	9.52	3420	B	1.24	9.52
	Chromium	0.316	J	0.151	0.467	0.285	J	0.153	0.476	0.303	J	0.153	0.476
	Cobalt	0.113	J	0.0746	0.467	0.076	U	0.076	0.476	0.076	U	0.076	0.476
	Copper	2.55		0.19	0.467	1.81		0.193	0.476	3.22		0.193	0.476
	Iron	161		1.46	4.67	87.3		1.49	4.76	151		1.49	4.76
	Lead	0.265	U	0.265	0.467	0.27	U	0.27	0.476	0.27	U	0.27	0.476
	Magnesium	334		0.547	1.87	431		0.557	1.9	388		0.557	1.9
	Manganese	42.4		0.122	0.935	59.9		0.125	0.952	31.7		0.125	0.952
	Mercury	0.0141		0.000942	0.0096	0.00263	J	0.000957	0.00974	0.0339		0.000959	0.00976
	Nickel	0.318	J	0.0798	0.467	0.169	J	0.0813	0.476	0.244	J	0.0813	0.476
	Potassium	6590		16.7	46.7	5890		17	47.6	8000		17	47.6
	Selenium	0.151	U	0.151	0.467	0.222	J	0.154	0.476	0.358	J	0.154	0.476
	Silver	0.0843	U	0.0843	0.467	0.0859	U	0.0859	0.476	0.0859	U	0.0859	0.476
	Sodium	67.2		3.39	9.35	112		3.46	9.52	67.6		3.46	9.52
	Thallium	0.935	U	0.935	0.935	0.952	U	0.952	0.952	0.952	U	0.952	0.952
	Vanadium	0.33	J	0.0849	0.467	0.16	J	0.0865	0.476	0.311	J	0.0865	0.476
	Zinc	5.73		0.157	0.467	5.36		0.16	0.476	8.85		0.16	0.476

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-8. Non-radiological Results for On-Site by Location for Calendar Year 2002 , Vegetation
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	33				45				51			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	352		0.77	4.85	265	B	0.778	4.9	225	B	0.728	4.59
	Antimony	0.333	U	0.333	0.971	0.337	U	0.337	0.98	0.315	U	0.315	0.917
	Arsenic	0.403	J	0.2	0.485	0.256	J	0.202	0.49	0.189	U	0.189	0.459
	Barium	6.77		0.0648	0.485	19		0.0654	0.49	19		0.0612	0.459
	Beryllium	0.0485	U	0.0485	0.485	0.049	U	0.049	0.49	0.0459	U	0.0459	0.459
	Cadmium	0.0533	J	0.0464	0.485	0.0706	J	0.0469	0.49	0.0439	U	0.0439	0.459
	Calcium	4350		1.27	9.71	3910	B	1.28	9.8	2510	B	1.2	9.17
	Chromium	0.579		0.156	0.485	0.526	B	0.158	0.49	0.603	B	0.148	0.459
	Cobalt	0.141	J	0.0775	0.485	0.181	BJ	0.0782	0.49	0.162	BJ	0.0732	0.459
	Copper	1.93		0.197	0.485	3.31		0.199	0.49	3.25		0.186	0.459
	Iron	348		1.52	4.85	230		1.54	4.9	219		1.44	4.59
	Lead	0.74		0.275	0.485	0.368	J	0.278	0.49	0.645		0.26	0.459
	Magnesium	1300		0.568	1.94	1340	B	0.573	1.96	617	B	0.537	1.83
	Manganese	26.6		0.127	0.971	19.6		0.128	0.98	14.3		0.12	0.917
	Mercury	0.0189		0.000872	0.00888	0.00309	J	0.00093	0.00946	0.0103		0.000957	0.00974
	Nickel	0.736		0.0829	0.485	0.322	J	0.0837	0.49	0.415	J	0.0783	0.459
	Potassium	6380		17.4	48.5	6800		8.77	24.5	6080		16.4	45.9
	Selenium	0.598	B	0.157	0.485	0.358	J	0.159	0.49	0.257	J	0.149	0.459
	Silver	0.0876	U	0.0876	0.485	0.198	BJ	0.0884	0.49	0.211	BJ	0.0828	0.459
	Sodium	1960		3.53	9.71	12.8		3.56	9.8	42.9		3.33	9.17
	Thallium	0.971	U	0.971	0.971	0.98	U	0.98	0.98	0.917	U	0.917	0.917
	Vanadium	0.782		0.0882	0.485	0.588	B	0.089	0.49	0.532	B	0.0833	0.459
	Zinc	12.5	B	0.163	0.485	6.25	B	0.165	0.49	13.1	B	0.154	0.459

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-9. Non-radiological Results for Community by Location for Calendar Year 2002 , Sediment

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	8				11				68			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
Community	Aluminum	8930	B	0.77	4.85	8710	B	0.748	4.72	5580	B	0.763	4.81
	Antimony	0.394	J	0.333	0.971	0.508	J	0.324	0.943	0.871	J	0.33	0.962
	Arsenic	3.11		0.2	0.485	2.76		0.195	0.472	12		0.198	0.481
	Barium	153		0.0648	0.485	100		0.0629	0.472	148		0.0641	0.481
	Beryllium	0.474	J	0.0485	0.485	0.435	J	0.0472	0.472	0.417	J	0.0481	0.481
	Cadmium	0.206	J	0.0464	0.485	0.166	J	0.0451	0.472	0.219	J	0.046	0.481
	Calcium	20900	B	1.27	9.71	15400	B	1.23	9.43	35700	B	12.5	96.2
	Chromium	8.38		0.156	0.485	8.37		0.152	0.472	9.31		0.155	0.481
	Cobalt	3.74		0.0775	0.485	2.89		0.0753	0.472	5.43		0.0767	0.481
	Copper	8.01		0.197	0.485	6.65		0.192	0.472	5.87		0.195	0.481
	Iron	10200		1.52	4.85	9460		1.48	4.72	10400		1.51	4.81
	Lead	6.78		0.275	0.485	7.68		0.268	0.472	8.24		0.273	0.481
	Magnesium	4140		0.568	1.94	3060		0.552	1.89	3240		0.562	1.92
	Manganese	238		0.127	0.971	196		0.123	0.943	291		0.126	0.962
	Mercury	0.00858	J	0.000941	0.0096	0.00728	J	0.000874	0.00889	0.00627	J	0.000913	0.00929
	Nickel	7.34		0.0829	0.485	6		0.0806	0.472	8.88		0.0821	0.481
	Potassium	1680		3.47	9.71	1630		3.37	9.43	1120		3.44	9.62
	Selenium	0.41	J	0.157	0.485	0.153	U	0.153	0.472	0.156	U	0.156	0.481
	Silver	0.0876	U	0.0876	0.485	0.0851	U	0.0851	0.472	0.0867	U	0.0867	0.481
	Sodium	194		3.53	9.71	140		3.43	9.43	65.3		3.49	9.62
	Thallium	0.971	U	0.971	0.971	0.943	U	0.943	0.943	2.34		0.962	0.962
	Vanadium	19.8		0.0882	0.485	20.3		0.0857	0.472	19.8		0.0873	0.481
	Zinc	28.9		0.163	0.485	26.3		0.159	0.472	24.6		0.162	0.481

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-10. Non-radiological Results for Perimeter by Location for Calendar Year 2002, Sediment
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	60				65E				73			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
Perimeter	Aluminum	5500	B	0.778	4.9	4830		0.734	4.63	6050		0.793	5
	Antimony	0.337	U	0.337	0.98	0.318	U	0.318	0.926	0.343	U	0.343	1
	Arsenic	2.24		0.202	0.49	1.18		0.191	0.463	1.49		0.206	0.5
	Barium	143		0.0654	0.49	52		0.0618	0.463	49.8		0.0667	0.5
	Beryllium	0.287	J	0.049	0.49	0.285	J	0.0463	0.463	0.321	J	0.05	0.5
	Cadmium	0.0516	J	0.0469	0.49	0.0443	U	0.0443	0.463	0.0992	J	0.0478	0.5
	Calcium	30400		1.28	9.8	12100		1.21	9.26	29700		1.3	10
	Chromium	9.6		0.158	0.49	6		0.149	0.463	6.41		0.161	0.5
	Cobalt	4.96		0.0782	0.49	5.83		0.0739	0.463	4.57		0.0798	0.5
	Copper	7.53		0.199	0.49	6.75		0.188	0.463	6.26		0.203	0.5
	Iron	18500		1.54	4.9	15600		1.45	4.63	13700		1.57	5
	Lead	5.6		0.278	0.49	4.16		0.263	0.463	5.21		0.284	0.5
	Magnesium	3060		0.573	1.96	2360		0.541	1.85	2850		0.585	2
	Manganese	253		0.128	0.98	191		0.121	0.926	221		0.131	1
	Mercury	0.000918	J	0.00091	0.00926	0.000972	U	0.000972	0.00988	0.00336	J	0.000845	0.0086
	Nickel	6.23		0.0837	0.49	4.22		0.0791	0.463	5.04		0.0854	0.5
	Potassium	1450		3.51	9.8	1260		3.31	9.26	1520		3.58	10
	Selenium	0.534	B	0.159	0.49	0.658	B	0.15	0.463	0.56	B	0.162	0.5
	Silver	0.0884	U	0.0884	0.49	0.0835	U	0.0835	0.463	0.0902	U	0.0902	0.5
	Sodium	58.7		3.56	9.8	52.4		3.36	9.26	53.4		3.63	10
	Thallium	0.98	U	0.98	0.98	0.926	U	0.926	0.926	1	U	1	1
	Vanadium	35.1		0.089	0.49	27.7		0.0841	0.463	24.5		0.0908	0.5
	Zinc	29.8		0.165	0.49	24.7	B	0.156	0.463	30.2	B	0.168	0.5

