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Annual Site Environmental Report for Sandia National Laboratories, New Mexico

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Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185

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ABSTRACT

Sandia National Laboratories, New Mexico (SNL/NM) is a government-owned, contractor-operated facility owned by the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) and managed by 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, 2004. 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 450.1, *Environmental Protection Program* (DOE 2005) and DOE Order 231.1A, *Environment, Safety, and Health Reporting* (DOE 2004a).

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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.

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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NOTE: Appendices are either located after Chapter 9 or on a CD that is affixed to the back cover of this document.

FIGURES

TABLES

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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
	AFSEC	Albuquerque Full-Scale Experimental Complex
	AHCF	Auxiliary Hot Cell Facility
	AIRFA	American Indian Religious Freedom Act
	ALARA	as low as reasonably achievable
	AMPL	Advanced Manufacturing Process Laboratory
	ANG	Air National Guard
	ANOVA	Analysis of Variance
	APPDL	Advanced Pulse Power Development
	AQC	Air Quality Compliance
	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	C&D	Construction and Demolition
	CAA	Clean Air Act
	CAAA	Clean Air Act Amendments
	CAMU	Corrective Action Management Unit
	CAN	Clean Air Network
	CAP	Consolidated Audit Program
	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
	CIS	Chemical Inventory System
	CMS	Corrective Measures Study
	COA	City of Albuquerque
	COC	Contaminants of Concern
	COD	Chemical Oxygen Demand
	COOC	Compliance Order on Consent
	CPMS	Criteria Pollutant Monitoring Station
	CRIO	Community Resources Information Office
	CSRL	Compound Semi-Conductor Research Laboratory
	CSS	Sanitary Sewer Line
	CUB	Central Utility Building
	CWA	Clean Water Act
	CWL	Chemical Waste Landfill
	CWP	corporate work process
	CY	Calendar Year
D	D&D	decontamination and demolition
	DCG	derived concentration guide
	DoD	U.S. Department of Defense
	DOE	U.S. Department of Energy

	DQO	data quality objective
	DSS	Drain and Septic Systems
	DSSI	Diversified Scientific Services, Inc.
E	EA	Environmental Assessment
	ECF	Explosive Components Facility
	EDE	effective dose equivalent
	EDP	Experiment Development Plan
	EEANM	Environmental Education Association of New Mexico
	EID	Environmental Information Document
	EIS	Environmental Impact Statement
	EM	Environmental Management
	EMS	Environmental Management System
	EO	Executive Order
	EPA	U.S. Environmental Protection Agency
	EPCRA	Emergency Planning and Community Right-to-Know Act
	EPP	Environmentally Preferable Purchasing
	ER	Environmental Restoration
	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
	FCS	Facilities Control System
	FSID	Facilities and Safety Information Document
	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
	HE	high explosives
	HERMES-III	High Energy Radiation Megavolt Electron Source-III
	HLW	high-level radioactive waste
	HSWA	Hazardous and Solid Waste Amendments
	HWB	Hazardous Waste Bureau
	HWMF	Hazardous Waste Management Facility
I	IC	Incident Command
	ICM	Interim Corrective Measure
	IES	Integrated Enabling Service
	ILMS	Integrated Laboratory Management System
	IRP	Installation Restoration Program
	ISMS	Integrated Safety Management System
J	JCEL	Joint Computational Engineering Laboratory
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
	LLRI	Lovelace Respiratory Research Institute
	LLW	low-level waste
	LTES	Long-Term Environmental Stewardship
	LTTD	Low-Temperature Thermal Desorption
	LWDS	Liquid Waste Disposal System
M	M&O	Maintenance and Operation
	MAC	maximum allowable concentration
	MAPEP	Mixed Analyte Performance Evaluation Program
	MBTA	Migratory Bird Treaty Act
	MCL	maximum contaminant level
	MDA	minimum detectable activity
	MDL	minimum detection limit
	MDL	Microelectronics Development Laboratory
	MEI	maximally exposed individual
	MESA	Microsystems and Engineering Sciences Application
	MIPP	Medical Isotope Production Project
	MLLW	mixed low-level waste
	MNA	monitored natural attenuation
	MOC	Management and Operating Contract
	MP	monitoring point
	MSB	Manzano storage bunkers
	MSDS	Material Safety Data Sheet
	MW	mixed waste
	MWL	Mixed Waste Landfill
N	N/A	not available or not applicable
	NAAQS	National Ambient Air Quality Standards
	ND	not detected
	NELAP	National Environmental Laboratory Accreditation Program
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants
	NFA	No Further Action
	NGF	Neutron Generator Facility
	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
	NOV	Notice of Violation
	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
	NWS	National Weather Service
O	OA	Office of Independent Oversight and Performance Assurance
	ODS	Ozone-depleting substance
	ORPS	Occurrence Reporting Processing System

P

P2	Pollution Prevention
PA/SI	Preliminary Assessment/Site Inspection
PCB	polychlorinated biphenyl
PCCP/PA	Post-Closure Care Plan/Permit Application
PEP	Performance Evaluation Plan
PER	Performance Evaluation Report
PETL	Processing and Environmental Technology Laboratory
pH	potential of Hydrogen
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
QSAS	Quality Systems Analytical Services

R

RAP	Remedial Action Proposal
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
RMWMF	Radioactive and Mixed Waste Management Facility
ROD	Record of Decision
RPSD	Radiation Protection Sample Diagnostics
RQ	reportable quantity
RRL	Rio Rancho Landfill

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
SSO	Sandia Site Operations
ST	stabilization treatment
START	Sandia Tomography and Radionuclide Transport Laboratory
STP	Site Treatment Plan
SUWCO	Sewer Use and Wastewater Control Ordinance
SVOC	Semi Volatile Organic Compound
SWEIS	Site-Wide Environmental Impact Statement

X

	SWMP	Storm Water Monitoring Point
	SWMU	Solid Waste Management Unit
	SWP3	Storm Water Pollution Prevention Plan
	SWTF	Solid Waste Transfer Facility
T	TA	Technical Area
	TAG	Tijeras Arroyo Groundwater
	TAL	Target Analyte List
	TCE	trichloroethylene
	TCLP	toxicity characteristic leaching procedure
	TDS	total dissolved solids
	TESLA	Tera-Electron Volt Energy Superconducting Linear Accelerator
	TLD	thermoluminescent dosimeter
	TLV	threshold limit value
	TNMHC	total non-methane hydrocarbon
	TOC	Total Organic Carbon
	TOMP	Toxic Organic Management Plans
	TOP	Technology and Operations Prototype
	TOX	total halogenated organics
	TPH	Total extractable petroleum hydrocarbons
	TRI	Toxic Release Inventory
	TRU	transuranic (radioactive waste)
	TSCA	Toxic Substances Control Act
	TSD	treatment, storage, and disposal
	TSS	total suspended solids
	TTF	Thermal Treatment Facility
	TTR	Tonopah Test Range
	TU	Temporary Unit
U	UAW	unaccounted for water
	UNM	University of New Mexico
	USAF	U.S. Air Force
	USFS	U.S. Forest Service
	USGBC	U.S Green Building Council
	USGS	U.S. Geological Survey
	UST	underground storage tank
V	VCA	Voluntary Corrective Action
	VCM	Voluntary Corrective Measure
	VOC	volatile organic compound
	VSA	Vertical Sensor Array
	VZMS	Vadose Zone Monitoring System
W	WERC	a consortium for environmental education and technology development established through a cooperative agreement with DOE
	WFO	work for others
	WIPP	Waste Isolation Pilot Plant
	WQG	Water Quality Group

UNITS OF MEASURE

°C	degree centigrade
cm	centimeter
°F	degrees Fahrenheit
fasl	feet above sea level
ft	feet
g	gram
gal	gallon
gpcd	gallons per capita per day
kg	kilogram
km	kilometer
kW	kilowatt
L	liter
lb	pound
mb	millibar
m/s	miles per second
mg	milligram
mph	miles per hour
ppbv	parts per billion by volume
ppm	parts per million
scf	standard cubic feet
tpy	tons per year
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
µR/hr	microroentgen per hour	Std Dev	standard deviation

CHEMICAL ABBREVIATIONS

Ag	Silver	Mn	Manganese
Al	Aluminum	NaCl	sodium chloride
As	Arsenic	Ni	Nickel
Ba	Barium	NO_2	nitrogen dioxide
Be	Beryllium	NO_x	nitrogen oxides
Cd	Cadmium	O_3	ozone
Cr	Chromium	Pb	Lead
Co	Cobalt	Sb	Antimony
Cu	Copper	Se	Selenium
Fe	Iron	SO_2	sulfur dioxide
CO	carbon monoxide	TCA	trichloroethane
Eh	redox	TCE	trichloroethylene
H^3	tritium	Tl	Thallium
Hg	Mercury	U_{tot}	total uranium
${}_1H^1$	hydrogen	V	Vanadium
HCl	hydrochloric acid	Zn	Zinc
K	Potassium	1,1,1,-TCA	1,1,1,-trichloroethane
Mg	Magnesium		

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)

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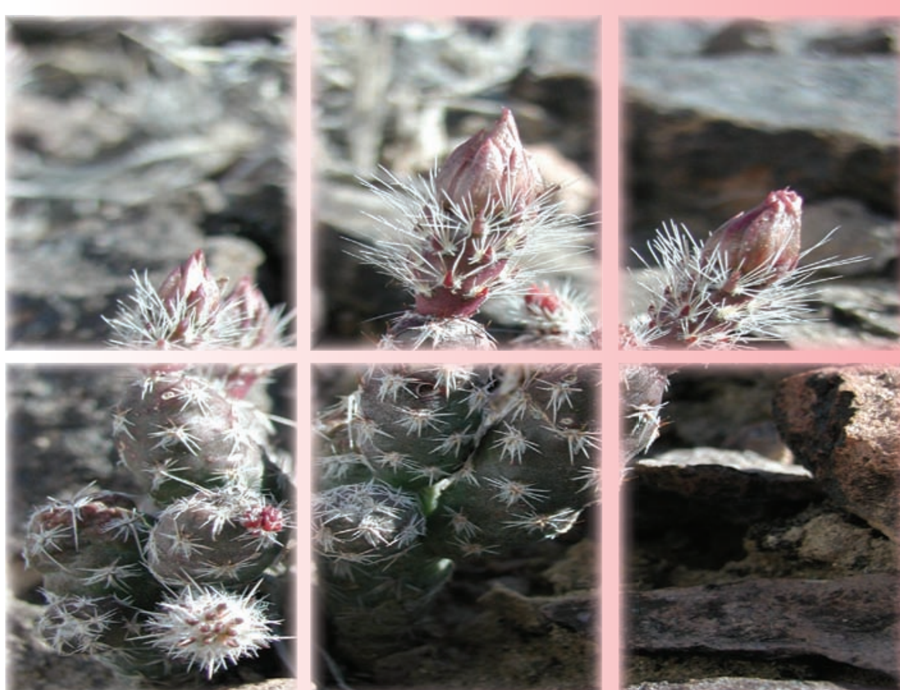
EXECUTIVE SUMMARY

Included are summaries of the following Environmental Programs:

Waste Management and Pollution Prevention (P2)
Environmental Restoration (ER) Project
Terrestrial Surveillance
Water Quality
Groundwater Protection
Air Quality
National Environmental Policy Act (NEPA) Activities



Dwarf Cholla

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 operated by Sandia Corporation, owned by the DOE/NNSA, and managed by the Sandia Site Office (SSO). This Annual Site Environmental Report (ASER) was prepared in accordance with and as required by DOE Order 450.1, *Environmental Protection Program* (DOE 2005) and DOE Order 231.1A, *Environment, Safety, and Health Reporting* (DOE 2004).

This ASER summarizes environmental protection, restoration, and monitoring programs in place at SNL/NM for Calendar Year (CY) 2004. 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 Safety Management System (ISMS). The ISMS program is structured around five safety management functions and provides the processes to assist line management in identifying and controlling hazards. Sandia Corporation is implementing an Environmental Management System (EMS) as an enhancement of the ISMS. The EMS is that part of the ISMS that addresses environmental consequences of SNL/NM's activities, products, and services. In 2004, SNL/NM continued to work to improve environmental management (EM) based on best management practices (BMPs), bench marking, and process improvements. Further information about ISMS can be found in Chapter 8.

All 2004 program activities are performed continuously, but reported in this ASER on a CY basis, unless otherwise noted (programs based on the Fiscal Year (FY) run from October 1st through September 30th annually). The primary environmental programs in place at SNL/NM are summarized below.

Waste Management and Pollution Prevention (P2)

Waste at SNL/NM is processed at five facilities: the Hazardous Waste Management Facility (HWMF), the Thermal Treatment Facility (TTF), the Radioactive and Mixed Waste Management Facility (RMWMF), the Manzano Storage Bunkers (MSB), and the Solid Waste Transfer Facility (SWTF). 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. In 2004, SNL/NM received several awards for P2 accomplishments.

Environmental Restoration (ER) Project and Long-term Environmental Stewardship (LTES)

At the close of 2004, there were 126 regulated ER sites remaining to be addressed and three sites were being actively remediated at SNL/NM. In 2004, 41 sites were proposed for No Further Action (NFA). LTES at SNL/NM is defined as activities necessary to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites, including currently active sites. LTES activities have been increasing as the ER Project completion date of 2006 approaches. The ER Project is focusing on project closure, while also working with the SNL/NM EM Department on transitioning LTES activities to EM.

Terrestrial Surveillance

Soil, sediment, and vegetation are collected from on-site, perimeter, and off-site (community locations outside Kirtland Air Force Base [KAFB] boundaries) locations. The terrestrial surveillance sampling objectives are to detect any potential releases or migration of contaminated material to off-site locations. In 2004, there were no terrestrial sample results that indicated concern that would trigger actions at locations that are not already being addressed by the ER Project.

Water Quality

- ***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). All SNL/NM effluent discharge standards were within the City of Albuquerque's Sewer Use and Wastewater Control Ordinance (SUWCO) established limits during 2004. For the first time, SNL/NM received the City of Albuquerque Award of Excellence for the 2003-2004 City of Albuquerque pre-treatment year in 2004.

- ***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 seven requests made for individual discharges to the ground surface in 2004. In 2004, all requests met the New Mexico Environment Department (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. All permit requirements for both lagoons were met in 2004. In 2004, there were six reportable surface releases reported to NMED. There was no discernible impact to the environment due to any of these surface discharges.

- ***Storm Water Runoff*** – In FY 2004, analytical monitoring was required under SNL/NM's National Pollutant Discharge Elimination System (NPDES) Multi-General Permit for Storm Water Discharges Associated with Industrial Activities (Multi-Sector General). This NPDES permit requires quarterly analytical sampling be conducted in the second and fourth year of the five year permit, weather permitting. FY 2004 is the fourth year of the permit. The permit also requires visual observations be performed every quarter. No visual observations were collected for the 4th quarter of FY 2004 due to the lack of adequate runoff. For samples collected during the 1st, 2nd and 3rd quarters of FY 2004, no unusual characteristics were noted. The permit is due for renewal in FY 2005.

- ***Oil Storage and Spill Control*** – A Spill Prevention Control and Countermeasures (SPCC) Plan is required under the Clean Water Act (CWA). Sandia Corporation's SPCC Plan describes oil storage facilities and the mitigation controls in place to prevent inadvertent discharges of oil. Facilities at SNL/NM subject to the regulations include oil storage tanks (underground storage tanks (USTs) and above ground storage tanks [ASTs]), bulk storage areas (multiple containers), and temporary or portable tanks.

Groundwater Protection

- ***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 14 wells and one spring in FY 2004. 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. All of the exceedences are attributed to naturally occurring sources.

- ***ER*** – The ER Project collects groundwater samples at six general project areas: the Chemical Waste Landfill (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 six locations throughout SNL/NM and compares results with National Ambient Air Quality Standards (NAAQS) and local ambient air standards. The network monitors criteria pollutants and VOCs. There were no gaseous pollutant exceedances in 2004.

- ***Air Quality Compliance –*** Air quality standards are implemented by regulations promulgated by local and federal governments in accordance with the Clean Air Act (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 U.S. Environmental Protection Agency (EPA) determine applicable air quality standards for non-radiological pollutants.

- ***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 2004, there were 15 SNL/NM facilities reporting NESHAP-regulated emissions. Of these 15 sources, 14 were point sources and one was a diffuse source. In 2004, 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 0.0010 millirem per year (mrem/yr). The off-site MEI received an EDE of 0.00045 mrem/yr. Both doses are well below the EPA standard of 10 mrem/yr.

National Environmental Policy Act (NEPA) Activities

In 2004, the NEPA Team complied 2003 data for use in updating the SNL/NM Environmental Information Document (EID) and the SNL/NM Facilities and Safety Information Document (FSID). The EID provides comprehensive baseline data to support an assessment of changes to the existing environment at SNL/NM. The FSID summarizes changes at major SNL/NM facilities since publication of the SNL/NM SWEIS in December 1999. In 2004, SNL/NM transmitted 74 NEPA checklists to DOE/NNSA/SSO for review and determination.

chapter one

INTRODUCTION

In This Chapter ...

Environmental Snapshot

Kirtland Air Force Base (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) located at the foot of the Manzanita Mountains, with a mean elevation of 5,384 feet and a maximum of 7,986 feet.

Cholla Cactus

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 owned by the DOE/NNSA and managed by the Sandia Site Office (SSO).

SNL/NM is located on 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. 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).

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 USFS (Figure 1-1) located at the foot of the Manzanita Mountains, with a mean elevation of 5,384 feet and a maximum of 7,986 feet. 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 8,585 acres. Of these, Sandia Corporation conducts its operations within 2,841 acres. An additional 5,648 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 Isleta Pueblo 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 directives that establish specific requirements for environmental programs. There are six primary DOE directives currently on the contract baseline that pertain to the environmental protection and management:

- DOE Order 231.1A, *Environment, Safety, and Health Reporting* (DOE 2004a);
- DOE Order 231.1-2, *Occurrence Reporting and Processing of Operations Information* (DOE 2003a);
- DOE Order 435.1, Chg 1, *Radioactive Waste Management* (DOE 2001);
- DOE Order 450.1, *Environmental Protection Program* (DOE 2005);
- DOE Order 5400.5, Chg 2, *Radiation Protection of the Public and the Environment* (DOE 1993a); and
- SEN-22-90, *DOE Policy on Signatures of RCRA Permit Applications* (DOE 1990).

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.

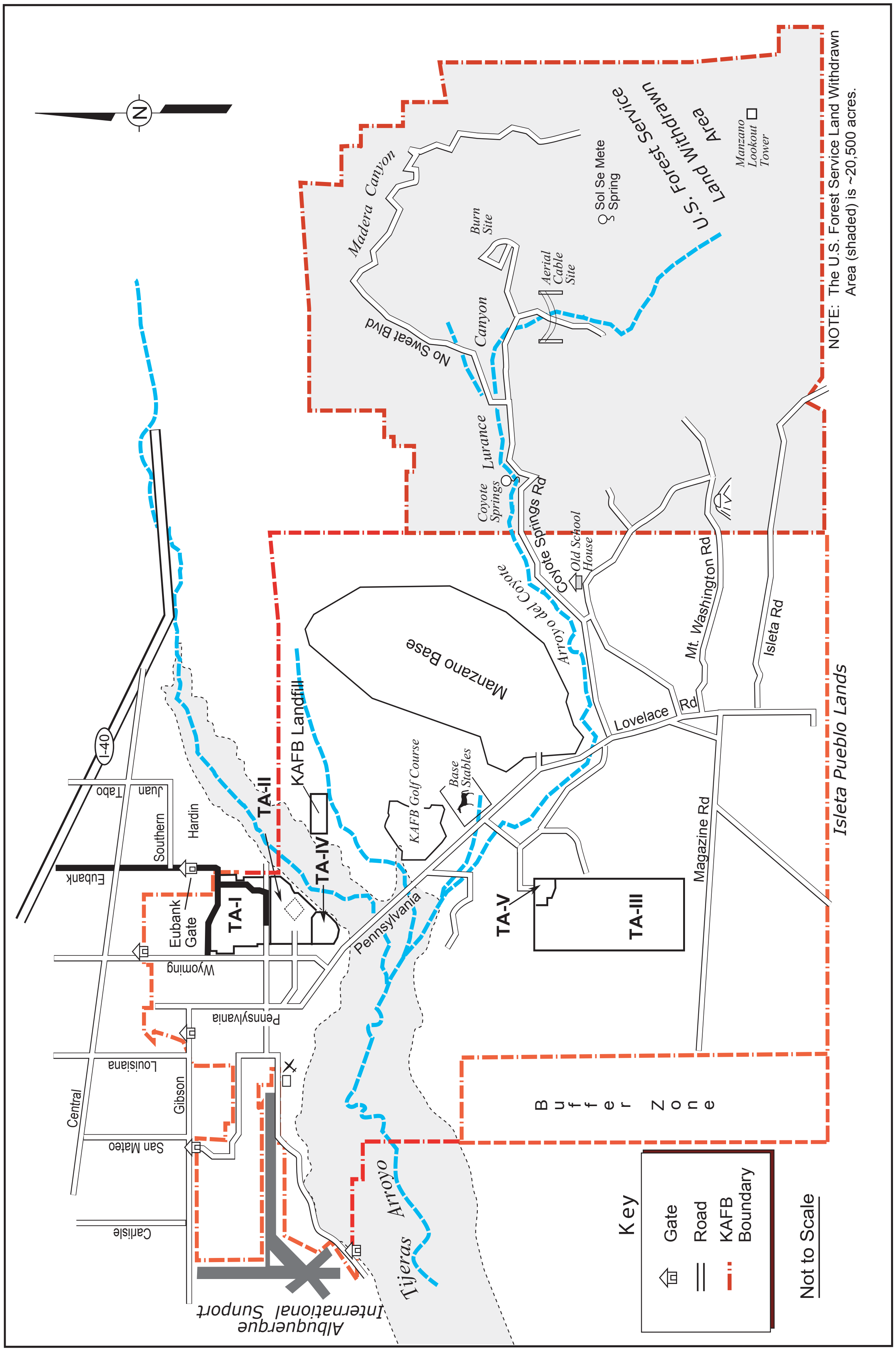


FIGURE 1-1. SNL/NM Technical Areas and the U.S. Forest Service Land Withdrawn Area

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

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 as well as the long-term environmental stewardship (LTES) website:

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

http://www.sandia.gov/ltes/

A History of Progress

Sandia Corporation has made tremendous progress in building a comprehensive ES&H Program. The ES&H Manual (SNL 2005), 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. Several audits have been 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. The results of these audits, as well as SNL/NM internal audits support the commitment of SNL/NM in the area of ES&H.

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.

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.

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, the 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, and various laboratories such as the Advanced Manufacturing Processes Laboratory (AMPL), the Microelectronics Development Laboratory (MDL), the Neutron Generator Production Facility (NGPF), the Processing and Environmental Technology Laboratory (PETL), and the Joint Computational Engineering Laboratory (JCEL). The Microsystems and Engineering Sciences Applications (MESA) Complex is currently under construction, with an expected completion by mid-2006, and full operational capabilities in place by the end of 2007.

Technical Area II (TA-II)
TA-II now includes the original, diamond-shaped compound south of TA-I and several facilities south of Hardin Blvd. TA-II stretches to the boundary of TA-IV and includes the Explosive Components Facility (ECF), the Hazardous Waste Management Facility (HWMF), the Facilities Command Center, the Solid Waste Transfer Facility (SWTF), and the Construction Recycling Facility.

Technical Area III (TA-III)
TA-III is the largest and most remote area of all the TAs, and is characterized by 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 (to be replaced by the Thermal Test Complex, under construction in 2005). Other facilities include the Radioactive and Mixed Waste Management Facility (RMWMF), the Mixed Waste Landfill (MWL), the Corrective Action Management Unit (CAMU), and the Large Melt Facility.

Technical Area IV (TA-IV)
TA-IV is located south of TA-II and houses facilities used to conduct R&D activities in inertial-confinement fusion, pulsed power, and nuclear particle acceleration. Accelerators located in TA-IV include the Z Accelerator, the Advanced Pulsed-Power Development Laboratory (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 I (RHEPP I) Accelerator, the High Power Microwave Laboratory, and the Short-Pulse High Intensity Nanosecond X-Radiator (SPHINX).