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-11. Non-radiological Results for On-Site by Location for Calendar Year 2002, Sediment
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	72				74			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	12800		0.69	4.35	10100	B	0.728	4.59
	Antimony	0.299	U	0.299	0.87	0.315	U	0.315	0.917
	Arsenic	4.83		0.179	0.435	3.07		0.189	0.459
	Barium	138		0.058	0.435	149		0.0612	0.459
	Beryllium	0.762		0.0435	0.435	0.498		0.0459	0.459
	Cadmium	0.128	J	0.0416	0.435	0.0636	J	0.0439	0.459
	Calcium	45400	B	2.84	21.7	42700	B	1.2	9.17
	Chromium	14.4		0.14	0.435	10.4	B	0.148	0.459
	Cobalt	5.39		0.0694	0.435	5.34	B	0.0732	0.459
	Copper	12.9		0.177	0.435	10.4		0.186	0.459
	Iron	14700		1.36	4.35	16300		1.44	4.59
	Lead	13.9		0.247	0.435	8.4		0.26	0.459
	Magnesium	5280		0.509	1.74	5030	B	0.537	1.83
	Manganese	293		0.114	0.87	340		0.12	0.917
	Mercury	0.013		0.00087	0.0088	0.0031	J	0.00097	0.0099
	Nickel	11.1		0.0743	0.435	8.57		0.0783	0.459
	Potassium	2580		7.77	21.7	2410		3.28	9.17
	Selenium	0.414	BJ	0.141	0.435	0.551		0.149	0.459
	Silver	0.078	U	0.0784	0.435	0.293	BJ	0.0828	0.459
	Sodium	192		3.16	8.7	112		3.33	9.17
	Thallium	0.87	U	0.87	0.87	1.29		0.917	0.917
	Vanadium	29.2		0.079	0.435	33.4	B	0.0833	0.459
	Zinc	43.3		0.146	0.435	45.6	B	0.154	0.459

See notes at end of table.

TABLE C-11. Non-radiological Results for On-Site by Location for Calendar Year 2002, Sediment (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Analyte	75				79			
		Result		Decision Level	Detection Limit	Result		Decision Level	Detection Limit
On-Site	Aluminum	10100	B	0.778	4.9	13500		0.69	4.35
	Antimony	0.361	J	0.337	0.98	0.43	J	0.299	0.87
	Arsenic	3.33		0.202	0.49	4.41		0.179	0.435
	Barium	107		0.0654	0.49	183		0.058	0.435
	Beryllium	0.563		0.049	0.49	0.654		0.0435	0.435
	Cadmium	0.115	J	0.0469	0.49	0.246	J	0.0416	0.435
	Calcium	47400	B	1.28	9.8	108000		5.67	43.5
	Chromium	12.6	B	0.158	0.49	15.1		0.14	0.435
	Cobalt	5.26	B	0.0782	0.49	5.08		0.0694	0.435
	Copper	12.5		0.199	0.49	12.1		0.177	0.435
	Iron	13400		1.54	4.9	14000		1.36	4.35
	Lead	12.6		0.278	0.49	11.9		0.247	0.435
	Magnesium	4860	B	0.573	1.96	4860		0.509	1.74
	Manganese	296		0.128	0.98	311		0.114	0.87
	Mercury	0.0063	J	0.001	0.0099	0.0103		0.00095	0.0097
	Nickel	10.6		0.0837	0.49	12.7		0.0743	0.435
	Potassium	2020		3.51	9.8	2750		15.5	43.5
	Selenium	0.37	J	0.159	0.49	0.264	BJ	0.141	0.435
	Silver	0.177	BJ	0.0884	0.49	0.0784	U	0.0784	0.435
	Sodium	80.1		3.56	9.8	91.4		3.16	8.7
	Thallium	0.98	U	0.98	0.98	2.15		0.87	0.87
	Vanadium	27.5	B	0.089	0.49	24.5		0.079	0.435
	Zinc	41	B	0.165	0.49	46.7		0.146	0.435

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

TABLE C-12. Radiological Replicate Results for Calendar Year 2002, Soil

Location Type	Location	Sample ID	Analyte	Units	Activity (± 2 σ)		Decision Level	Detection Limit	Average	Std Dev	CV
Community	**11**	059418-001	Cesium-137	pCi/g	0.0552 ± 0.0205		0.00942	0.0195	0.0496	0.0151947	30.63%
		059418-002	Cesium-137	pCi/g	0.0612 ± 0.0242		0.0111	0.0233			
		059418-003	Cesium-137	pCi/g	0.0324 ± 0.0319		0.0117	0.0244			
		059418-001	Tritium	pCi/g	0.488 ± 1.31	U	1.08	2.16	0.2053333	0.4604621	224.25%
		059418-002	Tritium	pCi/g	0.454 ± 1.31	U	1.08	2.16			
		059418-003	Tritium	pCi/g	-0.326 ± 1.21	U	1.03	2.06			
		059418-001	Uranium	μg/g	0.515		0.006	0.04	0.6153333	0.1469433	23.88%
		059418-002	Uranium	μg/g	0.784		0.006	0.04			
		059418-003	Uranium	μg/g	0.547		0.00598	0.0398			
Perimeter	**64**	059377-001	Cesium-137	pCi/g	0.71 ± 0.075		0.0135	0.0278	0.6206667	0.1149362	18.52%
		059377-002	Cesium-137	pCi/g	0.661 ± 0.0923		0.015	0.0309			
		059377-003	Cesium-137	pCi/g	0.491 ± 0.0548		0.00981	0.0202			
		059377-001	Tritium	pCi/g	-0.845 ± 1.31	U	1.13	2.25	-1.3925	0.7742819	-55.60%
		059377-002	Tritium	pCi/g	-1.94 ± 1.25	U	1.12	2.23			
		059377-003	Tritium	pCi/g	-0.0151 ± 0.134	U	0.113	0.23			
		059377-001	Uranium	μg/g	0.686		0.00593	0.0395	0.6923333	0.0136504	1.97%
		059377-002	Uranium	μg/g	0.708		0.00596	0.0398			
		059377-003	Uranium	μg/g	0.683		0.00595	0.0397			
On-Site	**20**	059391-001	Cesium-137	pCi/g	0.611 ± 0.0732		0.0127	0.0266	0.493	0.132921	26.96%
		059391-002	Cesium-137	pCi/g	0.349 ± 0.0442		0.0101	0.0208			
		059391-003	Cesium-137	pCi/g	0.519 ± 0.062		0.00912	0.0189			
		059391-001	Tritium	pCi/mL	-0.0277 ± 0.103	U	0.102	0.216	0.0195333	0.0594572	304.39%
		059391-002	Tritium	pCi/mL	0 ± 0.107	U	0.104	0.22			
		059391-003	Tritium	pCi/mL	0.0863 ± 0.117	U	0.106	0.225			
		059391-001	Uranium	μg/g	1.67		0.00596	0.0398	1.0113333	0.5715569	56.52%
		059391-002	Uranium	μg/g	0.646		0.00587	0.0391			
		059391-003	Uranium	μg/g	0.718		0.00596	0.0398			

See notes at end of table.

TABLE C-12. Radiological Replicate Results for Calendar Year 2002, Soil *(concluded)*

Location Type	Location	Sample ID	Analyte	Units	Activity (± 2 σ)		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	**2NE**	059410-001	Cesium-137	pCi/g	0.155 ± 0.0352		0.0123	0.0259	0.1613333	0.0145717	9.03%
		059410-002	Cesium-137	pCi/g	0.151 ± 0.0334		0.012	0.0253			
		059410-003	Cesium-137	pCi/g	0.178 ± 0.0308		0.0132	0.0275			
		059410-001	Tritium	pCi/g	0.353 ± 1.1	U	0.908	1.82	0.1606	0.2720947	169.42%
		059410-002	Tritium	pCi/g	-0.0318 ± 1.04	U	0.878	1.76			
		059410-003	Tritium	pCi/g	1.6 ± 0.267		0.107	0.227			
		059410-001	Uranium	µg/g	0.755		0.00593	0.0395	0.482	0.2381365	49.41%
		059410-002	Uranium	µg/g	0.317		0.00589	0.0393			
		059410-003	Uranium	µg/g	0.374		0.00593	0.0395			
	33	059367-001	Cesium-137	pCi/g	0.303 ± 0.0423		0.013	0.0273	0.332	0.0418688	12.61%
		059367-002	Cesium-137	pCi/g	0.313 ± 0.0467		0.0102	0.021			
		059367-003	Cesium-137	pCi/g	0.38 ± 0.0488		0.0134	0.0277			
		059367-001	Tritium	pCi/g	-0.425 ± 1.17	U	1	2.01	-0.5425	0.1661701	-30.63%
		059367-002	Tritium	pCi/g	0.228 ± 0.125		0.0979	0.206			
		059367-003	Tritium	pCi/g	-0.66 ± 1.19	U	1.02	2.05			
		059367-001	Uranium	µg/g	0.897		0.00599	0.0399	0.8836667	0.023094	2.61%
		059367-002	Uranium	µg/g	0.857		0.00598	0.0398			
		059367-003	Uranium	µg/g	0.897		0.006	0.04			
	53	059409-001	Cesium-137	pCi/g	0.143 ± 0.0338		0.0114	0.0235	0.1706667	0.0285365	16.72%
		059409-002	Cesium-137	pCi/g	0.2 ± 0.0297		0.00801	0.0166			
		059409-003	Cesium-137	pCi/g	0.169 ± 0.0438		0.013	0.0277			
		059409-001	Tritium	pCi/mL	0.0843 ± 0.129	U	0.103	0.219	0.0843	0	0.00%
		059409-002	Tritium	pCi/mL	-0.0755 ± 0.99	U	0.834	1.67			
		059409-003	Tritium	pCi/mL	0.0843 ± 0.13	U	0.103	0.219			
		059409-001	Uranium	µg/g	0.364		0.00596	0.0398	0.3386667	0.0260256	7.68%
		059409-002	Uranium	µg/g	0.34		0.00588	0.0392			
		059409-003	Uranium	µg/g	0.312		0.00587	0.0391			

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
µg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.

Std Dev = standard deviaition
CV = coefficient of variation

TABLE C-13. Radiological Replicate Results for Calendar Year 2002, Sediment

Location Type	Location	Sample ID	Analyte	Units	Activity (± 2 σ)		Decision Level	Detection Limit	Average	Std Dev	CV
Community	**11**	059420-001	Cesium-137	pCi/g	0.0689 ± 0.0248		0.0137	0.0285	0.1543	0.075464	48.91%
		059420-002	Cesium-137	pCi/g	0.182 ± 0.0368		0.0151	0.0315			
		059420-003	Cesium-137	pCi/g	0.212 ± 0.0444		0.015	0.0312			
		059420-001	Tritium	pCi/mL	0.0288 ± 0.11	U	0.0906	0.194	0.095933	0.092932	96.87%
		059420-002	Tritium	pCi/mL	0.057 ± 0.112	U	0.0898	0.192			
		059420-003	Tritium	pCi/mL	0.202 ± 0.126		0.0909	0.195			
		059420-001	Uranium	µg/g	0.494		0.006	0.04	0.530667	0.045081	8.50%
		059420-002	Uranium	µg/g	0.517		0.00599	0.0399			
		059420-003	Uranium	µg/g	0.581		0.00595	0.0397			
On-Site	**74**	059332-001	Cesium-137	pCi/g	0.0235 ± 0.0264	U	0.0128	0.0267	0.038833	0.018653	48.03%
		059332-002	Cesium-137	pCi/g	0.0596 ± 0.0225		0.0128	0.0269			
		059332-003	Cesium-137	pCi/g	0.0334 ± 0.025		0.0133	0.0278			
		059332-001	Tritium	pCi/mL	0.0807 ± 0.0917	U	0.0723	0.153	0.088267	0.038512	43.63%
		059332-002	Tritium	pCi/mL	0.0541 ± 0.0902	U	0.0726	0.153			
		059332-003	Tritium	pCi/mL	0.13 ± 0.0924	U	0.07	0.148			
		059332-001	Uranium	µg/g	0.904		0.00589	0.0393	0.844	0.080895	9.58%
		059332-002	Uranium	µg/g	0.752		0.00598	0.0398			
		059332-003	Uranium	µg/g	0.876		0.00594	0.0396			

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
µg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
Std Dev = standard deviaition
CV = coefficient of variation

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TABLE C-14. Radiological Replicate Results for Calendar Year 2002, Vegetation

Location Type	Location	Sample ID	Analyte	Units	Activity (± 2 σ)		Decision Level	Detection Limit	Average	Std Dev	CV
Community	**11**	059419-001	Cesium-137	pCi/g	-0.00103 ± 0.0124	U	0.01	0.021	0.0052	0.0100	190.54%
		059419-002	Cesium-137	pCi/g	0.0167 ± 0.069	U	0.036	0.078			
		059419-003	Cesium-137	pCi/g	0 ± 0.0313	U	0.027	0.058			
		059419-001	Tritium	pCi/mL	-0.0291 ± 0.125	U	0.107	0.227	-0.0001	0.0290	-28950.13%
		059419-002	Tritium	pCi/mL	0.0288 ± 0.128	U	0.106	0.224			
		059419-003	Tritium	pCi/mL	0 ± 0.127	U	0.107	0.226			
		059419-001	Uranium	μg/g	0.00559	U	0.006	0.037	0.0056	0.0000	0.41%
		059419-002	Uranium	μg/g	0.00563	U	0.006	0.038			
		059419-003	Uranium	μg/g	0.00559	U	0.006	0.037			
On-Site	**33**	059368-001	Cesium-137	pCi/g	0.000624 ± 0.0164	U	0.0135	0.0282	-0.00174	0.002065	-118.78%
		059368-002	Cesium-137	pCi/g	-0.0032 ± 0.0219	U	0.0171	0.0357			
		059368-003	Cesium-137	pCi/g	-0.00264 ± 0.0238	U	0.0188	0.0394			
		059368-001	Tritium	pCi/mL	0 ± 0.102	U	0.0855	0.18	0.018967	0.016489	86.94%
		059368-002	Tritium	pCi/mL	0.027 ± 0.0984	U	0.0812	0.171			
		059368-003	Tritium	pCi/mL	0.0299 ± 0.109	U	0.0897	0.188			
		059368-001	Uranium	μg/g	0.0288	J	0.00595	0.0397	0.01697	0.010747	63.33%
		059368-002	Uranium	μg/g	0.0143	J	0.00596	0.0398			
		059368-003	Uranium	μg/g	0.00781	J	0.00586	0.0391			

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
Std Dev = standard deviaition
CV = coefficient of variation
J = Estimated value, the analyte concentration fell above the effective decision level and below the effective detection limit.

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TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Community	**11**	059418-001	Aluminum	4910	B	0.755	4.76	4840	140	2.87%
		059418-002	Aluminum	4930	B	0.715	4.5			
		059418-003	Aluminum	4680	B	0.748	4.72			
		059418-001	Antimony	0.327	U	0.327	0.952	0.354	0.055	15.61%
		059418-002	Antimony	0.318	J	0.309	0.901			
		059418-003	Antimony	0.418	J	0.324	0.943			
		059418-001	Arsenic	2.35		0.197	0.476	2.48	0.11	4.45%
		059418-002	Arsenic	2.55		0.186	0.45			
		059418-003	Arsenic	2.53		0.195	0.472			
		059418-001	Barium	165		0.0635	0.476	168	8	4.72%
		059418-002	Barium	162		0.0601	0.45			
		059418-003	Barium	177		0.0629	0.472			
		059418-001	Beryllium	0.279	J	0.0476	0.476	0.279	0.009	3.05%
		059418-002	Beryllium	0.287	J	0.045	0.45			
		059418-003	Beryllium	0.27	J	0.0472	0.472			
		059418-001	Cadmium	0.0539	J	0.0455	0.476	0.062	0.014	22.45%
		059418-002	Cadmium	0.0542	J	0.0431	0.45			
		059418-003	Cadmium	0.0782	J	0.0451	0.472			
		059418-001	Calcium	12400	B	1.24	9.52	12567	208	1.66%
		059418-002	Calcium	12800	B	1.17	9.01			
		059418-003	Calcium	12500	B	1.23	9.43			
		059418-001	Chromium	7.22		0.153	0.476	7.11	0.20	2.76%
		059418-002	Chromium	7.24		0.145	0.45			
		059418-003	Chromium	6.89		0.152	0.472			
		059418-001	Cobalt	2.96		0.076	0.476	2.90	0.06	1.96%
		059418-002	Cobalt	2.88		0.0719	0.45			
		059418-003	Cobalt	2.85		0.0753	0.472			
		059418-001	Copper	4.67		0.193	0.476	4.65	0.05	1.06%
		059418-002	Copper	4.68		0.183	0.45			
		059418-003	Copper	4.59		0.192	0.472			
		059418-001	Iron	8740		1.49	4.76	8793	244	2.78%
		059418-002	Iron	9060		1.41	4.5			
		059418-003	Iron	8580		1.48	4.72			
		059418-001	Lead	5.84		0.27	0.476	5.76	0.11	1.94%
		059418-002	Lead	5.8		0.256	0.45			
		059418-003	Lead	5.63		0.268	0.472			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Community *(concluded)*	**11**	059418-001	Magnesium	2290		0.557	1.9	2280	36	1.58%
		059418-002	Magnesium	2310		0.527	1.8			
		059418-003	Magnesium	2240		0.552	1.89			
		059418-001	Manganese	305		0.125	0.952	283	20	7.06%
		059418-002	Manganese	278		0.118	0.901			
		059418-003	Manganese	266		0.123	0.943			
		059418-001	Mercury	0.0059	J	0.000907	0.00923	0.005	0.001	28.10%
		059418-002	Mercury	0.0034	J	0.000903	0.00919			
		059418-003	Mercury	0.0044	J	0.00093	0.00946			
		059418-001	Nickel	5.03		0.0813	0.476	4.91	0.21	4.29%
		059418-002	Nickel	5.04		0.0769	0.45			
		059418-003	Nickel	4.67		0.0806	0.472			
		059418-001	Potassium	1240		3.41	9.52	1197	67	5.56%
		059418-002	Potassium	1230		3.22	9.01			
		059418-003	Potassium	1120		3.37	9.43			
		059418-001	Selenium	0.168	J	0.154	0.476	0.223	0.109	48.85%
		059418-002	Selenium	0.349	J	0.146	0.45			
		059418-003	Selenium	0.153	U	0.153	0.472			
		059418-001	Silver	0.0859	U	0.0859	0.476	0.084	0.002	2.92%
		059418-002	Silver	0.0813	U	0.0813	0.45			
		059418-003	Silver	0.0851	U	0.0851	0.472			
		059418-001	Sodium	188		3.46	9.52	277	124	44.72%
		059418-002	Sodium	418		3.27	9.01			
		059418-003	Sodium	224		3.43	9.43			
		059418-001	Thallium	0.952	U	0.952	0.952	0.932	0.027	2.92%
		059418-002	Thallium	0.901	U	0.901	0.901			
		059418-003	Thallium	0.943	U	0.943	0.943			
		059418-001	Vanadium	20.6		0.0865	0.476	20.8	0.6	2.74%
		059418-002	Vanadium	21.4		0.0818	0.45			
		059418-003	Vanadium	20.3		0.0857	0.472			
		059418-001	Zinc	20.9		0.16	0.476	20.27	0.85	4.20%
		059418-002	Zinc	20.6		0.152	0.45			
		059418-003	Zinc	19.3		0.159	0.472			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Perimeter	**64**	059377-001	Aluminum	13500		0.785	4.95	13867	321	2.32%
		059377-002	Aluminum	14100		0.793	5			
		059377-003	Aluminum	14000		0.785	4.95			
		059377-001	Antimony	0.34	U	0.34	0.99	0.340	0.008	0.51%
		059377-002	Antimony	0.343	U	0.343	1			
		059377-003	Antimony	0.34	U	0.34	0.99			
		059377-001	Arsenic	2.6		0.204	0.495	2.78	0.18	6.49%
		059377-002	Arsenic	2.77		0.206	0.5			
		059377-003	Arsenic	2.96		0.204	0.495			
		059377-001	Barium	105		0.066	0.495	109	4	3.31%
		059377-002	Barium	110		0.0667	0.5			
		059377-003	Barium	112		0.066	0.495			
		059377-001	Beryllium	0.574		0.0495	0.495	0.576	0.002	0.36%
		059377-002	Beryllium	0.578		0.05	0.5			
		059377-003	Beryllium	0.575		0.0495	0.495			
		059377-001	Cadmium	0.16	J	0.0473	0.495	0.1283	0.0473	36.89%
		059377-002	Cadmium	0.151	J	0.0478	0.5			
		059377-003	Cadmium	0.0739	J	0.0473	0.495			
		059377-001	Calcium	5260		1.29	9.9	6010	1082	18.00%
		059377-002	Calcium	5520		1.3	10			
		059377-003	Calcium	7250		1.29	9.9			
		059377-001	Chromium	9.82		0.16	0.495	9.91	0.16	1.63%
		059377-002	Chromium	9.82		0.161	0.5			
		059377-003	Chromium	10.1		0.16	0.495			
		059377-001	Cobalt	7.3		0.079	0.495	7.78	0.43	5.58%
		059377-002	Cobalt	7.91		0.0798	0.5			
		059377-003	Cobalt	8.14		0.079	0.495			
		059377-001	Copper	14		0.201	0.495	14.6	0.7	4.49%
		059377-002	Copper	15.3		0.203	0.5			
		059377-003	Copper	14.5		0.201	0.495			
		059377-001	Iron	22700		1.55	4.95	24100	1706	7.08%
		059377-002	Iron	23600		1.57	5			
		059377-003	Iron	26000		1.55	4.95			
		059377-001	Lead	15.3		0.281	0.495	15.0	1.7	11.52%
		059377-002	Lead	16.5		0.284	0.5			
		059377-003	Lead	13.1		0.281	0.495			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Perimeter *(concluded)*	**64**	059377-001	Magnesium	7030		0.579	1.98	7530	469	6.23%
		059377-002	Magnesium	7600		0.585	2			
		059377-003	Magnesium	7960		0.579	1.98			
		059377-001	Manganese	558		0.13	0.99	590	28	4.80%
		059377-002	Manganese	602		0.131	1			
		059377-003	Manganese	611		0.13	0.99			
		059377-001	Mercury	0.0169		0.00097	0.00987	0.0119	0.0044	36.66%
		059377-002	Mercury	0.0101		0.000864	0.00878			
		059377-003	Mercury	0.00875		0.000851	0.00866			
		059377-001	Nickel	8.66		0.0846	0.495	8.98	0.28	3.14%
		059377-002	Nickel	9.11		0.0854	0.5			
		059377-003	Nickel	9.18		0.0846	0.495			
		059377-001	Potassium	3660		17.7	49.5	3740	72	1.93%
		059377-002	Potassium	3760		17.9	50			
		059377-003	Potassium	3800		17.7	49.5			
		059377-001	Selenium	0.8	B	0.16	0.495	0.835	0.032	3.79%
		059377-002	Selenium	0.861	B	0.162	0.5			
		059377-003	Selenium	0.845	B	0.16	0.495			
		059377-001	Silver	0.0893	U	0.0893	0.495	0.0896	0.0005	0.58%
		059377-002	Silver	0.0902	U	0.0902	0.5			
		059377-003	Silver	0.0893	U	0.0893	0.495			
		059377-001	Sodium	83.4		3.6	9.9	84.5	2.6	3.04%
		059377-002	Sodium	87.4		3.63	10			
		059377-003	Sodium	82.6		3.6	9.9			
		059377-001	Thallium	0.99	U	0.99	0.99	0.9933	0.0058	0.58%
		059377-002	Thallium	1	U	1	1			
		059377-003	Thallium	0.99	U	0.99	0.99			
		059377-001	Vanadium	35.3		0.0899	0.495	37.6	3.1	8.25%
		059377-002	Vanadium	36.3		0.0908	0.5			
		059377-003	Vanadium	41.1		0.0899	0.495			
		059377-001	Zinc	75.7	B	0.167	0.495	80.1	4.8	5.98%
		059377-002	Zinc	85.2	B	0.168	0.5			
		059377-003	Zinc	79.4	B	0.167	0.495			