Technical Area V (TA-V)
TA-V, located adjacent to the northeast corner of TA-III, includes facilities that routinely handle radioactive materials used in experimental research and defense programs. TA-V houses the Sandia Pulsed Reactor (SPR), the Gamma Irradiation Facility (GIF), the Annular Core Research Reactor (ACRR), the Hot Cell Facility (HCF), and the Auxiliary Hot Cell Facility (AHCF), which has not yet entered operational status.

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.

Facilities Outside KAFB Boundaries
Facilities that are or will be utilized by SNL/NM personnel, but are outside the boundaries of KAFB, include the Center for Integrated Nanotechnologies (CINT) presently under construction, with full operational activities expected by May 2007; the MESA Technology and Operations Prototype (TOP), and the International Programs Building. All are located in the Sandia Science and Technology Park along Eubank Boulevard.

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-mile long escarpment distinguished by steep cliffs, pinnacles, and narrow canyons. Sandia Crest at 10,678 feet 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 feet wide and 108 feet 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 about eight miles from the KAFB west boundary.

Today, water from the Rio Grande is primarily used for agricultural irrigation. Construction is currently underway to build a water treatment plant 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 square miles in area and a total population of approximately 1.5 million. A recent count of the population within an 80-kilometer (50-mile) radius of SNL/NM was 854,211 residents (DOC 2005). The Albuquerque metropolitan area alone has approximately 723,296 residents (DOC 2005). 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 miles 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 miles wide and 100 miles long and 3,000 square miles in area (Grant 1982). 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 feet deep. On the west side of the Tijeras fault complex within the basin, groundwater levels occur from 295 to 492 feet below the surface.

A shallow groundwater system (SGWS) overlies the regional system in the north portion of KAFB. The SGWS extends southward from TA-I 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 feet below ground level in the western part and 420 feet to groundwater in the east.

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

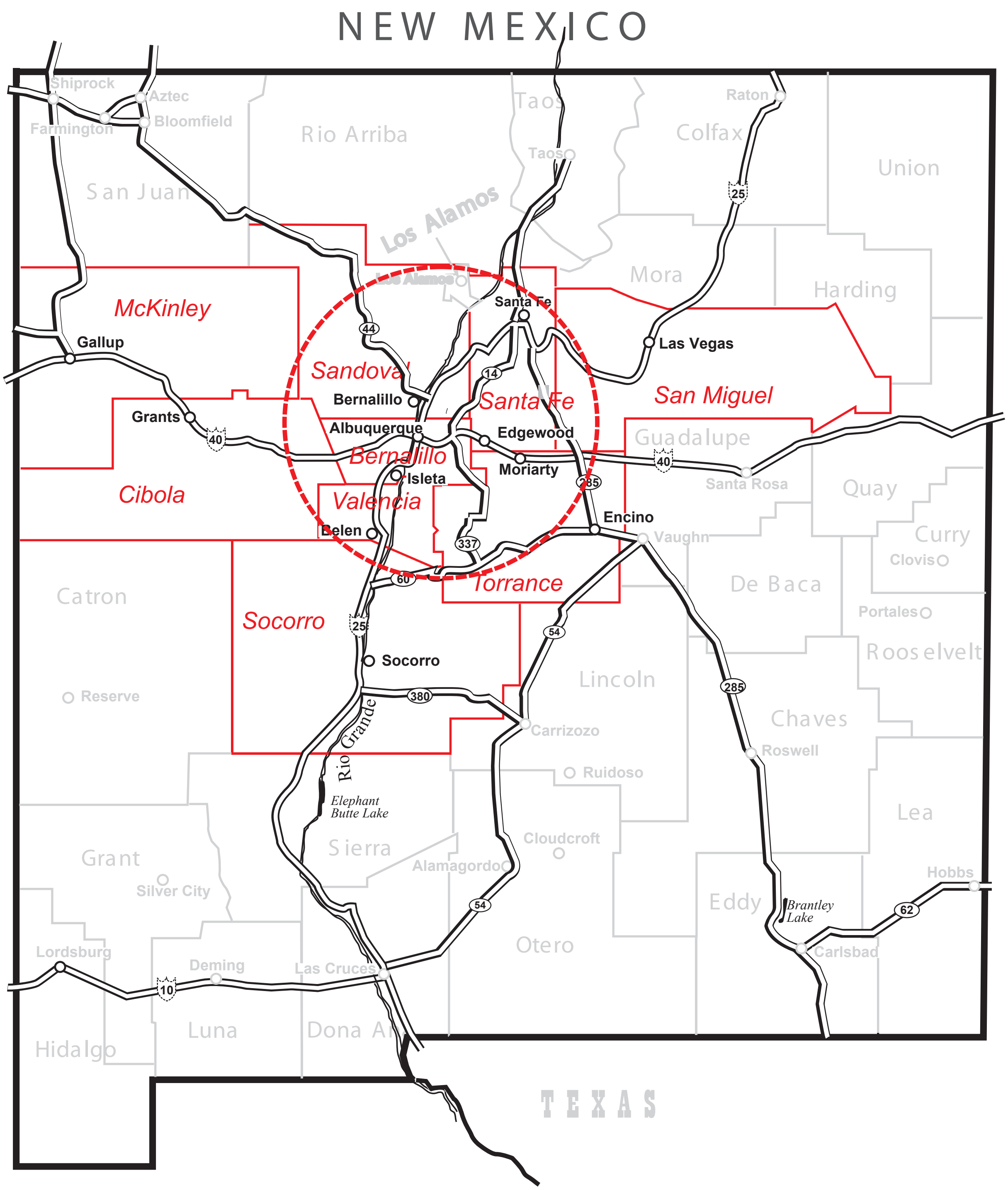


FIGURE 1-2. State of New Mexico Map
The overlay shows major roads, cities, county lines, and the 50-mi radius from SNL/NM facilities (dashed circle).

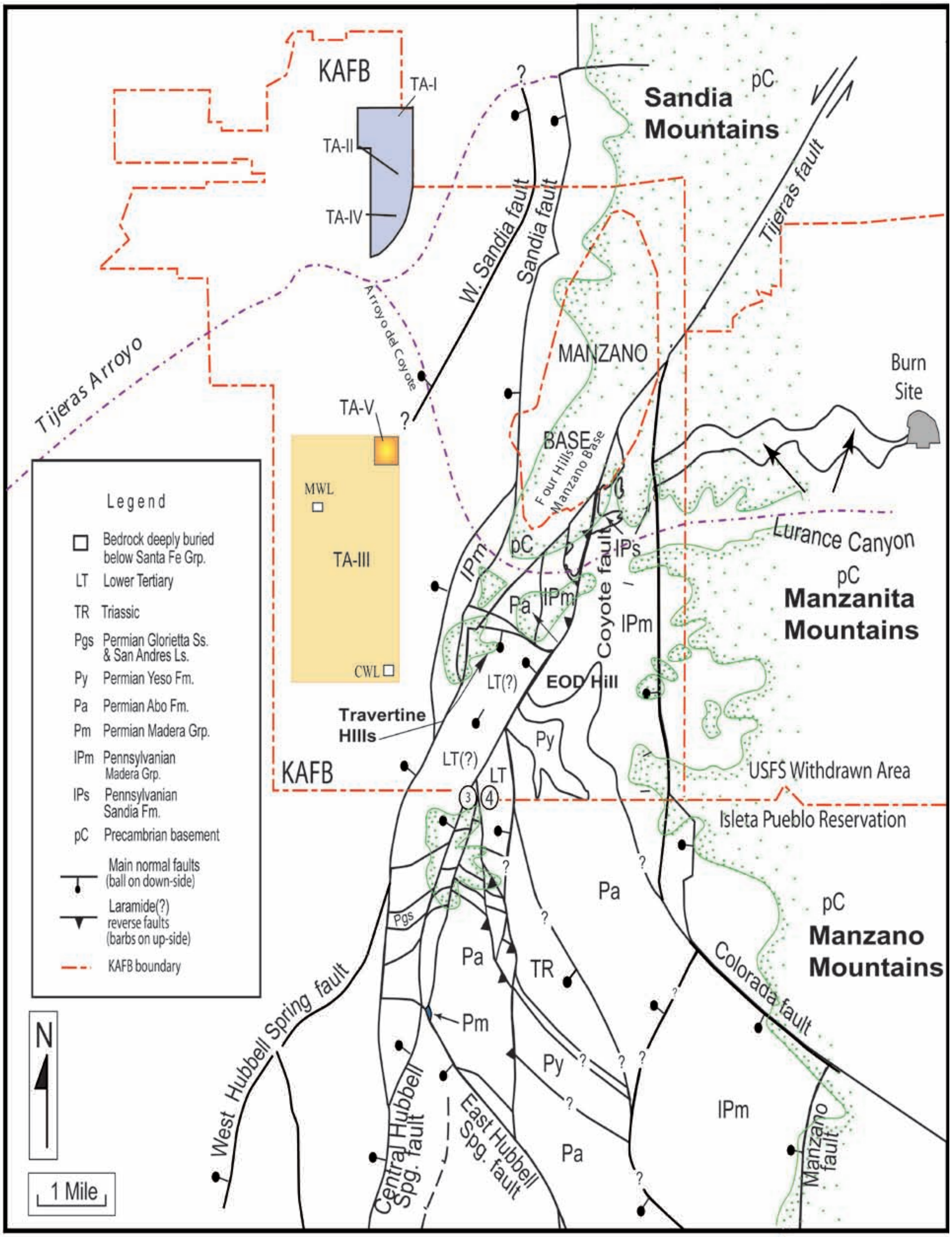


FIGURE 1-3. Generalized Geology in the Vicinity of SNL/KAFB

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 feet (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

Large diurnal temperature ranges, summer monsoons, and frequent drying winds are characteristic of the regional climate in the Albuquerque Basin and Sandia and Manzano Mountains.

Temperatures are typical of mid-latitude dry continental climates with summer high temperatures in the basin in the 90s F and winter high temperatures around 50 F. Daily low temperatures range from around 60s in the summer to the low 20s in the winter. The dry continental climate also produces low average humidities in the late spring and summer prior to the onset of the monsoon season. Daytime relative humidities can be between 10 and 20% in the spring and early summer, with an average humidity near 30%. Average winter relative humidities are in the 50s.

Precipitation varies across the region with many locations in the higher elevations of the mountains receiving twice the annual rainfall of locations in the Albuquerque Basin. Most precipitation falls between July and October, and mainly in the form of brief heavy rain showers. Average annual precipitation based on 10 years of data collected between 1995 and 2004 is around 8.5 inches at SNL/NM with 10.9 inches in the lower foothills. Annual precipitation recorded at the National Weather Service (NWS) cooperative stations in mountain elevations varies between 10 and 23 inches. The winter season in the Albuquerque Basin and around SNL/NM is generally dry with an average of less than 1.5 inches of precipitation falling between December and February.

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 an upslope-downslope diurnal pattern to wind flows. Winds tend to blow toward the mountains or up the Rio Grande Valley 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 miles per hour. Wind gusts can commonly reach 50 miles per hour.

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 1999a). 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

Are we in a Drought?

Droughts can be defined according to meteorological, agricultural, or hydrological criteria, but no matter what criteria is used, drought is an extended period of deficient rainfall relative to a statistical mean. When areas are in an agricultural drought, the insufficient moisture causes adverse effects on vegetation. Hydrological drought produces critically low water tables and reduced stream flows.

Precipitation, the lifeblood of our semi-arid climate, can vary drastically from year to year. Most folks are familiar with how years of deficit rainfall can effect how and where people live in the great Southwest. Our part of the Southwest enjoyed ample rainfall, actually, above average rainfall for the 30 years between 1971 and 2000, but that all changed in 2000. Are we returning to more normal conditions, or are we experiencing something new to our area? Here is a sample of some of the rainfall averages for different time periods based on National Weather Service (NWS) data from the Albuquerque airport. As can be seen from this table, the most recent 30 year climatic average is almost 1 inch above the average of all data, and almost 2.5 inches over a 15 year period in the 40s and 50s.

Time Period	Average Rain (inches)
All years (82)	8.57
1971-2000	9.47
1941-1970	7.73
1942-1956	7.00

Here is the most recent five years of precipitation data collected at SNL/NM for two locations, with one in the foothills, and compared to the NWS. As can be seen from the table, the foothills location generally gets about 2 more inches of rainfall than the lower location at SNL/NM. While this is only a 5 year indication, the average looks like it is tending to the conditions experienced in the 30 year period of the 1940s through 1970. The scarce precipitation that occurred between 2000 and 2003 effected environmental sampling in a number of ways. Meager precipitation does not support vegetation growth or re-growth, and fewer rain events and smaller amounts of rain do not create good storm water sampling conditions. In addition, without the support of vegetation, more soil can be picked up and carried by strong winds, potentially effecting particulate matter concentrations.