See notes ate end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**20**	059391-001	Aluminum	8600		2.83	17.9	9230	598	6.48%
		059391-002	Aluminum	9300		0.741	4.67			
		059391-003	Aluminum	9790		0.778	4.9			
		059391-001	Antimony	983		1.23	3.57	328	567	173.03%
		059391-002	Antimony	0.321	U	0.321	0.935			
		059391-003	Antimony	0.337	U	0.337	0.98			
		059391-001	Arsenic	77.1		0.737	1.79	27.4	43.0	157.00%
		059391-002	Arsenic	2.47		0.193	0.467			
		059391-003	Arsenic	2.66		0.202	0.49			
		059391-001	Barium	89		0.238	1.79	93	3	3.63%
		059391-002	Barium	94		0.0623	0.467			
		059391-003	Barium	95.4		0.0654	0.49			
		059391-001	Beryllium	0.398	J	0.179	1.79	0.414	0.020	4.89%
		059391-002	Beryllium	0.408	J	0.0467	0.467			
		059391-003	Beryllium	0.437	J	0.049	0.49			
		059391-001	Cadmium	2.89		0.171	1.79	1.2733	1.4025	110.15%
		059391-002	Cadmium	0.548		0.0447	0.467			
		059391-003	Cadmium	0.382	J	0.0469	0.49			
		059391-001	Calcium	16900	B	4.66	35.7	18200	1127	6.19%
		059391-002	Calcium	18800	B	1.22	9.35			
		059391-003	Calcium	18900	B	1.28	9.8			
		059391-001	Chromium	10.9		0.575	1.79	10.8	0.6	5.68%
		059391-002	Chromium	10.1		0.151	0.467			
		059391-003	Chromium	11.3		0.158	0.49			
		059391-001	Cobalt	4.32		0.285	1.79	4.39	0.11	2.51%
		059391-002	Cobalt	4.34		0.0746	0.467			
		059391-003	Cobalt	4.52		0.0782	0.49			
		059391-001	Copper	11.8		0.725	1.79	10.32	1.28	12.45%
		059391-002	Copper	9.46		0.19	0.467			
		059391-003	Copper	9.71		0.199	0.49			
		059391-001	Iron	12400		5.6	17.9	13767	1305	9.48%
		059391-002	Iron	13900		1.46	4.67			
		059391-003	Iron	15000		1.54	4.9			
		059391-001	Lead	34300		5.07	8.93	11467	19774	172.45%
		059391-002	Lead	36.3		0.265	0.467			
		059391-003	Lead	63.7		0.278	0.49			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	**20**	059391-001	Magnesium	3570		2.09	7.14	3700	115	3.12%
		059391-002	Magnesium	3790		0.547	1.87			
		059391-003	Magnesium	3740		0.573	1.96			
		059391-001	Manganese	235		0.467	3.57	255	17	6.84%
		059391-002	Manganese	263		0.122	0.935			
		059391-003	Manganese	267		0.128	0.98			
		059391-001	Mercury	0.0118		0.000886	0.00901	0.0127	0.0009	6.71%
		059391-002	Mercury	0.0135		0.00089	0.00905			
		059391-003	Mercury	0.0127		0.000878	0.00893			
		059391-001	Nickel	8.74		0.305	1.79	8.29	0.44	5.26%
		059391-002	Nickel	7.87		0.0798	0.467			
		059391-003	Nickel	8.26		0.0837	0.49			
		059391-001	Potassium	2430		12.8	35.7	2453	59	2.39%
		059391-002	Potassium	2520		3.34	9.35			
		059391-003	Potassium	2410		3.51	9.8			
		059391-001	Selenium	0.923	BJ	0.579	1.79	0.661	0.229	34.55%
		059391-002	Selenium	0.56	B	0.151	0.467			
		059391-003	Selenium	0.501	B	0.159	0.49			
		059391-001	Silver	1.18	J	0.322	1.79	0.4509	0.6314	140.04%
		059391-002	Silver	0.0843	U	0.0843	0.467			
		059391-003	Silver	0.0884	U	0.0884	0.49			
		059391-001	Sodium	46.1		13	35.7	52.8	6.1	11.64%
		059391-002	Sodium	54		3.39	9.35			
		059391-003	Sodium	58.2		3.56	9.8			
		059391-001	Thallium	3.57	U	3.57	3.57	1.83	1.51	82.51%
		059391-002	Thallium	0.935	U	0.935	0.935			
		059391-003	Thallium	0.98	U	0.98	0.98			
		059391-001	Vanadium	20.8		0.324	1.79	24.2	3.8	13.13%
		059391-002	Vanadium	24.6		0.0849	0.467			
		059391-003	Vanadium	27.1		0.089	0.49			
		059391-001	Zinc	36.4		0.601	1.79	36.4	0.1	0.16%
		059391-002	Zinc	36.5		0.157	0.467			
		059391-003	Zinc	36.4		0.165	0.49			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**2NE**	059410-001	Aluminum	8160	B	0.793	5	8497	437	5.14%
		059410-002	Aluminum	8340	B	0.793	5			
		059410-003	Aluminum	8990	B	0.793	5			
		059410-001	Antimony	0.343	U	0.343	1	0.343	0.000	0.00%
		059410-002	Antimony	0.343	U	0.343	1			
		059410-003	Antimony	0.343	U	0.343	1			
		059410-001	Arsenic	1.99		0.206	0.5	1.99	0.01	0.50%
		059410-002	Arsenic	1.98		0.206	0.5			
		059410-003	Arsenic	2		0.206	0.5			
		059410-001	Barium	61.8		0.0667	0.5	65.3	3.3	5.02%
		059410-002	Barium	65.8		0.0667	0.5			
		059410-003	Barium	68.3		0.0667	0.5			
		059410-001	Beryllium	0.359	J	0.05	0.5	0.372	0.016	4.18%
		059410-002	Beryllium	0.367	J	0.05	0.5			
		059410-003	Beryllium	0.389	J	0.05	0.5			
		059410-001	Cadmium	0.195	J	0.0478	0.5	0.169	0.025	14.65%
		059410-002	Cadmium	0.146	J	0.0478	0.5			
		059410-003	Cadmium	0.165	J	0.0478	0.5			
		059410-001	Calcium	5640		1.3	10	5317	1034	19.44%
		059410-002	Calcium	6150		1.3	10			
		059410-003	Calcium	4160		1.3	10			
		059410-001	Chromium	8.49		0.161	0.5	8.79	0.29	3.30%
		059410-002	Chromium	8.8		0.161	0.5			
		059410-003	Chromium	9.07		0.161	0.5			
		059410-001	Cobalt	2.55		0.0798	0.5	2.68	0.14	5.07%
		059410-002	Cobalt	2.66		0.0798	0.5			
		059410-003	Cobalt	2.82		0.0798	0.5			
		059410-001	Copper	5.89		0.203	0.5	5.83	0.23	3.95%
		059410-002	Copper	5.58		0.203	0.5			
		059410-003	Copper	6.03		0.203	0.5			
		059410-001	Iron	9280		1.57	5	9693	410	4.23%
		059410-002	Iron	9700		1.57	5			
		059410-003	Iron	10100		1.57	5			
		059410-001	Lead	8.36		0.284	0.5	8.42	0.06	0.66%
		059410-002	Lead	8.43		0.284	0.5			
		059410-003	Lead	8.47		0.284	0.5			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	**2NE**	059410-001	Magnesium	2060		0.585	2	2107	40	1.92%
		059410-002	Magnesium	2130		0.585	2			
		059410-003	Magnesium	2130		0.585	2			
		059410-001	Manganese	133		0.131	1	141	9	6.61%
		059410-002	Manganese	138		0.131	1			
		059410-003	Manganese	151		0.131	1			
		059410-001	Mercury	0.00765	J	0.00097	0.00987	0.0086	0.0009	10.95%
		059410-002	Mercury	0.00952		0.000927	0.00943			
		059410-003	Mercury	0.00849	J	0.000909	0.00924			
		059410-001	Nickel	5.53		0.0854	0.5	5.62	0.11	2.02%
		059410-002	Nickel	5.59		0.0854	0.5			
		059410-003	Nickel	5.75		0.0854	0.5			
		059410-001	Potassium	1690		3.58	10	1697	50	2.97%
		059410-002	Potassium	1650		3.58	10			
		059410-003	Potassium	1750		3.58	10			
		059410-001	Selenium	0.462	BJ	0.162	0.5	0.551	0.078	14.23%
		059410-002	Selenium	0.61	B	0.162	0.5			
		059410-003	Selenium	0.581	B	0.162	0.5			
		059410-001	Silver	0.0902	U	0.0902	0.5	0.0902	0.0000	0.00%
		059410-002	Silver	0.0902	U	0.0902	0.5			
		059410-003	Silver	0.0902	U	0.0902	0.5			
		059410-001	Sodium	39.4		3.63	10	38.1	1.1	2.98%
		059410-002	Sodium	37.3		3.63	10			
		059410-003	Sodium	37.6		3.63	10			
		059410-001	Thallium	1	U	1	1	1.0	0.0	0.00%
		059410-002	Thallium	1	U	1	1			
		059410-003	Thallium	1	U	1	1			
		059410-001	Vanadium	17		0.0908	0.5	17.6	0.6	3.14%
		059410-002	Vanadium	17.6		0.0908	0.5			
		059410-003	Vanadium	18.1		0.0908	0.5			
		059410-001	Zinc	25.2		0.168	0.5	25.5	0.5	1.81%
		059410-002	Zinc	25.2		0.168	0.5			
		059410-003	Zinc	26		0.168	0.5			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**33**	059367-001	Aluminum	11100		0.763	4.81	11167	503	4.51%
		059367-002	Aluminum	10700		0.721	4.55			
		059367-003	Aluminum	11700		0.755	4.76			
		059367-001	Antimony	0.33	U	0.33	0.962	0.323	0.010	2.99%
		059367-002	Antimony	0.312	U	0.312	0.909			
		059367-003	Antimony	0.327	U	0.327	0.952			
		059367-001	Arsenic	5.06		0.198	0.481	5.12	0.84	16.44%
		059367-002	Arsenic	4.31		0.188	0.455			
		059367-003	Arsenic	5.99		0.197	0.476			
		059367-001	Barium	126		0.0641	0.481	129	5	3.59%
		059367-002	Barium	126		0.0606	0.455			
		059367-003	Barium	134		0.0635	0.476			
		059367-001	Beryllium	0.786		0.0481	0.481	0.755	0.113	14.98%
		059367-002	Beryllium	0.63		0.0455	0.455			
		059367-003	Beryllium	0.85		0.0476	0.476			
		059367-001	Cadmium	0.241	J	0.046	0.481	0.258	0.015	5.87%
		059367-002	Cadmium	0.263	J	0.0435	0.455			
		059367-003	Cadmium	0.27	J	0.0455	0.476			
		059367-001	Calcium	49000	B	3.13	24	51900	3061	5.90%
		059367-002	Calcium	55100	B	2.96	22.7			
		059367-003	Calcium	51600	B	3.11	23.8			
		059367-001	Chromium	13.3		0.155	0.481	13.6	0.3	2.24%
		059367-002	Chromium	13.7		0.146	0.455			
		059367-003	Chromium	13.9		0.153	0.476			
		059367-001	Cobalt	5.2		0.0767	0.481	5.39	0.67	12.35%
		059367-002	Cobalt	4.84		0.0725	0.455			
		059367-003	Cobalt	6.13		0.076	0.476			
		059367-001	Copper	11.7		0.195	0.481	11.4	0.4	3.82%
		059367-002	Copper	10.9		0.185	0.455			
		059367-003	Copper	11.6		0.193	0.476			
		059367-001	Iron	13800		1.51	4.81	13567	404	2.98%
		059367-002	Iron	13100		1.42	4.55			
		059367-003	Iron	13800		1.49	4.76			
		059367-001	Lead	13.2		0.273	0.481	13.1	0.3	2.33%
		059367-002	Lead	12.8		0.258	0.455			
		059367-003	Lead	13.4		0.27	0.476			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result	Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	**33**	059367-001	Magnesium	4640	0.562	1.92	4660	191	4.09%
		059367-002	Magnesium	4480	0.532	1.82			
		059367-003	Magnesium	4860	0.557	1.9			
		059367-001	Manganese	297	0.126	0.962	299	10	3.24%
		059367-002	Manganese	291	0.119	0.909			
		059367-003	Manganese	310	0.125	0.952			
		059367-001	Mercury	0.0141	0.000973	0.0099	0.0131	0.0012	8.94%
		059367-002	Mercury	0.0118	0.000972	0.00988			
		059367-003	Mercury	0.0133	0.000919	0.00935			
		059367-001	Nickel	11.1	0.0821	0.481	11.3	0.4	3.57%
		059367-002	Nickel	11.1	0.0776	0.455			
		059367-003	Nickel	11.8	0.0813	0.476			
		059367-001	Potassium	2980	8.6	24	3017	346	11.48%
		059367-002	Potassium	2690	8.13	22.7			
		059367-003	Potassium	3380	8.52	23.8			
		059367-001	Selenium	0.588 B	0.156	0.481	0.607	0.019	3.13%
		059367-002	Selenium	0.607 B	0.147	0.455			
		059367-003	Selenium	0.626 B	0.154	0.476			
		059367-001	Silver	0.0867 U	0.0867	0.481	0.0865	0.0006	0.66%
		059367-002	Silver	0.087 J	0.082	0.455			
		059367-003	Silver	0.0859 U	0.0859	0.476			
		059367-001	Sodium	319	3.49	9.62	322	17	5.19%
		059367-002	Sodium	340	3.3	9.09			
		059367-003	Sodium	307	3.46	9.52			
		059367-001	Thallium	0.962 U	0.962	0.962	0.958	0.006	0.57%
		059367-002	Thallium	0.961	0.909	0.909			
		059367-003	Thallium	0.952 U	0.952	0.952			
		059367-001	Vanadium	25.1	0.0873	0.481	24.7	0.7	2.70%
		059367-002	Vanadium	23.9	0.0825	0.455			
		059367-003	Vanadium	25	0.0865	0.476			
		059367-001	Zinc	60.7	0.162	0.481	54.2	6.3	11.57%
		059367-002	Zinc	48.2	0.153	0.455			
		059367-003	Zinc	53.6	0.16	0.476			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**53**	059409-001	Aluminum	7640	B	0.741	4.67	7507	140	1.87%
		059409-002	Aluminum	7520	B	0.793	5			
		059409-003	Aluminum	7360	B	0.785	4.95			
		059409-001	Antimony	0.321	U	0.321	0.935	0.335	0.012	3.56%
		059409-002	Antimony	0.343	U	0.343	1			
		059409-003	Antimony	0.34	U	0.34	0.99			
		059409-001	Arsenic	1.73		0.193	0.467	1.78	0.06	3.51%
		059409-002	Arsenic	1.85		0.206	0.5			
		059409-003	Arsenic	1.76		0.204	0.495			
		059409-001	Barium	55.6		0.0623	0.467	53.2	2.8	5.29%
		059409-002	Barium	53.9		0.0667	0.5			
		059409-003	Barium	50.1		0.066	0.495			
		059409-001	Beryllium	0.334	J	0.0467	0.467	0.328	0.009	2.60%
		059409-002	Beryllium	0.331	J	0.05	0.5			
		059409-003	Beryllium	0.318	J	0.0495	0.495			
		059409-001	Cadmium	0.107	J	0.0447	0.467	0.0880	0.0192	21.77%
		059409-002	Cadmium	0.0882	J	0.0478	0.5			
		059409-003	Cadmium	0.0687	J	0.0473	0.495			
		059409-001	Calcium	1550		1.22	9.35	1470	212	14.40%
		059409-002	Calcium	1230		1.3	10			
		059409-003	Calcium	1630		1.29	9.9			
		059409-001	Chromium	8.29		0.151	0.467	7.99	0.33	4.10%
		059409-002	Chromium	8.04		0.161	0.5			
		059409-003	Chromium	7.64		0.16	0.495			
		059409-001	Cobalt	2.73		0.0746	0.467	2.65	0.12	4.51%
		059409-002	Cobalt	2.7		0.0798	0.5			
		059409-003	Cobalt	2.51		0.079	0.495			
		059409-001	Copper	5.79		0.19	0.467	5.24	0.57	10.90%
		059409-002	Copper	5.27		0.203	0.5			
		059409-003	Copper	4.65		0.201	0.495			
		059409-001	Iron	9160		1.46	4.67	8910	255	2.86%
		059409-002	Iron	8920		1.57	5			
		059409-003	Iron	8650		1.55	4.95			
		059409-001	Lead	8.8		0.265	0.467	7.63	1.11	14.54%
		059409-002	Lead	7.51		0.284	0.5			
		059409-003	Lead	6.59		0.281	0.495			