Year	Tower A36 (inches)	Tower SC1 (inches)	NWS (inches)
2000	7.6	10.62	8.23
2001	6.42	8.78	6.5
2002	5.89	7.86	6.39
2003	6.51	7.63	6.35
2004	10.69	12.66	11.6
Average	7.42	9.51	7.81

What is the answer to the question about what we are experiencing; something new or something like the normal experienced from 1941 through 1970? Only time will tell…

Water Conservation in Albuquerque and at & SNL/NM

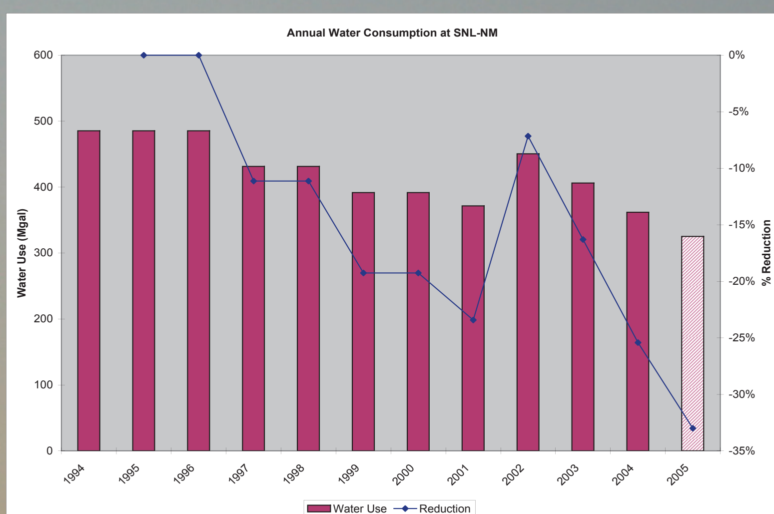
The future of Albuquerque depends greatly upon the availability of water for the generations to come. Water conservation is one of the surest, cheapest ways that Albuquerqueans can ensure that future.

Mayor Martin Chavez announced the City's new water conservation goal is to reduce our water usage by 40% by 2014.

In 1994, Mayor Martin Chavez and the Albuquerque City Council called for a 30% reduction in water use in ten years. The response by City water customers has been extraordinary, with per person usage dropping from 250 gallons per capita per day (gpcd) when the program began in 1995, to 193 by the end of 2003. When unaccounted for water (UAW) is deducted, usage actually drops to 175 gpcd. Per account analysis in 2003 shows a reduction of 28% compared to the baseline use in 1995.

Residential customers, who represent nearly 70% of all water use, have reduced their usage by 32% since the program began. Institutional customers, whose numbers are much smaller, have achieved similar results. Commercial and industrial customers are being urged to respond accordingly.

SNL/NM is conscious of water conservation as well. The graph below shows SNL/NM's water use and reduction over the last 10 years.



Information provided by cabq.gov and SNL/NM's Porcelain Press 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 of KAFB lands fall within this zone.

TABLE 1-1. 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*

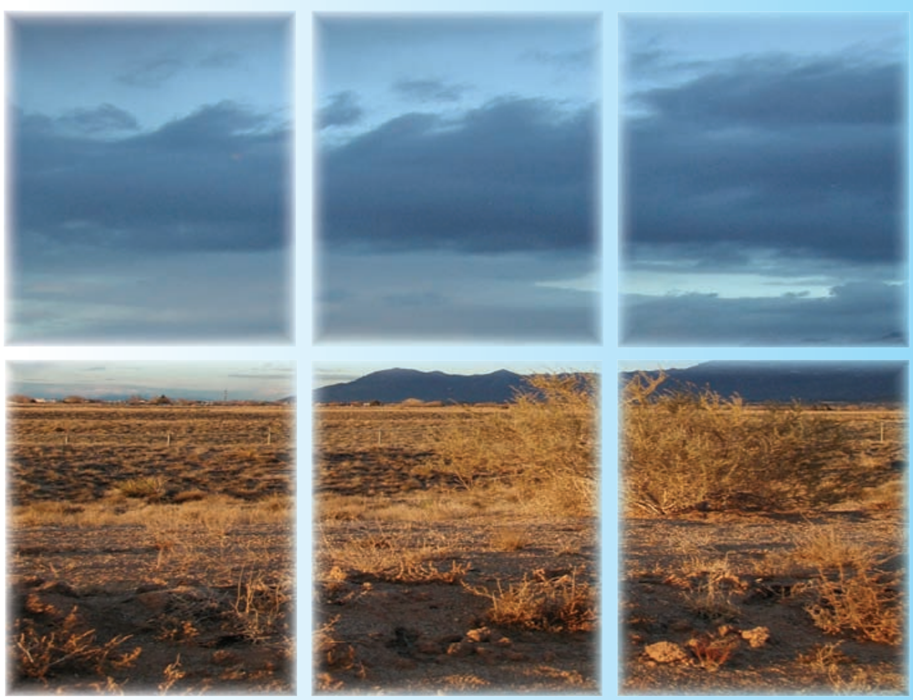
chapter two

COMPLIANCE SUMMARY

<u>In This Chapter ...</u>

Environmental Snapshot

The Federal Facility Compliance Act (FFCA) requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste.



View of Mountains from Sandia National Laboratories

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.

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) are listed in Chapter 9.

Compliance Order on Consent (COOC)
A COOC was agreed to by the New Mexico Environment Department (NMED) and DOE/SNL/NM in 2004. The COOC provides corrective action requirements and establishes schedules and deliverables. The COOC is mandated under the New Mexico Hazardous Waste Act and New Mexico Solid Waste Act.

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 Superfund Amendments, and Reauthorization Act (SARA), in 2004 (Table 2-6 and Section 6.2.2). 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.

Information on EPCRA can be found at the following U.S. Environmental Protection Agency (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.

TABLE 2-1. 2004 SARA Title III (or EPCRA) Reporting Requirements Applicable to SNL/NM

Section	SARA Title III Section Title	Requires Reporting? Yes	No	Description
302 - 303	Emergency Planning	✓		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 extremely hazardous substance, or as defined under CERCLA, occurred in 2004.
311-312	Hazardous Chemical Storage Reporting Requirements	✓		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 extremely hazardous substances 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 was below the reporting threshold in 2004 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
TRI = Toxic Release Inventory
EPA = U.S. Environmental Protection Agency
SSO = Sandia Site Office
lbs = pounds
DOE = U.S. Department of Energy
NNSA = National Nuclear Security Administration
SNL/NM = Sandia National Laboratories, New Mexico
CFR = Code of Federal Regulations
SARA = Superfund Amendments and Reauthorization Act
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
EPCRA = Emergency Planning and Community Right-to-Know Act

Each year, nearly 23,000 facilities report to EPA under the TRI Program. The proposed TRI Reporting Forms Modification Rule (1674 Federal Register/Vol. 70, No.6/ Monday, January 10, 2005) seeks comment on eliminating certain information from the reports, simplifying other reporting data, and in some cases, reducing duplicate data collection efforts. The options being proposed reduce the cost of compiling and submitting TRI reports, while maintaining the quality and practical utility of the TRI data. Over the next year, EPA anticipates proposing two rules to simplify TRI reporting requirements; this is the first. Comments on the proposed rule are due to EPA by March 11, 2005.

In 2004, 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 2004* (SNL/Outrider Corporation 2005), which lists all purchases of chemicals (even though the quantities are below the threshold quantities).

This chemical inventory supports compliance with SARA Title III as well as reporting for the City of Albuquerque inventory requirements.

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 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

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://www.eh.doe.gov/oepa/laws/aea.html

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 http://www.epa.gov/region5/watercwa.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 http://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 http://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 http://www.archives.gov/federal_register/executive_orders/disposition_tables.html

Federal Facility Compliance Act (FFCA)

Directs federal agencies regarding environmental compliance http://tis.eh.doe.gov/oepa/laws/ffca.html

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Controls the distribution and use of various pesticides http://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/laws/mbta.html

National Emission Standards for Hazardous Air Pollutants (NESHAP)

Specifies standards for radionuclide air emissions and other hazardous air releases under the CAA http://www.epa.gov/radiation/neshaps/

National Environmental Policy Act (NEPA)

Requires federal agencies to review all proposed activities so as to include environmental aspects 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) http://www.epa.gov/region5/defs/html/rcra.htm

Safe Drinking Water Act (SDWA)

Provides specific standards used for drinking water sources http://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 comunication standards for hazardous materials over a threshold amount that are stored or used in a community ` http://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) http://www.epa.gov/compliance/civil/tsca/index.html 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 Chapter 3 (Section 3.3) for more details.

Chapter 3 summarizes Sandia Corporation's hazardous waste management activities during 2004.

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 Hazardous Waste Management Facility (HWMF) and the Thermal Treatment Facility (TTF); updated applications for operating permits for the Radioactive and Mixed Waste Management Facility (RMWMF), the High Bay Waste Storage Facility (HBWSF), and seven Manzano Storage Bunkers (MSB); a new application for operation of the Auxiliary Hot Cell Facility (AHCF); and requests for renewal of existing permits and authorizations for the Corrective Action Management Unit (CAMU) and associated treatment operations. Sandia and DOE continue to operate under the existing permits during the permit renewal process. Since the initial submittal, SNL/NM and DOE have revised the permit request several times in response to NMED comments, NMED requests for additional information, and changes in waste management operations. SNL/NM and DOE withdrew the permit applications for the HBWSF and two MSBs because these units will not be needed for future RCRA-regulated waste management. SNL/NM and DOE requested significant modifications to the permit for the CAMU to reflect the completion of treatment activities, placement of all soils in the containment cell, and construction of the cover on the cell during 2003. The most recent revision was submitted on November 29, 2004. Active permits are listed in Chapter 9.

During 2004, Sandia and DOE also requested minor modification to the existing permits for the HWMF and TTF to reflect changes in personnel and operations. NMED has approved the changes for both units.

Closures – During 2004, Sandia Corporation continued closure and post-closure care activities for hazardous waste management units that are no longer used as follows:

Chemical Waste Landfill (CWL)
The CWL was used for hazardous waste disposal under interim status until 1985. Details are included in Chapter 3, Page 3-4.

CAMU – Some of the soil placed in the CAMU was treated in the Low Temperature Thermal Desorption (LTTD) and/or the temporary unit (TU) prior to placement in the cell. Closure activities were completed during 2004, and Sandia Corporation and DOE are currently conducting post-closure care. Details are included in Chapter 3, Page 3-4.

HBWSF – SNL/NM no longer needs the waste storage capacity provided by the HBWSF. In April 2004, Sandia Corporation and DOE submitted a revised plan to NMED, which incorporated NMED's comments, for closing the unit. NMED approved the plan in 2004.

MSB – SNL/NM no longer needs the waste storage capacity provided by two of the MSBs. These units were not used for storage of hazardous or MW under interim status. Sandia Corporation and DOE submitted a letter to NMED stating the units were not used; NMED is reviewing the information.

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 were developed.

In 2004, 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 Region VI 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 from actual or calculated emissions. 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 2004, the MEI was located at Chestnut Test Site, just south of Technical Area V (TA-V). The dose at this location was 0.0010 mrem/yr. The off-site MEI was located at the Eubank Gate Area. The dose at this location was 0.00045 mrem/yr. Both doses are well below the EPA standard. Sandia Corporation met all NESHAP compliance requirements in 2004. For perspective, the annual radiation dose from natural background radiation is about 360 mrem/year.

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 regulations for sanitary sewer discharges based on federal pretreatment standards; (2) the EPA and NMED administer regulations concerning oil storage and surface discharges; and (3) the EPA has regulatory authority over storm water discharges and mandates requirements for oil storage and secondary containment.

New Mexico Stream Standards

New Mexico is in the process of obtaining the authority to regulate discharges under the National Pollutant Discharge Elimination System (NPDES). New Mexico's goal is to obtain this authority by 2008; until then, EPA Region VI is the permitting agency. New Mexico has enacted 20 6.4 NMAC "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. SNL/NM does compare 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 were no exceedances of permit limits in 2004.