See notes at end of table.

TABLE C-15. Non-radiological Replicate Results for Calendar Year 2002 ,Soil (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	53	059409-001	Magnesium	1680		0.547	1.87	1650	30	1.82%
		059409-002	Magnesium	1650		0.585	2			
		059409-003	Magnesium	1620		0.579	1.98			
		059409-001	Manganese	168		0.122	0.935	156	13	8.05%
		059409-002	Manganese	158		0.131	1			
		059409-003	Manganese	143		0.13	0.99			
		059409-001	Mercury	0.00753	J	0.000879	0.00894	0.0081	0.0006	7.03%
		059409-002	Mercury	0.00866	J	0.000896	0.00912			
		059409-003	Mercury	0.00801	J	0.000932	0.00948			
		059409-001	Nickel	5.06		0.0798	0.467	4.88	0.18	3.58%
		059409-002	Nickel	4.88		0.0854	0.5			
		059409-003	Nickel	4.71		0.0846	0.495			
		059409-001	Potassium	1580		3.34	9.35	1563	15	0.98%
		059409-002	Potassium	1550		3.58	10			
		059409-003	Potassium	1560		3.54	9.9			
		059409-001	Selenium	0.447	BJ	0.151	0.467	0.520	0.094	18.26%
		059409-002	Selenium	0.485	BJ	0.162	0.5			
		059409-003	Selenium	0.627	B	0.16	0.495			
		059409-001	Silver	0.0843	U	0.0843	0.467	0.0879	0.0032	3.61%
		059409-002	Silver	0.0902	U	0.0902	0.5			
		059409-003	Silver	0.0893	U	0.0893	0.495			
		059409-001	Sodium	34.4		3.39	9.35	31.6	4.1	13.02%
		059409-002	Sodium	33.6		3.63	10			
		059409-003	Sodium	26.9		3.6	9.9			
		059409-001	Thallium	0.935	U	0.935	0.935	0.975	0.035	3.59%
		059409-002	Thallium	1	U	1	1			
		059409-003	Thallium	0.99	U	0.99	0.99			
		059409-001	Vanadium	16.5		0.0849	0.467	15.9	0.6	3.77%
		059409-002	Vanadium	15.9		0.0908	0.5			
		059409-003	Vanadium	15.3		0.0899	0.495			
		059409-001	Zinc	23		0.157	0.467	21.6	1.5	6.72%
		059409-002	Zinc	21.7		0.168	0.5			
		059409-003	Zinc	20.1		0.167	0.495			

NOTES: B = The analyte was found in the blank above the effective decision level (organics), or the effective detection limit (inorganics).
J = Estimated value, the analyte concentration fell above the effective decision level and below the effective detection limit.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
CV = coefficient of variation
Std Dev = standard deviation

TABLE C-16. Non-radiological Replicate Results for Calendar Year 2002, Sediment
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Community	**11**	059420-001	Aluminum	8710	B	0.748	4.72	10803	2520	23.32%
		059420-002	Aluminum	10100	B	0.77	4.85			
		059420-003	Aluminum	13600	B	0.77	4.85			
		059420-001	Antimony	0.508	J	0.324	0.943	0.391	0.101	25.82%
		059420-002	Antimony	0.333	U	0.333	0.971			
		059420-003	Antimony	0.333	U	0.333	0.971			
		059420-001	Arsenic	2.76		0.195	0.472	3.05	0.25	8.21%
		059420-002	Arsenic	3.22		0.2	0.485			
		059420-003	Arsenic	3.16		0.2	0.485			
		059420-001	Barium	100		0.0629	0.472	121	22	17.86%
		059420-002	Barium	119		0.0648	0.485			
		059420-003	Barium	143		0.0648	0.485			
		059420-001	Beryllium	0.435	J	0.0472	0.472	0.549	0.113	20.49%
		059420-002	Beryllium	0.553		0.0485	0.485			
		059420-003	Beryllium	0.66		0.0485	0.485			
		059420-001	Cadmium	0.166	J	0.0451	0.472	0.200	0.030	14.73%
		059420-002	Cadmium	0.216	J	0.0464	0.485			
		059420-003	Cadmium	0.218	J	0.0464	0.485			
		059420-001	Calcium	15400	B	1.23	9.43	17300	3466	20.03%
		059420-002	Calcium	15200	B	1.27	9.71			
		059420-003	Calcium	21300	B	1.27	9.71			
		059420-001	Chromium	8.37		0.152	0.472	9.62	1.51	15.69%
		059420-002	Chromium	9.2		0.156	0.485			
		059420-003	Chromium	11.3		0.156	0.485			
		059420-001	Cobalt	2.89		0.0753	0.472	3.38	0.53	15.64%
		059420-002	Cobalt	3.31		0.0775	0.485			
		059420-003	Cobalt	3.94		0.0775	0.485			
		059420-001	Copper	6.65		0.192	0.472	8.52	2.45	28.81%
		059420-002	Copper	7.61		0.197	0.485			
		059420-003	Copper	11.3		0.197	0.485			
		059420-001	Iron	9460		1.48	4.72	10920	1273	11.66%
		059420-002	Iron	11500		1.52	4.85			
		059420-003	Iron	11800		1.52	4.85			
		059420-001	Lead	7.68		0.268	0.472	8.65	1.60	18.49%
		059420-002	Lead	7.78		0.275	0.485			
		059420-003	Lead	10.5		0.275	0.485			

See notes at end of table.

TABLE C-16. Non-radiological Replicate Results for Calendar Year 2002, Sediment (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Community *(concluded)*	**11**	059420-001	Magnesium	3060		0.552	1.89	3860	923	23.91%
		059420-002	Magnesium	3650		0.568	1.94			
		059420-003	Magnesium	4870		0.568	1.94			
		059420-001	Manganese	196		0.123	0.943	240	38	15.99%
		059420-002	Manganese	264		0.127	0.971			
		059420-003	Manganese	261		0.127	0.971			
		059420-001	Mercury	0.00728	J	0.00087	0.0089	0.0099	0.0023	23.34%
		059420-002	Mercury	0.0106		0.00096	0.0098			
		059420-003	Mercury	0.0117		0.00097	0.0098			
		059420-001	Nickel	6		0.0806	0.472	7.25	1.39	19.18%
		059420-002	Nickel	7.01		0.0829	0.485			
		059420-003	Nickel	8.75		0.0829	0.485			
		059420-001	Potassium	1630		3.37	9.43	1987	427	21.50%
		059420-002	Potassium	1870		3.47	9.71			
		059420-003	Potassium	2460		3.47	9.71			
		059420-001	Selenium	0.153	U	0.153	0.472	0.222	0.063	28.46%
		059420-002	Selenium	0.236	J	0.157	0.485			
		059420-003	Selenium	0.277	J	0.157	0.485			
		059420-001	Silver	0.0851	U	0.0851	0.472	0.0868	0.0014	1.66%
		059420-002	Silver	0.0876	U	0.0876	0.485			
		059420-003	Silver	0.0876	U	0.0876	0.485			
		059420-001	Sodium	140		3.43	9.43	159	19	11.65%
		059420-002	Sodium	161		3.53	9.71			
		059420-003	Sodium	177		3.53	9.71			
		059420-001	Thallium	0.943	U	0.943	0.943	0.962	0.016	1.68%
		059420-002	Thallium	0.971	U	0.971	0.971			
		059420-003	Thallium	0.971	U	0.971	0.971			
		059420-001	Vanadium	20.3		0.0857	0.472	21.2	1.2	5.54%
		059420-002	Vanadium	20.7		0.0882	0.485			
		059420-003	Vanadium	22.5		0.0882	0.485			
		059420-001	Zinc	26.3		0.159	0.472	32.5	7.5	22.93%
		059420-002	Zinc	30.5		0.163	0.485			
		059420-003	Zinc	40.8		0.163	0.485			

See notes at end of table.

TABLE C-16. Non-radiological Replicate Results for Calendar Year 2002, Sediment (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**74**	059332-001	Aluminum	10100	B	0.728	4.59	8633	1326	15.36%
		059332-002	Aluminum	8280	B	0.793	5			
		059332-003	Aluminum	7520	B	0.793	5			
		059332-001	Antimony	0.315	U	0.315	0.917	0.334	0.016	4.84%
		059332-002	Antimony	0.343	U	0.343	1			
		059332-003	Antimony	0.343	U	0.343	1			
		059332-001	Arsenic	3.07		0.189	0.459	2.59	0.43	16.42%
		059332-002	Arsenic	2.46		0.206	0.5			
		059332-003	Arsenic	2.25		0.206	0.5			
		059332-001	Barium	149		0.0612	0.459	131	16	12.00%
		059332-002	Barium	124		0.0667	0.5			
		059332-003	Barium	120		0.0667	0.5			
		059332-001	Beryllium	0.498		0.0459	0.459	0.416	0.072	17.42%
		059332-002	Beryllium	0.387	J	0.05	0.5			
		059332-003	Beryllium	0.362	J	0.05	0.5			
		059332-001	Cadmium	0.0636	J	0.0439	0.459	0.0585	0.0092	15.80%
		059332-002	Cadmium	0.0478	U	0.0478	0.5			
		059332-003	Cadmium	0.064	J	0.0478	0.5			
		059332-001	Calcium	42700	B	1.2	9.17	35800	6900	19.27%
		059332-002	Calcium	28900	B	1.3	10			
		059332-003	Calcium	35800	B	1.3	10			
		059332-001	Chromium	10.4	B	0.148	0.459	8.82	1.37	15.52%
		059332-002	Chromium	8.06	B	0.161	0.5			
		059332-003	Chromium	8	B	0.161	0.5			
		059332-001	Cobalt	5.34	B	0.0732	0.459	4.62	0.63	13.57%
		059332-002	Cobalt	4.25	B	0.0798	0.5			
		059332-003	Cobalt	4.26	B	0.0798	0.5			
		059332-001	Copper	10.4		0.186	0.459	8.43	1.71	20.29%
		059332-002	Copper	7.49		0.203	0.5			
		059332-003	Copper	7.39		0.203	0.5			
		059332-001	Iron	16300		1.44	4.59	13333	2581	19.36%
		059332-002	Iron	12100		1.57	5			
		059332-003	Iron	11600		1.57	5			
		059332-001	Lead	8.4		0.26	0.459	7.12	1.13	15.87%
		059332-002	Lead	6.7		0.284	0.5			
		059332-003	Lead	6.26		0.284	0.5			

See notes at end of table.

TABLE C-16. Non-radiological Replicate Results for Calendar Year 2002, Sediment (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	**74**	059332-001	Magnesium	5030	B	0.537	1.83	4347	605	13.92%
		059332-002	Magnesium	4130	B	0.585	2			
		059332-003	Magnesium	3880	B	0.585	2			
		059332-001	Manganese	340		0.12	0.917	281	51	18.12%
		059332-002	Manganese	248		0.131	1			
		059332-003	Manganese	256		0.131	1			
		059332-001	Mercury	0.00307	J	0.00097	0.0099	0.0027	0.0006	22.56%
		059332-002	Mercury	0.00301	J	0.00095	0.0097			
		059332-003	Mercury	0.00199	J	0.00089	0.0091			
		059332-001	Nickel	8.57		0.0783	0.459	7.31	1.09	14.98%
		059332-002	Nickel	6.71		0.0854	0.5			
		059332-003	Nickel	6.64		0.0854	0.5			
		059332-001	Potassium	2410		3.28	9.17	2070	322	15.55%
		059332-002	Potassium	2030		3.58	10			
		059332-003	Potassium	1770		3.58	10			
		059332-001	Selenium	0.551		0.149	0.459	0.554	0.055	9.94%
		059332-002	Selenium	0.611		0.162	0.5			
		059332-003	Selenium	0.501		0.162	0.5			
		059332-001	Silver	0.293	BJ	0.0828	0.459	0.272	0.028	10.13%
		059332-002	Silver	0.241	BJ	0.0902	0.5			
		059332-003	Silver	0.283	BJ	0.0902	0.5			
		059332-001	Sodium	112		3.33	9.17	98	16	16.52%
		059332-002	Sodium	101		3.63	10			
		059332-003	Sodium	80.2		3.63	10			
		059332-001	Thallium	1.29		0.917	0.917	1.12	0.15	13.33%
		059332-002	Thallium	1	U	1	1			
		059332-003	Thallium	1.08		1	1			
		059332-001	Vanadium	33.4	B	0.0833	0.459	28.1	4.6	16.46%
		059332-002	Vanadium	25.5	B	0.0908	0.5			
		059332-003	Vanadium	25.3	B	0.0908	0.5			
		059332-001	Zinc	45.6	B	0.154	0.459	37.1	7.4	19.94%
		059332-002	Zinc	33.6	B	0.168	0.5			
		059332-003	Zinc	32.1	B	0.168	0.5			

NOTES: B = The analyte was found in the blank above the effective decision level (organics), or the effective detection limit (inorganics).
J = Estimated value, the analyte concentration fell above the effective decision level and below the effective detection limit.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
CV = coefficient of variation
Std Dev = standard deviation

TABLE C-17. Non-radiological Replicate Results for Calendar Year 2002, Vegetation

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Community	**11**	059419-001	Aluminum	72.1	B	0.755	4.76	58.53	16.83	28.75%
		059419-002	Aluminum	63.8	B	0.755	4.76			
		059419-003	Aluminum	39.7	B	0.755	4.76			
		059419-001	Antimony	0.327	U	0.327	0.952	0.327	0.000	0.00%
		059419-002	Antimony	0.327	U	0.327	0.952			
		059419-003	Antimony	0.327	U	0.327	0.952			
		059419-001	Arsenic	0.197	U	0.197	0.476	0.269	0.125	46.36%
		059419-002	Arsenic	0.197	U	0.197	0.476			
		059419-003	Arsenic	0.413	J	0.197	0.476			
		059419-001	Barium	7.97		0.0635	0.476	7.10	2.00	28.11%
		059419-002	Barium	4.82		0.0635	0.476			
		059419-003	Barium	8.52		0.0635	0.476			
		059419-001	Beryllium	0.0476	U	0.0476	0.476	0.0476	0.0000	0.00%
		059419-002	Beryllium	0.0476	U	0.0476	0.476			
		059419-003	Beryllium	0.0476	U	0.0476	0.476			
		059419-001	Cadmium	0.0455	U	0.0455	0.476	0.0455	0.0000	0.00%
		059419-002	Cadmium	0.0455	U	0.0455	0.476			
		059419-003	Cadmium	0.0455	U	0.0455	0.476			
		059419-001	Calcium	2030	B	1.24	9.52	1960	104	5.33%
		059419-002	Calcium	1840	B	1.24	9.52			
		059419-003	Calcium	2010	B	1.24	9.52			
		059419-001	Chromium	0.285	J	0.153	0.476	0.222	0.066	29.82%
		059419-002	Chromium	0.228	J	0.153	0.476			
		059419-003	Chromium	0.153	U	0.153	0.476			
		059419-001	Cobalt	0.076	U	0.076	0.476	0.076	0.000	0.00%
		059419-002	Cobalt	0.076	U	0.076	0.476			
		059419-003	Cobalt	0.076	U	0.076	0.476			
		059419-001	Copper	1.81		0.193	0.476	1.73	0.50	28.97%
		059419-002	Copper	1.19		0.193	0.476			
		059419-003	Copper	2.18		0.193	0.476			
		059419-001	Iron	87.3		1.49	4.76	73.6	18.9	25.70%
		059419-002	Iron	81.4		1.49	4.76			
		059419-003	Iron	52		1.49	4.76			

See notes at end of table.

TABLE C-17. Non-radiological Replicate Results for Calendar Year 2002, Vegetation *(continued)*

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Community *(concluded)*	**11**	059419-001	Lead	0.27	U	0.27	0.476	0.27	0.00	0.00%
		059419-002	Lead	0.27	U	0.27	0.476			
		059419-003	Lead	0.27	U	0.27	0.476			
		059419-001	Magnesium	431		0.557	1.9	462	49	10.63%
		059419-002	Magnesium	437		0.557	1.9			
		059419-003	Magnesium	519		0.557	1.9			
		059419-001	Manganese	59.9		0.125	0.952	112.17	88.20	78.63%
		059419-002	Manganese	62.6		0.125	0.952			
		059419-003	Manganese	214		0.125	0.952			
		059419-001	Mercury	0.00263	J	0.00096	0.0097	0.0033	0.0008	25.98%
		059419-002	Mercury	0.00294	J	0.00093	0.0095			
		059419-003	Mercury	0.00423	J	0.00089	0.009			
		059419-001	Nickel	0.169	J	0.0813	0.476	0.195	0.035	17.90%
		059419-002	Nickel	0.182	J	0.0813	0.476			
		059419-003	Nickel	0.235	J	0.0813	0.476			
		059419-001	Potassium	5890		17	47.6	5910	430	7.28%
		059419-002	Potassium	6350		17	47.6			
		059419-003	Potassium	5490		17	47.6			
		059419-001	Selenium	0.222	J	0.154	0.476	0.260	0.129	49.72%
		059419-002	Selenium	0.154	U	0.154	0.476			
		059419-003	Selenium	0.404	J	0.154	0.476			
		059419-001	Silver	0.0859	U	0.0859	0.476	0.0859	0.0000	0.00%
		059419-002	Silver	0.0859	U	0.0859	0.476			
		059419-003	Silver	0.0859	U	0.0859	0.476			
		059419-001	Sodium	112		3.46	9.52	259	241	93.23%
		059419-002	Sodium	127		3.46	9.52			
		059419-003	Sodium	537		3.46	9.52			
		059419-001	Thallium	0.952	U	0.952	0.952	0.952	0.000	0.00%
		059419-002	Thallium	0.952	U	0.952	0.952			
		059419-003	Thallium	0.952	U	0.952	0.952			
		059419-001	Vanadium	0.16	J	0.0865	0.476	0.1282	0.0377	29.43%
		059419-002	Vanadium	0.138	J	0.0865	0.476			
		059419-003	Vanadium	0.0865	U	0.0865	0.476			
		059419-001	Zinc	5.36		0.16	0.476	5.64	0.54	9.63%
		059419-002	Zinc	5.3		0.16	0.476			
		059419-003	Zinc	6.27		0.16	0.476			

See notes at end of table.