Surface Discharge

Surface discharges made to the ground or to containment areas must be evaluated for compliance with regulations implemented through the New

Mexico Water Quality Control Commission (NMWQCC). Sandia Corporation issued seven one-time internal surface discharge permits in 2004. Additionally, two evaporation lagoons in TA-IV 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. All permit conditions for the permitted sites were met in 2004. In 2004, there were six reportable surface releases that were 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.

Collecting analytical samples at SNL/NM has always been a challenge due to Albuquerque's climatic condition and FY04 was not an exception. For details see section 6.3.4 and Appendix A.

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 Environmental Management (EM) Department routinely collects potable water samples in response to drinking 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 2004. 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 Pesticide Control Act. Sandia Corporation's Biological Control Activity compiles information on pesticide use at SNL/NM, as discussed in Section 3.5. Sandia Corporation was in full compliance with FIFRA in 2004.

2.1.11 National Environmental Policy Act (NEPA)

NEPA requires federal agencies and private entities that perform federally-sponsored projects to include the consideration of environmental aspects, be aware of the potential environmental impacts associated with their operations, and include this information in early project planning and decision-making. NEPA mandates that an agency's decision process be open for public review. Additionally, 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. Details are provided in Section 3.6.

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 and the Ecology Program. Table 2-2 lists threatened and endangered species potentially occurring in Bernalillo County.

2.1.13 Migratory Bird Treaty Act (MBTA)

The MBTA of 1918 implemented the 1916 Convention for the protection of migratory birds. The original statute implemented the agreement between the United States (U.S.) and Great Britain (for Canada) and later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and Russia. 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, the MBTA is coordinated with NEPA compliance reviews and the Ecology Program.

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 on and in close proximity to DOE/NNSA-permitted 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 planned to avoid potential impacts to these archaeological sites. In 2004, the planned location of one new building on Cibola National Forest land was moved to avoid such a site. It is DOE/NNSA's responsibility to ensure that cultural resources are not adversely impacted by DOE activities.

Historical Building Assessment

In 2004, with regard to SNL/NM, DOE/NNSA/SSO completed consultation with the New Mexico State Historic Preservation Office (SHPO) on 37 individual buildings. None were found to be of historic significance or eligible to the National Register of Historic Places. Consultation was also completed on the buildings at SNL/NM's 300-Foot Drop Tower and Water Impact Facility, which was found to be eligible to the National Register; preservation via recordation is underway at the site. In addition, documentation continued on the environmental test facilities included in the Test Capabilities Revitalization Project. Previously, one building and four districts were found eligible for the National Register of Historic Places.

2.1.15 Environmental Compliance Executive Orders (EOs)

EOs related to environmental compliance include:

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 lands withdrawn from the Cibola National Forest, are managed by the USAF and the U.S. Forest Service

TABLE 2-2. 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	
Yellow-billed Cuckoo	*Coccyzus Americanus*	Candidate	--	

(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 performs analysis to assess that its existing or proposed operations do not cause 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 currently working under DOE Order 450.1 to meet the requirements of this EO (DOE 2005).

2.1.16 DOE Directives

DOE directives on the contract baseline that pertain to environmental protection and management are discussed in Chapter 1, "Operations Contract." In 2004, Sandia Corporation met all requirements stated in these DOE directives.

2.1.17 Summary of Radiological Releases

A summary of radiological releases and public dose resulting from Sandia Corporation operations is provided in Table 2-3. More detailed information is found in Chapters 5 and 6 of this report.

TABLE 2-3. SNL/NM Radiological Dose Reporting for Calendar Year 2004

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	1.0E-3	1.0E-5	0.001%	5.1E-2	5.1E-4	793,740	-	-
Water	0	0	0	0	0	0	-	-
Other Pathways	0	0	0	0	0	0	-	-
All Pathways	1.0E-3	1.0E-5	0.001%	5.1E-2	5.1E-4	793,740	2.9E5	2.9E3

Radiological Atmospheric Releases for 2004 (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
1.3	0	4.5	1.4E-3	6.6E-8	0	3.9E-7	4.2E-7	0	1.0E-5	2.7E-4

Liquid Effluent Releases of Radioactive Material for 2004

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
km = kilometer
U = Uranium
Pu = Plutonium
MEI = maximally exposed individual

2.2 2004 RELEASES, COMPLIANCE ISSUES, AND ENVIRONMENTAL OCCURRENCES

Under DOE Order 231.1-2, an occurrence is defined as one or more (i.e., recurring) events or conditions that adversely affect, or may adversely affect, DOE (including NNSA) or contractor personnel, the public, property, the environment, or the DOE mission. Events or conditions meeting criteria thresholds identified in DOE 231.1-2 or determined to be recurring through performance analysis are occurrences. In addition, there are environmental releases that may not meet the 231.1-2 reporting thresholds but are still reportable to outside agencies (see section 2.2.2 and 6.2.2).

2.2.1 Occurrence Tracking

DOE occurrence reporting is tracked by the Performance Assurance Department. All SNL/NM occurrences are entered into the DOE Occurrence Reporting and Processing System (ORPS) database, which also tracks corrective actions and closure of occurrence reports.

2004 was the first complete year under the new DOE occurrence reporting requirements. For all categories, there were 51 occurrences, one of which was a recurring occurrence, ALO-KO-SNL-NMSITE-2004-0002, Recurring - Discovery of Beryllium Contamination in a non-Beryllium Use Facility.

DOE Order 231.1-2 2004 Environmental Occurrences

DOE Order 231.1-2 environmental and environmentally-related occurrences for five years (2000-2004) are shown in Figure 2-1. This figure shows all occurrences for which "nature of occurrence" (pre August 25, 2003) and "reporting criteria" (post August 25, 2003) included "environmental." In 2004, there were four reportable environmental occurrences. All four occurrences were categorized as Significance Category 4, the lowest level occurrence. Four were reportable under reporting criterion 5 A (4) "Any release (onsite or offsite) of a hazardous substance, material, waste, or radionuclide from a DOE facility that must be reported to outside agencies in a format other than routine periodic reports. (However, oil spills of less than 10 gallons and with negligible environmental impact need not be reported in ORPS.)"

There were four additional occurrences that were not reported under environmental reporting criteria, but that were of possible environmental concern. Three of these were reportable under reporting criterion 10(2) "An event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern to other facilities or activities in the DOE complex." One event was reported under criterion 9(2) "Any written notification from an outside regulatory agency that a site/facility is considered to be in noncompliance with a schedule or requirement (e.g., Notice of Violation, Notice of Intent to Sue, Notice of Noncompliance, Warning Letter, Finding of Violation, Finding of Alleged Violation, Administrative Order, or a similar type of notification or enforcement action)." Table 2-4 summarizes the four environmental and four environmentally-related occurrences from 2004.

2.2.2 Environmental Release Tracking

Environmental releases include releases to the environment that are not tracked through ORPS, including notifications to outside agencies.

2004 Environmental Releases

In 2004, there were six reportable environmental releases to outside agencies, three of which were tracked through ORPS. Detailed information regarding these releases can be found in Section 6.2.2.

2.3 2004 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 2004 are listed in Table 2-5.

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 2-6 summarizes the 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 2004. This includes permit applications that are pending and are under review by various agencies.

2.6 ENVIRONMENTAL PERFORMANCE MEASURES

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

SNL/NM executive management has established high-level corporate ES&H objectives, which are:

- Zero job-related injuries and illnesses;
- Zero environmental incidents; and
- Zero operations fines, violations, or penalties.

In support of these objectives, seven specific ES&H measures have been adopted, with specific numerical expectations for each. These are listed in Table 2-7.

Environmental performance is also assessed through performance measures in the Performance Evaluation Plan (PEP) agreement between DOE/NNSA/SSO and Sandia Corporation. On the basis of the PEP, DOE/NNSA SSO prepares an annual Performance Evaluation Report (PER) assessing SNL/NM's performance for the Fiscal Year (FY). For 2004, the overall score for Sandia Corporation was outstanding.

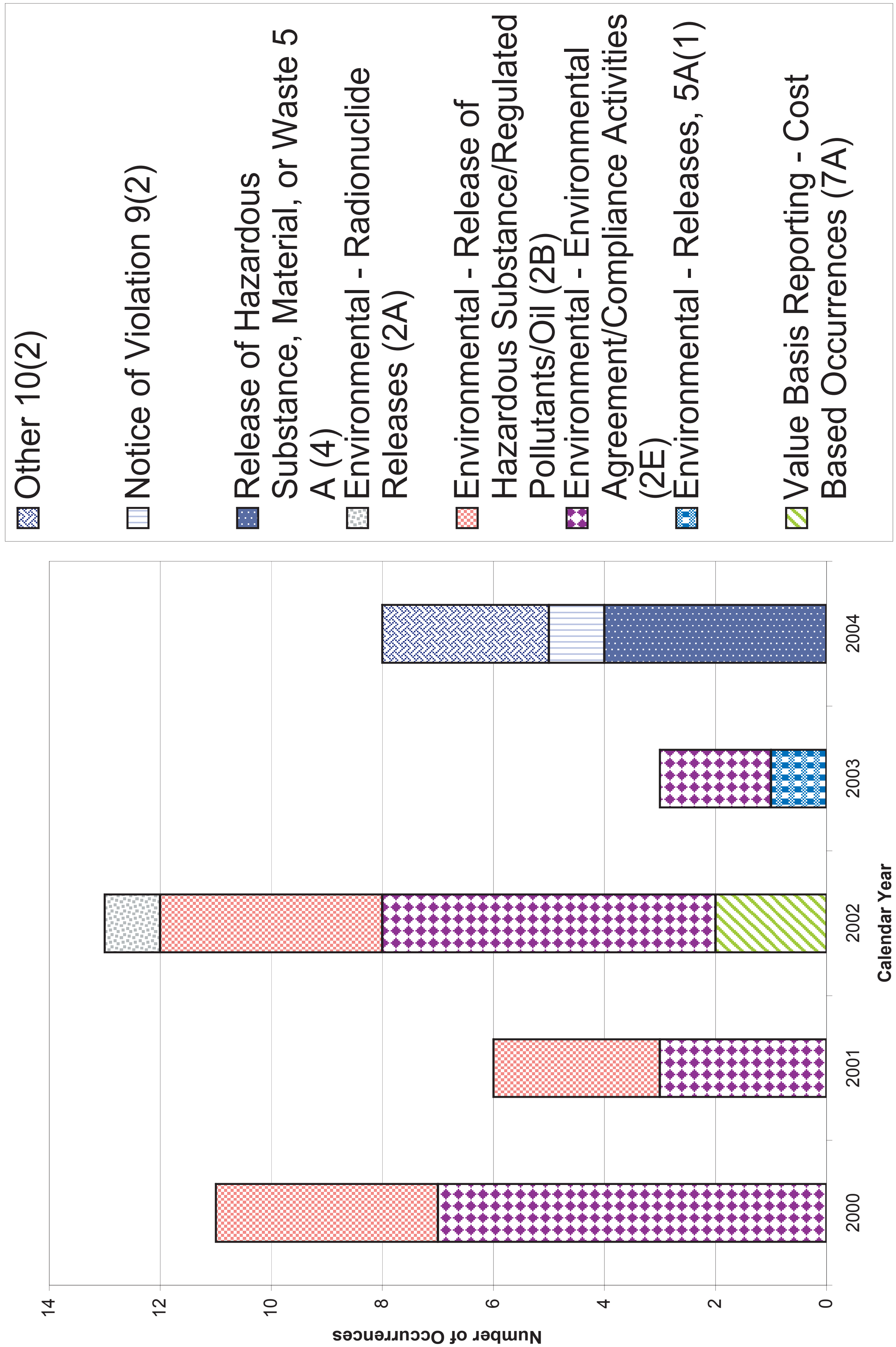


FIGURE 2-1. Environmentally-related Occurrences for Five Years (2000-2004)

TABLE 2-4. DOE Order 231.1-2 2004 Reportable Environmental Occurrences

Date	Occurrence Significance Category	Reporting Criteria	Description
February 2004	3	10(2)	The Facilities Control System (FCS) received alarms associated with the Building 858 chiller plant. The craftspeople ensured that all appropriate valves in the primary chilled water loop were open and started manually venting the air vents in the water system. They identified that refrigerant (R500) was being vented from the system and determined that refrigerant from the evaporator tube system had entered the chilled water loop causing a vapor lock which had stopped chilled water flow. Approximately 3650 pounds of R500 refrigerant was released. No refrigerant was released to the ground surface.
July 2004	4	5A(4)	In TA-III, it was observed that diesel fuel had spilled onto the ground underneath the stop valve of a diesel fuel storage tank. The tank had been on location for approximately five years and the site had been inactive for over a year. An initial estimate of the volume spilled was 10-20 gallons. The fuel stop valve was suspected in the leak, however it was not leaking when discovered. The visible stain on the soil was approximately 62 inches in diameter. The time of the spill is not known.
July 2004	4	9(2)	As a result of the February 2003 NMED audit, SNL/NM received a Notice of Violation (NOV). The NOV contains 27 possible violations of the Resource Conservation and Recovery Act (RCRA).
August 2004	4	5A(4)	A subcontractor was performing mechanical operations in TA-V and observed that a diesel fuel line had ruptured on a reach forklift. The subcontractor placed 5-gallon drums under the fuel line to capture the remainder of the fuel that was leaking from the forklift. A total of three 5-gallon buckets were used to catch the leaking fuel, which was transferred to a 55-gallon drum. Approximately 10-15 gallons of fuel leaked onto the asphalt from the forklift and was contained in the immediate area. The NMED was notified of the spill.
August 2004	4	5A(4)	Two structural craftspeople removed cooling tower fill (evaporative media) from a building's cooling tower located when one noticed fibers and reported that the fill material might contain asbestos. The supervisor went to the job site and agreed that the material appeared suspect for asbestos. Work activities to remove the louvers were suspended and a sample of the material was placed in a bag for delivery to the asbestos support team the next morning.
August 2004	3	10(2)	A construction worker knocked a valve off the top a chiller in the Microsystems and Engineering Sciences Application (MESA) Central Utilities Building (CUB). A refrigerant (approximately 2,100 pounds) was released from the chiller. The workers were maneuvering an articulated boom lift above the chiller. The boom lift struck a pressure relief valve on top of the chiller, breaking off the valve. All refrigerant in the chiller vented into the CUB and not released to the environment.
November 2004	4	5A(4)	In TA-I, a construction crew was cleaning a building heating system with Industrial Water Engineering cleaner (CL-483). After the system was cleaned the system was drained and flushed. Cleaning solution and flush water was discharged to a storm drain manhole assuming it was a sanitary sewer. The sanitary sewer manhole was approximately 10 feet to the south and covered with soil from construction activities. Approximately 75 gallons of CL-483 containing sodium hydroxide and sodium metasilscate was mixed with about 10,000 gallons of water. After removing the cleaning solution, another 10,000 to 20,000 gallons of water was used to flush the system.
November 2004	4	10(2)	SNL/NM sent diesel-contaminated soil to the Rio Rancho Landfill (RRL) for disposal. After this date, the SNL/NM Hazardous Waste Management Facility (HWMF) received information that indicated the soil may have been improperly disposed, based on the regulatory limitation of 1,000 parts per million (ppm) of Total Petroleum Hydrocarbons (TPH) in soil that is landfilled.

TABLE 2-5. Environmental Program Audits and Appraisals Conducted In 2004

Appraising Agency	Title	Date	Summary
External Audits and Appraisals			
NMED	RCRA Compliance	February 2003	On July 2, 2004, DOE and SNL/NM received 3 administrative compliance orders from NMED listing 27 violations identified during the inspection. DOE and Sandia are currently negotiating with NMED regarding the orders.
NMED	RCRA Compliance	May 2004	NMED noted 3 potential violations during the inspection. No final report was received during 2004 regarding the inspection.
Internal Audits and Appraisals			
DOE/SSO	ISMS/ Perform Work	January - March 2004	Completed, 2 Findings, 3 Observations, 1 Noteworthy Practice
DOE/SSO	ISMS/Identify Hazards	March - November 2004	Completed, 2 Findings, 3 Observations
DOE/SSO	Radiation Protection/RP Program	April 2004	Completed, 1 Finding, 2 Observations
DOE/SSO	ISMS Feedback & Improve	April - June 2004	Completed, 4 Findings, 4 Observations, 1 Noteworthy Practice
DOE/SSO	Radioactive & Mixed Waste/Operations	May 2004	Completed, 6 Observations
DOE/SSO	Safety Engineering/ Construction ES&H	May 2004	Completed, 5 Observations, 1 Noteworthy Practice
DOE/SSO	Environmental Protection/ Air Permits in Bernalillo County	June 2004	Completed, 1 Observation
DOE/SSO	Emergency Management/ Wildland Fire Management	September 2004	Completed, 1 Observation
DOE/SSO	Environmental Protection/ Air Quality Compliance	September 2004	Completed, 1 Observation
Inspections and Observations			
NMED	DP530 Pulsed Power Lagoons Inspection	Monthly	Monthly internal inspections were performed by SNL/NM and documented on monthly inspection checklists filed in the ES&H Records Center.
COA	Wastewater Inspection	May 2004	COA inspection of flow basin 2069G. There were no findings
COA	Wastewater Inspection	June 2004	COA inspection of flow basins 2069F & 2069K. There were no findings.
COA	Wastewater Inspection	October 2004	COA inspection of flow basins 2069A & 2069I. There were no findings.
COA	Wastewater Inspection	October 2004	COA inspection of flow basins 2069F & 2069K. There were no findings.

NOTE: DOE = U.S. Department of Energy
SSO = Sandia Site Office
SNL/NM = Sandia National Laboratories/New Mexico
OA = Office of Independent Oversight and Performance Assurance
EPA = U.S. Environmental Protection Agency
ES&H = Environment, Safety and Health
NMED = New Mexico Environment Department
RCRA = Resource Conservation Recovery Act
COA = City of Albuquerque

TABLE 2-6. 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 to the NRC. CERCLA and EPCRA are discussed in Section 2.1.1 and 2.1.2 of this report. As discussed in Section 2.1.2, there were no reportable releases at SNL/NM under CERCLA or EPCRA in 2004.	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 appropriate Bureau Chief verifying the prior oral notification. Within 15 days, the owner and/or operator shall send written notification to the appropriate Bureau Chief describing any corrective actions taken and/or to be taken relative to the discharge. Six surface discharge releases occurred in 2004. Details are summarized in Section 6.2.2.	NMED 20.6.2.1203 NMAC
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. No events were reported to the City of Albuquerque in 2004.	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
POTW = Publicly-Owned Treatment Works
SNL/NM = Sandia National Laboratories, New Mexico
NMED= New Mexico Environment Department
NMAC = New Mexico Administrative Code
CFR = Code of Federal Regulations

TABLE 2-7. Environmental Performance Measures

Measure	2003 Actual	2004 Actual	2004 Goal	2005 Goal
Total Recordable Case Rate	3.2	3.0	2.5	1.75
Days Away Case Rate	0.50	0.38	0.35	0.28
Days Away Rate	10.3	3.4	6.3	4.0
Hazardous Waste Generated (metric tons)	52.1	42.7	≤ 50	≤ 50
Percent Solid Waste Recycled	37	45.9	45	48
Number of Notices of Violation	2	2	≤ 1	0
Amount of fines or penalties	$50	Potential $3.2 Million 2003 NMED RCRA pending	$0	$0

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chapter three

ENVIRONMENTAL PROGRAMS INFORMATION

<u>**In This Chapter ...**</u>

Environmental Management System (EMS)
ER Project
Waste Management
Waste Minimization and P2 Programs
Biological Control Activities
NEPA Compliance Activities
Environmental Education Outreach Program

Environmental Snapshot

The Environmental Education Outreach Program participated in the following events in 2004:

- *The School to World Conference*
- *Dia del Rio at the Albuquerque Aquarium*
- *School presentations throughout Albuquerque*
- *New Mexico Environmental Health Conference*

Sandia Employee Performing a Groundwater Demonstration at James Monroe Middle School

Environmental programs at Sandia National Laboratories, New Mexico (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. U.S. Department of Energy (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 pollution prevention (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.

Environmental Management System (EMS)

Sandia Corporation is implementing an EMS as an enhancement of the Integrated Safety Management System (ISMS). The EMS is that part of the ISMS that addresses the environmental consequences of SNL/NM's activities, products, and services. The EMS is intended to provide a systematic and structured approach for addressing flow-down (see illustration) of requirements, environmental compliance, incorporation of P2 into project planning, setting environmental objectives and goals, long-term resource stewardship, recognition of environmental consequences, feedback and improvement mechanisms, and continual improvement.

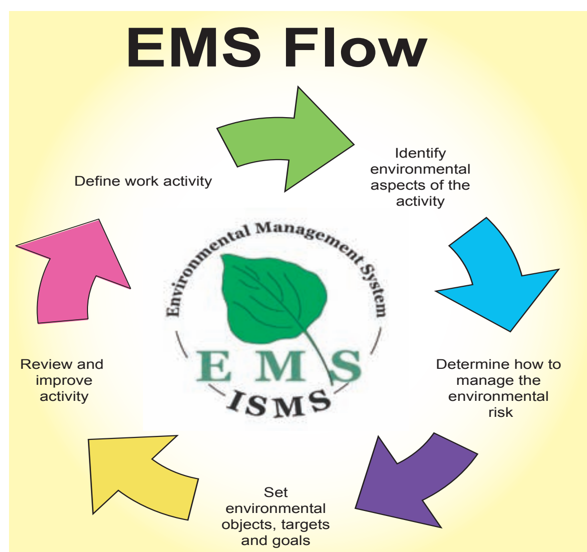
3.1 EMS

In 2004, SNL/NM continued to work to improve EM based on BMPs, bench marking, and process improvements. It is expected that a robust EMS will contribute to employee and stakeholder satisfaction, significant cost savings, and environmental risk reduction.

SNL/NM's Maintenance and Operation (M&O) Contract incorporates DOE Order 450.1, *Environmental Protection Program* (DOE 2005). It requires the implementation of an EMS integrated with the ISMS by the end of December, 2005. SNL/NM's strategy for managing and implementing the ES&H Program is described in the ISMS. More information about ISMS can be found in Chapter 8.

EMS progress is included in the DOE Performance Incentives of Sandia Corporation. In 2004, the EMS Team conducted a site-wide environmental aspects and impacts analysis for SNL/NM activities. The team then worked with divisions and some centers to verify their activities and environmental risk. The information will be used to help develop environmental goals.

Required employee training, ES&H Awareness, ES&H100, was updated in 2004 to include environmental and energy management, the ES&H Policy, and P2 guidance. EMS information was also displayed during Earth Day and Integrated Enabling Service (IES) events at SNL/NM.



The cornerstone of an EMS is a commitment to environmental protection at the highest levels of the organization. The ES&H Policy, CPSR400.1, is a statement of SNL/NM's commitment regarding ES&H performance, compliance with all applicable laws, and incorporation of ES&H in planning.

ES&H Policy, CPSR400.1

The ES&H Policy of Sandia Corporation is to support the corporate vision and protect and preserve the environment and safety and health of its employees, contractors, visitors, and the public. Concern and conduct in matters pertaining to ES&H are the responsibility of all SNL/NM members of the workforce. SNL/NM's strategy for managing and implementing the ES&H Program is described in the CPR400.1.2, ISMS. Sandia Corporation's ES&H program mandates compliance with all applicable laws, regulations, DOE directives included in the Prime Contract between DOE and SNL/NM, and internal corporate policy requirements. Sandia Corporation has adopted the core values of: integrity; excellence; service to the nation and each other; and teamwork. Sandia Corporation strives to:

- Plan work, incorporating safety awareness, protective health practices, P2, and stewardship;
- Evaluate and manage risk with effective ES&H systems;
- Implement controls to prevent injuries, hazardous exposures, or releases;
- Do quality work while protecting people, the environment, and our nation's security;
- Continually improve our ES&H performance and incorporate lessons learned; and
- Communicate ES&H issues to our employees, the community, regulators, and stakeholders.

3.2 ENVIRONMENTAL RESTORATION (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.

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.

SNL/NM, DOE, and the New Mexico Environment Department (NMED) negotiated a Compliance Order on Consent (COOC) during 2003 that was signed in April 2004. It supports the goal of completing the ER Project by the year 2006.

3.2.1 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 NMED grants NFA status, the site is placed in a table titled "Corrective Actions Complete Without Controls" or "Corrective Actions Complete With Controls," based on its land-use category. 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 U.S. Environmental Protection Agency (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.