TABLE C-17. Non-radiological Replicate Results for Calendar Year 2002, Vegetation *(continued)*

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**33**	059368-001	Aluminum	352		0.77	4.85	170	158	93.06%
		059368-002	Aluminum	88.2		0.748	4.72			
		059368-003	Aluminum	69.3		0.755	4.76			
		059368-001	Antimony	0.333	U	0.333	0.971	0.328	0.005	1.40%
		059368-002	Antimony	0.324	U	0.324	0.943			
		059368-003	Antimony	0.327	U	0.327	0.952			
		059368-001	Arsenic	0.403	J	0.2	0.485	0.265	0.120	45.10%
		059368-002	Arsenic	0.195	U	0.195	0.472			
		059368-003	Arsenic	0.197	U	0.197	0.476			
		059368-001	Barium	6.77		0.0648	0.485	3.76	2.61	69.34%
		059368-002	Barium	2.3		0.0629	0.472			
		059368-003	Barium	2.21		0.0635	0.476			
		059368-001	Beryllium	0.0485	U	0.0485	0.485	0.0478	0.0007	1.39%
		059368-002	Beryllium	0.0472	U	0.0472	0.472			
		059368-003	Beryllium	0.0476	U	0.0476	0.476			
		059368-001	Cadmium	0.0533	J	0.0464	0.485	0.0488	0.0041	8.31%
		059368-002	Cadmium	0.0475	J	0.0451	0.472			
		059368-003	Cadmium	0.0455	U	0.0455	0.476			
		059368-001	Calcium	4350		1.27	9.71	2487	1614	64.91%
		059368-002	Calcium	1520		1.23	9.43			
		059368-003	Calcium	1590		1.24	9.52			
		059368-001	Chromium	0.579		0.156	0.485	0.363	0.192	52.76%
		059368-002	Chromium	0.296	J	0.152	0.472			
		059368-003	Chromium	0.214	J	0.153	0.476			
		059368-001	Cobalt	0.141	J	0.0775	0.485	0.0974	0.0377	38.73%
		059368-002	Cobalt	0.0753	U	0.0753	0.472			
		059368-003	Cobalt	0.076	U	0.076	0.476			
		059368-001	Copper	1.93		0.197	0.485	1.48	0.39	26.72%
		059368-002	Copper	1.29		0.192	0.472			
		059368-003	Copper	1.21		0.193	0.476			
		059368-001	Iron	348		1.52	4.85	171	154	89.78%
		059368-002	Iron	93.1		1.48	4.72			
		059368-003	Iron	72.1		1.49	4.76			
		059368-001	Lead	0.74		0.275	0.485	0.426	0.272	63.83%
		059368-002	Lead	0.268	U	0.268	0.472			
		059368-003	Lead	0.27	U	0.27	0.476			

See notes at end of table.

TABLE C-17. Non-radiological Replicate Results for Calendar Year 2002, Vegetation *(concluded)*

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	**33**	059368-001	Magnesium	1300		0.568	1.94	973	284	29.14%
		059368-002	Magnesium	830		0.552	1.89			
		059368-003	Magnesium	790		0.557	1.9			
		059368-001	Manganese	26.6		0.127	0.971	20.3	5.5	27.28%
		059368-002	Manganese	16.4		0.123	0.943			
		059368-003	Manganese	17.8		0.125	0.952			
		059368-001	Mercury	0.0189		0.00087	0.0089	0.0117	0.0066	56.13%
		059368-002	Mercury	0.01		0.00087	0.0088			
		059368-003	Mercury	0.00612	J	0.00092	0.0093			
		059368-001	Nickel	0.736		0.0829	0.485	0.449	0.269	59.96%
		059368-002	Nickel	0.409	J	0.0806	0.472			
		059368-003	Nickel	0.202	J	0.0813	0.476			
		059368-001	Potassium	6380		17.4	48.5	6250	217	3.47%
		059368-002	Potassium	6000		16.9	47.2			
		059368-003	Potassium	6370		17	47.6			
		059368-001	Selenium	0.598	B	0.157	0.485	0.437	0.139	31.82%
		059368-002	Selenium	0.357	BJ	0.153	0.472			
		059368-003	Selenium	0.357	BJ	0.154	0.476			
		059368-001	Silver	0.0876	U	0.0876	0.485	0.0862	0.0013	1.48%
		059368-002	Silver	0.0851	U	0.0851	0.472			
		059368-003	Silver	0.0859	U	0.0859	0.476			
		059368-001	Sodium	1960		3.53	9.71	2007	571	28.48%
		059368-002	Sodium	2600		3.43	9.43			
		059368-003	Sodium	1460		3.46	9.52			
		059368-001	Thallium	0.971	U	0.971	0.971	0.955	0.014	1.50%
		059368-002	Thallium	0.943	U	0.943	0.943			
		059368-003	Thallium	0.952	U	0.952	0.952			
		059368-001	Vanadium	0.782		0.0882	0.485	0.395	0.337	85.48%
		059368-002	Vanadium	0.237	J	0.0857	0.472			
		059368-003	Vanadium	0.165	J	0.0865	0.476			
		059368-001	Zinc	12.5	B	0.163	0.485	9.2	2.9	31.96%
		059368-002	Zinc	7.04	B	0.159	0.472			
		059368-003	Zinc	7.94	B	0.16	0.476			

NOTES: B = The analyte was found in the blank above the effective decision level (organics), or the effective detection limit (inorganics).

J = Estimated value, the analyte concentration fell above the effective decision level and below the effective detection limit.

U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result

TABLE C-18. Summary TLD Results for Calendar Year 2002, SNL/NM

Location Class	Number of Locations	Mean Exposure Rate (uR/hour)	Median Exposure Rate (uR/hour)	Std Dev.	Minimum	Maximum
Community	12	10.1	9.6	1.3	8.6	12.3
Perimeter	7	10.1	9.6	1.1	9.2	12.1
On-Site	14	10.1	10.2	0.6	9.3	11.3
Operational	2	12.1	12.1	2.8	10.2	14.1

NOTES: uR = microroentgen (10^{-6} roentgen)

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TABLE C-19. TLD Measurements by Quarter and Location Class for Calendar Year 2002

Location Class	Location Number	1st Quarter (93 Days) Exposure (mR)	Error	2nd Quarter (91 Days) Exposure (mR)	Error	3rd Quarter (105 Days) Exposure (mR)	Error	4th Quarter (91 Days) Exposure (mR)	Error	Exposure Rate uR per hour	Error
Community	10	22.9	3	28.6	1.6	26.2	2	28.9	1	11.7	0.4
	28	19.9	3.4	22.6	2.6	20.7	2.1	22.8	0.7	9.4	0.5
	21	21.7	3.4	24.2	2.5	22.1	2	27.5	1.4	10.5	0.5
	27	22.1	3.2	22.7	1.2	23.5	2	27	0.7	10.4	0.4
	26	25.4	3.8	28.6	0.9	27.3	2	31	0.9	12.3	0.5
	30	26.2	3.1	26.2	2.5	24.4	2	29	0.6	11.6	0.5
	25	20.1	2.9	22.2	1.2	20.2	2	24.2	0.7	9.5	0.4
	24	20	1.9	19.9	2	17.2	2	21.9	0.7	8.7	0.4
	22	20.1	1.2	19.7	3.1	19.4	2.3	24.1	0.7	9.1	0.4
	29	19.4	2.4	19.8	0.7	17	2.2	22.4	0.6	8.6	0.4
	23	21.6	4	23.3	2.6	20.6	2	23.4	0.8	9.7	0.6
	11	19.3	1.8	21.3	1	18.8	2.1	22.9	0.7	9.0	0.3
Perimeter	40	21.4	2.2	17.6	1.9	20.3	0.5	24.6	0.6	9.2	0.3
	39	22.3	2.6	18	2.3	21.3	0.6	24.2	0.6	9.4	0.4
	5	22	3.3	18	3.2	20.5	1.4	25.6	1.1	9.4	0.5
	16	28.3	0.7	23.5	3	27.3	0.7	31.3	0.7	12.1	0.4
	18	23	0.9	19.4	3.5	21.2	0.6	25.3	0.7	9.7	0.4
	4	22.5	3.8	19	2.3	21.4	1.2	24.8	0.6	9.6	0.5
	19	25.2	3.8	21.6	3.7	24.8	0.8	28.3	1.3	11.0	0.6
	81	24.5	4.5	20.2	1.3	22.4	0.9	26.3	0.9	9.2	0.3

See notes at end of table.

TABLE C-19. TLD Measurements by Quarter and Location Class for Calendar Year, 2002 *(concluded)*

Location Class	Location Number	1st Quarter (93 Days) Exposure (mR)	Error	2nd Quarter (91 Days) Exposure (mR)	Error	3rd Quarter (105 Days) Exposure (mR)	Error	4th Quarter (91 Days) Exposure (mR)	Error	Average Exposure Rate uR per hour	Error
On-Site	31	21.1	4.1	18.6	2.6	20.5	1	26.3	0.6	10.2	0.5
	46	23.2	2.7	20	2.3	22.6	0.8	27.6	0.7	9.5	0.5
	6	23.2	2.3	19.2	1.3	21.5	0.6	25.3	0.9	10.2	0.4
	2NW	21.4	2.6	18.7	1.8	21	0.7	24.3	0.7	9.8	0.3
	20	24.3	3.7	21.7	2.8	23.7	0.5	28.9	0.9	9.4	0.4
	41	22.4	3.2	20.2	1.7	21.2	0.8	25	0.6	10.8	0.5
	42	21.3	2.9	18.1	2.8	20.6	1	25.1	0.6	9.7	0.4
	43	23.1	4.3	18.9	2.2	20.9	1.9	24.8	0.9	9.3	0.5
	3	24.7	4	19.3	1.7	21.9	1.5	26.2	0.5	9.6	0.6
	7	24.5	3.4	21.4	1.5	23.5	1.1	27.6	0.9	10.1	0.5
	47	25.1	3.4	20.4	2.6	22.5	0.6	27.2	1.1	10.6	0.4
	48	25.6	3	23.1	2.5	23.5	0.9	31.1	0.5	10.4	0.5
	1	24.5	1.2	20.9	1.7	23.1	1.1	27	0.8	11.3	0.4
	66	24.5	2.8	19.3	1.8	22.8	0.7	26	0.7	10.5	0.3
Operational	45	37.9	4.7	27.1	2.1	30.8	1	33.1	0.5	10.2	0.4
	45E	23	3.1	19.2	3.1	22.6	1.4	26.9	1.7	14.1	0.6

NOTES: mR = Milliroentgen (10^{-3} roentgen); uR = microroentgen (10^{-6} roentgen)

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