ER Management Units at SNL/NM

Chemical Waste Landfill (CWL)

The CWL is approximately 1.9 acres and is in the southeast corner of TA III. Disposal operations at the CWL began in 1962. From 1962 until 1981, the CWL was used for the disposal of chemical and solid waste generated by SNL/NM research activities. From 1981 through 1985, only solid waste was disposed of at the CWL; after 1985, all waste disposal ended. The primary contaminants of concern at the CWL are volatile organic compounds (VOCs) and metals.

Excavation of the landfill began September 30, 1998. All excavation was completed in February 2002. Over 52,000 cubic yards of soil and debris were excavated from the landfill between 1998 and 2002. The majority of the soils were disposed of at the Corrective Action Management Unit (CAMU), adjacent to the CWL, for treatment and/or placement into the containment cell for long-term management. However, approximately 70 cubic yards of soil was disposed off-site due to radiological activity above CAMU acceptance criteria. Additionally, a minor amount of soil contaminated with PCB compounds was disposed of off-site after the CAMU stopped accepting waste.

A revised Corrective Measures Study (CMS) Report was submitted in December 2004 as requested by the NMED. A revised Remedial Action Proposal (RAP) was included in the CMS Report as an annex and a revised Post-Closure Care Plan/Permit Application (PCCP/PA). PCCP/PA is scheduled to be submitted to NMED after approval of the CMS Report. The rejection of the Class 3 permit modification request resulted in the preparation and submittal of an Interim Corrective Measure (ICM) request, to allow cover construction to occur prior to approval of the revised CMS Report by NMED.

The ICM request was submitted to NMED in April 2004 and it was approved in September 2004. Backfilling of the CWL to four feet below ground surface was completed in February 2004. Clean-up activities in the site operational boundary area adjacent to the CWL was completed in February 2004. The CWL cover installation began in March 2005 and scheduled to be completed by July 2005. Final construction activities for closure of the site are scheduled to be completed at the end of 2005.

CAMU

The CAMU is permitted under RCRA and TSCA for the management of remediation waste (primarily contaminated soil) generated during the VCA conducted by the ER Project at the CWL. Storage, treatment, and containment activities are authorized under the CAMU permit (EPA 1997). The CAMU is located in TA-III next to the CWL and RMWMF. 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. LTTD treatment operations were completed in December 2002. The remaining ST treatment activities at the CAMU were performed during January of 2003.

The staging, treatment, and support areas at the CAMU were clean-closed under the RCRA and TSCA provisions as outlined in the Closure Plan (SNL 2002a) and all hazardous waste and hazardous waste residues were removed. The CAMU containment cell cover was installed in July 2003, which encapsulated the CWL remediation waste in place. Upon completion of closure activities, the CAMU was certified closed on October 15, 2003, in compliance with the closure requirements documented in the RCRA Closure Report (SNL 2003i). The portion of the CAMU where waste remains (CAMU containment cell) will continue to be monitored and maintained in accordance with post-closure requirements.

The CAMU containment cell design consists of engineered barriers and incorporates a bottom liner system with a leachate collection 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 on a monthly basis throughout 2004. The PSL, VSA, and CSS monitoring subsystems were monitored for the composition of soil gases and soil moisture content.

For the year 2004, 8,005 gallons of leachate were pumped from the leachate collection system. The amount of leachate pumped weekly started out the year at 500 gallons and by the close of the year was down to 80 gallons. The amount of leachate is decreasing steadily as anticipated. Monitoring results for 2004 were generally consistent with baseline data established between January 1999 and December 2000. VZMS monitoring results are compiled and reported on an annual basis; the most recent report was submitted in September 2004 (SNL 2004e). The annual VZMS monitoring reports are submitted to NMED as required by the CAMU Permit (the EPA also receives a copy).

ER Management Units at SNL/NM

Groundwater Management Unit

In 2004, SNL/NM ER performed groundwater monitoring at the CWL, Mixed Waste Landfill (MWL), Canyons, Drain and Septic Systems (DSS), Tijeras Arroyo Groundwater (TAG) Investigation, and TA-V. SNL/NM will continue groundwater monitoring as a part of Long-term Environmental Stewardship (LTES). LTES monitoring activities are scheduled to begin in October 2007.

The NMED has indicated that long-term groundwater monitoring will be required to address the uncertainty of future impacts of contamination on groundwater. Specific wells within CWL, MWL, Canyons, TAG, and TA-V networks will be proposed for long-term monitoring per separate requirements and site-specific monitoring plans, which will be developed and detailed in associated program plans. These program plans are contingent upon regulatory approval of corrective measure evaluation, post-closure care provisions, long-term monitoring and maintenance plans, and other regulatory procedures.

SNL/NM anticipates groundwater monitoring for contaminants of concern at both the CWL (VOCs and metals) and MWL (VOCs, metals, and radiological parameters). Additionally, SNL/NM expects that at a minimum monitored natural attenuation (MNA) will be part of the selected remedy for Canyons, TAG, and TA-V groundwater monitoring sites. Until LTES is initiated, SNL/NM ER will continue semiannual groundwater monitoring at the CWL, annual sampling at the MWL, and quarterly monitoring at Canyons, TAG, and TA-V locations.

Additional information is in Section 7.1.2.

- April 2004, SNL/NM submitted the Corrective Measures Evaluation Work Plan for TA-V Groundwater to NMED. The Work Plan was approved by NMED in October 2004.

- June 2004, SNL/NM submitted the Corrective Measures Evaluation Work Plan and the Current Conceptual Model of Groundwater Flow and Contaminant Transport for Canyons groundwater area.

MWL

The MWL was established in 1959 as a disposal area for radioactive and mixed wastes generated at SNL/NM research facilities. The landfill accepted approximately 100,000 cubic feet of low-level radioactive waste and minor amounts of mixed waste from March 1959 through December 1988. Tritium is the contaminant of primary concern at the MWL. It has been detected in surface and subsurface soils in and around the classified area of the landfill. However, there is no indication that tritium or other contaminants have migrated to groundwater, which is approximately 500 feet below the ground surface at the MWL. Tritium is released from MWL soils to the atmosphere at low levels, which do not pose a threat to human health or the environment.

A monitoring well network consisting of seven wells has been installed at the MWL. These wells are sampled annually for radionuclides, metals, VOCs and major ion chemistry. Sampling of these wells has been conducted since 1990. Additional information is in section 7.2.2.

MWL Closure Status:

In May 2003, SNL/NM submitted a CMS for the MWL to the NMED. In the CMS, Sandia Corporation proposed a vegetative soil cover as the final remedy for the site. On January 30, 2004, the DOE initiated a 60-day public comment period on the MWL. The NMED issued a Class 3 Permit Modification Request to incorporate the MWL Corrective Measures into the RCRA Permit for the site, and initiated a public comment period on the MWL CMS. The NMED requested that a bio-intrusion barrier be included with the vegetative soil cover.

In December 2004, a Public Hearing was held on the MWL CMS. Parties providing technical testimony included the DOE, SNL/NM, Citizen Action, and the NMED, among others. The Hearing Officer is currently reviewing the MWL case, and will submit recommendations in late spring of 2005.The NMED will then select the final remedy for the MWL, and Sandia Corporation will then prepare a Corrective Measures Implementation Plan and will implement the remedy. Following remedy implementation, SNL/NM will develop a Long Term Monitoring and Maintenance Plan for the MWL to address monitoring, maintenance, and physical and institutional controls for the MWL.

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
2004	**125**	**41**	**0**	**1**	**+1***	**126**
2003	126	15	0	5	-1	125
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
Column A is the Total ER Sites remaining to be removed from the RCRA Permit
*One Drain and Septic System (DSS) Area of Concern was determined to be inactive in Fiscal Year (FY) 2004, and submitted for NFA.
** 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.

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.

3.2.2 2004 Status and Activities

At the close of 2004, there were 126 regulated ER sites remaining on Sandia Corporation's RCRA Part B Operating Permit and three sites were being actively remediated at SNL/NM. In 2004, 41 sites were proposed for NFA, but no sites actually received final Class III Permit modification. 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 have 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 ER sites at SNL/NM, except MWL and the Canyons Area, have the completion goal date in 2006 with LTES to follow. Further information on ER Management Units can be found on pages 3-4 and 3-5.

3.2.3 LTES Activities

LTES at SNL/NM is defined as activities necessary to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites, including currently active sites.

Sandia Corporation's LTES activities have been increasing as the ER Project completion goal date of 2006 approaches. The ER Project is focusing on project closure, while also working with the SNL/NM EM Department on transitioning LTES activities to EM. The SNL/NM LTES team is taking steps to identify the issues, discuss them, and develop sensible, amicable, and cost effective solutions for the stewardship of our natural resources. In order to best address issues, LTES activities are being addressed through five internal focus groups: management and administration, community outreach, monitoring, institutional controls, and information management. Regulatory and DOE requirements for LTES are being reviewed, as well as suggestions generated by Kirtland Air Force Base (KAFB) tenants and stakeholders.

Please visit the LTES website for additional information.

http://www.sandia.gov/ltes/

LTES Draft Plan and LTES Implementation Plan

The ER Project and the DOE worked with local stakeholders and community representatives to develop a draft LTES Plan (DOE/SNL 2001) that identified the major elements of an LTES Program. A stakeholder task group further revised Chapter 6 of the plan, which needed additional information or resolution. These revisions were completed in 2004.

Sandia Corporation and the DOE are in the process of developing an Implementation Plan that directs the strategies for the EM Department to fully implement the LTES Program in 2007.

Public Outreach and Communication

Stakeholder's participate in quarterly DOE/Department of Defense (DoD) meetings on ER, as well as CRIO Quarterly LTES meetings. These meetings drive community input regarding LTES and offer the opportunity for progress reports on the current status of LTES. Stakeholders participated in a task group to further develop an LTES curriculum that was initially developed during the 2003 Summer Academy co-sponsored by WERC (a consortium for environmental education and technology development established through a cooperative agreement with DOE). Stakeholders then presented this curriculum at the Math and Science Teachers Annual Open House in October 2004.

3.3 WASTE MANAGEMENT

Waste at SNL/NM is processed at five facilities: the Hazardous Waste Management Facility (HWMF), the Thermal Treatment Facility (TTF), the Radioactive and Mixed Waste Management Facility (RMWMF), the Manzano Storage Bunkers (MSB), and the Solid Waste Transfer Facility (SWTF). The primary waste types handled by these waste management facilities are shown below.

3.3.1 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; if there is a spill or release, this is monitored before discharging. 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 temporary storage 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 90 days of receipt.

All applicable regulations for hazardous and chemical waste handled by the HWMF are listed in Chapter 9.

2004 Activities at the HWMF

In 2004, a total of 13,209 package items were handled by the HWMF. The HWMF shipped a total of 240,162 kg (528,356 lb) of RCRA-regulated hazardous waste (including recyclable waste). Specific waste categories handled and shipped in 2004 are shown in Table 3-2.

TABLE 3-2. Waste Shipped By the HWMF in 2004

Waste Categories Handled at the HWMF	2004 Waste Shipped	
RCRA Waste	**(kg)**	**(lb)**
Hazardous Waste	48,839	107,446
Hazardous Waste (Generated by ER Project)	178,885	393,767
Hazardous Waste (recycled)	3,961	8,714
Total	**231,785**	**509,927**
TSCA		
Asbestos	246,682	542,700
PCB (recycled NR)	9,184	20,205
PCB (recycled RCRA)	0	0
PCB (incin NR)	92	202
PCB (incin RCRA)	8,377	18,429
Total	**264,335**	**581,536**
BIOHAZARDOUS		
Infectious Waste	**510**	**1,124**
OTHER		
NR Waste (minus asbestos, PCB, subtitle D, ER, recycled)	194,273	427,401
Non-hazardous Solid Waste (RCRA Subtitle D)	3,149	6,928
Non-RCRA (Generated by ER Project)	163,112	358,846
Used Oil	13,854	30,479
Lead (recycled)	0	0
Other (recycled) – various batteries, fluorescent lamps, and non-PCB (ballasts, capacitors, and oils)	66,286	145,829
Total	**440,674**	**969,483**
Total Waste and Recyclables Shipped	**937,304**	**2,062,070**

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

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 3,961 kg (8,714 lb) of RCRA hazardous waste and 13,854 kg (30,479 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 66,286 kg (145,829 lb) of material was recycled in this category. Waste recycled at SNL/NM in 2004 is shown in Table 3-3.

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 2004, a total of 246,682 kg (542,700 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 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 fluorescent light ballasts, six PCB regulated items remain in use or storage for reuse at SNL/NM (the reduction from ten PCB regulated items in 2003 was the result of the disposition of obsolete equipment). Eight areas of existing PCB spill contamination from old transformers that have been removed from service are being actively managed in compliance with a EPA/TSCA use authorization.

In 2004, a total of 20,786 kg (45,813 lb) of PCB waste was shipped from the HWMF for disposal and recycle (the majority of PCB waste items came from the ER Project).

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 operates the TTF, a unit permitted for the treatment of certain explosive waste streams. In 2004, 990 kg (2,181 lb) of waste was treated in the TTF. In 2004, 8,426 kg (18,570 lb) of other explosive waste was transferred to KAFB for treatment.

SNL/NM's Radioactive Waste

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 generally consists of laboratory waste, decontamination and demolition (D&D) debris, and personnel protection equipment (PPE).*

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 (radioactive waste) *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.*

TABLE 3-3. Categories of Waste Recycled at SNL/NM in 2004

Material	Pounds
** Scrap Metal	2,804,944
* Paper/ Cardboard	876,263
Aluminum Cans	2,611
* Used Oil	199,358
Batteries	87,570
Computers	20,120
Tires	2,800
* Electric Scrap	209,917
* Other (e.g., light bulbs, ballasts, PCB)	185,875
Toner Cartridges	9,319
** Construction/ Remodeling (includes concrete, wallboard, ceiling tiles, wood, carpet, and asphalt)	3,090,275

Icons represent 10,000 lb except where noted * = 100,000 ** = 1,000,000

Sandia Corporation met the 2004 milestone deadlines 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 2004u). Sandia Corporation submitted an annual update for the STP covering FY 2003 activities by the March 2004 deadline (SNL 2004u).

3.3.2 Radioactive and Mixed Waste (MW)

The RMWMF and MSB are used to manage low-level waste (LLW), mixed low-level waste (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. Wastes are stored at the MSB. 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.

All radioactive and 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

Radioactive waste generated from SNL/NM is temporarily stored at the RMWMF and MSB. TRU and TRU/MW will be routed through Los Alamos National Laboratory (LANL) or directly to the Waste Isolation Pilot Plant (WIPP) for final disposal.

2004 Activities at the RMWMF

In 2004, the RMWMF managed all four waste types (LLW, MLLW, TRU, and TRU/MW). LLW was shipped to permitted off-site facilities for treatment and disposal.

In 2004, the RMWMF shipped 91,332 kg (201,297 lb) of LLW, 65,903 kg (145,251 lb) of MW, and 0 kg (0 lb) of TRU waste at SNL/NM. A five-year summary of radioactive waste shipped at SNL/NM during 2004 is shown in Figure 3-1. The LLW and MW managed at the RMWMF is generated through a variety of processes. During 2004, the LLW consisted of legacy wastes (wastes originally generated between 1990 and 1998), newly-generated wastes from production processes, and wastes from environmental restoration activities. During 2004, the MW consisted of wastes from environmental restoration activities, newly-generated wastes from production processes, and wastes generated during waste management activities at the RMWMF.

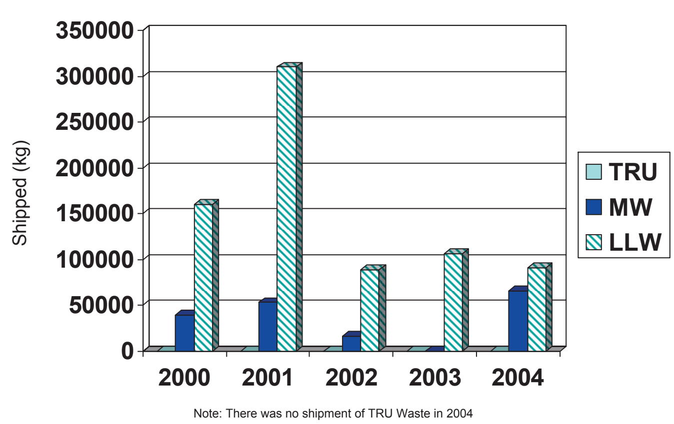


FIGURE 3-1. Five-Year Summary of Total Radioactive Waste Shipped at SNL/NM

3.3.3 MW Regulatory Status

As discussed in Section 2.1.4, Sandia Corporation manages MW in compliance with the FFCO (NMED 2004). 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 compliance history regarding MW managed is shown in Table 9-3.

MW Treatment

Table 9-4 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 Table 9-4 are performed on-site at the RMWMF: chemical deactivation (including potential of hydrogen [pH] neutralization), thermal deactivation, stabilization, macroencapsulation, and physical treatment (volume reduction). These are described in the current RCRA Part B Operating Permit application (most recently submitted to NMED in 2004).

Status of MW Management in 2004

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 2004.

In 2004, SNL/NM shipped MW to off-site facilities, and treated MW on site to meet applicable hazardous waste treatment standards. 65,903 kg (145,251 lb) of MW (3,023 cubic feet) was shipped to off-site facilities for treatment and/or disposal. 2,025 kg (4,466 lb) of MW was treated at the RMWMF. Of the treated waste, 242.8 kg (535 lb) were rendered non-hazardous.

3.3.4 Solid Waste

The primary function of the SWTF is to collect, process, and ship for disposal SNL/NM solid waste in compliance with all applicable regulations. The SWTF primarily accepts commercial solid waste. It does not accept hazardous, radioactive, residential, or food service wastes. In support of the Construction and Demolition (C&D) Recycle Center, small quantities of construction and demolition waste are also accepted, but are managed separately from the commercial solid waste.

SWTF Operations

Processing commercial solid waste at the SWTF consists of screening 100% of the waste for prohibited materials, which are removed if identified. The waste is further screened when it is placed on a conveyor that passes under a radiation detection system. If radiation is detected above background levels, the conveyor is automatically shut down and the source is investigated. (Screening 100% of the commercial solid waste is not a requirement of any regulations, and is a good faith effort to prevent prohibited materials from ending up in the landfill.) The conveyor then feeds the waste into a baler where it is compressed into desk sized bales. The bales are weighed, individually tracked, and loaded into a trailer for transport to a local landfill.

The SWTF also processes and ships (but does not collect) commercial solid waste from KAFB and DOE/NNSA. In 2004, the SWTF received 1,080,015 kg (2,380,354 lb) of SNL/NM commercial solid waste and 1,544,283 kg (3,403,601 lb) of KAFB and DOE/NNSA commercial solid waste.

Recyclables

The secondary function of the SWTF is to collect, process (screen, bale, and track), market, and ship recyclable the following materials from SNL/NM: cardboard, white paper, mixed paper, aluminum cans, computers, circuit boards, scrap metals, toner cartridges, and plastics (Table 3-3). Proceeds from the sale of recyclable materials are used to offset recycling program costs. The SWTF also provides some recycling support for KAFB and DOE/NNSA.

In 2004, construction was completed on an expansion to the SWTF called the C&D Recycle Center. The purpose of the C&D Recycle Center is to provide contractors of small C&D projects a location to recycle cardboard, wood, scrap metal, and wall board. SNL/NM is interested in expanding recycling capabilities to include additional materials as described in Section 3.4.4.

TTF and MSBs

The TTF is operated by SNL/NM as a treatment facility for certain explosive waste streams. The MSBs store LLW.

3.4 WASTE MINIMIZATION AND P2 PROGRAMS

3.4.1 Program Scope

The focus of the P2 Program is to reduce resource use, waste generated, 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 various programs at SNL/NM in meeting 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 ES&H personnel. P2 also researches waste reduction technologies and products applicable to SNL/NM 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 2004, SNL/NM received several awards for P2 accomplishments:

EPA WasteWise Program Champion

The EPA selected SNL/NM as a "2004 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 achievements in reducing and recycling waste from construction and demolition activities, as well as promoting the purchase of recycled content material by modifying its construction procurement contracts.

White House Closing the Circle Award

SNL/NM was awarded a 2004 "White House Closing the Circle Award" in the Green Purchasing category for continuous and outstanding progress in the area of construction purchasing. This year, a contractual requirement for reporting combined with training, compliance inspections, and performance monitoring increased purchases of material containing recycled content by over $300,000 or 40% over purchases made last year.

DOE Awards for P2 Accomplishments

For work completed in 2004, SNL/NM received four awards in three categories from the DOE NNSA P2 Program. These four awards were all submitted to be considered for the prestigious "White House Closing the Circle Award" to be announced and presented in 2005.

- ***Recycling:*** *Building 805 Decommissioning Phase Recycling* - SNL/NM recently completed the demolition of the largest D&D project on-site to date. The removed building was a 75,000 square-foot, three-story, chemical laboratory facility that underwent D&D during FY03 and FY04. Early in the project, SNL/NM D&D and P2 program staff collaborated to implement waste minimization, reuse, and recycling opportunities. As a result of these efforts, over 200 tons of materials were diverted from landfill disposal and an estimated $37,000 dollars of labor costs avoided.

- ***Recycling:*** *C&D Recycling Center* **-** SNL/NM designed and implemented a C&D recycle center that accepts waste generated from construction, demolition, remodeling, and maintenance projects. The C&D recycle center improves waste management practices for small to medium size projects by providing a facility for collecting recyclable materials that were previously disposed at a landfill. The C&D Recycle Center is designed **for "one-stop" disposition** of construction waste with containers for both recyclable and non-recyclable materials, thereby eliminating trips to the landfill.

- ***Sustainable Design (SD)/Green Building:*** *Joint Computational Engineering Laboratory* (*JCEL)*- SNL/NM's First Green Building. JCEL was designed to produce a healthful, resource-efficient and productive working environment. JCEL is a significant achievement for Sandia Corporation because it will be the first Leadership in Energy and Environmental Design (LEED) building at SNL/NM and one of only a few within the DOE community. The process developed for JCEL has since been used to incorporate SD into four other buildings at SNL/NM.

- ***Waste/P2:*** *Waste Reduction Techniques Applied to Landscaping* - Innovative approaches and educational programs have completely changed

Construction and Demolition Recycle Center

SNL/NM's landscape practices. The redesign of SNL/NM's landscaping resulted in a program that maintains a campus-like atmosphere for all to enjoy, while implementing cost savings, reducing water use, and minimizing waste. These practices are exemplary and demonstrate SNL/NM's leadership in implementing the beneficial landscaping requirements of DOE Order 450.1.

NM Recycling Coalition Federal Facility Recycler of the Year

In 2004, the NM Recycling Coalition honored SNL/NM as the Federal Facility Recycler of the Year for its efforts in recycling waste from construction projects. In 2003, JCEL became the first major construction project to fully implement a comprehensive waste recycling program, recycling 80% (by weight) of all waste materials generated. The results from this project have been incorporated as standard practice into new construction projects.

Joint Computational Engineering Laboratory

3.4.2 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. SNL/NM has issued dedicated contracts to supply some items, and where a dedicated contract is not appropriate, EPP 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.

Training is also provided to contractors to identify locally available items meeting the EPA's Comprehensive Product Guidelines for materials with recycled content. SNL/NM construction inspectors ensure that contractor reports for construction materials with recycled content are accurate. These efforts resulted in an increase from 82% of all construction purchases containing recycled material in FY 2003 to 96% in FY 2004.

SNL/NM completed a benchmark survey to compare SNL/NM's performance in EPP with that of other federal facilities and to identify activities and programs that could be implemented at SNL/NM to improve performance. The survey enhances the P2 Program's efforts toward continuous improvement. For example, information obtained about other site programs can be used to improve SNL/NM's program. Through the survey, SNL/NM learned that tracking and recording of construction subcontractor purchases is a best practice among peers.

In 2004, 96% 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 EPP.

3.4.3 Sustainable Design

SD addresses the design of resource productivity and P2 for life cycle savings into a facility's construction and operation. Synonymous with green building and high-performance building, SD strives to balance environmental responsibility, resource efficiency, occupant comfort and well-being, and community sensitivity. Aspects of SD include: proper site selection, energy and water efficiency, environmentally preferable materials; recycling construction waste; and enhancement of the indoor environmental quality through the use of daylighting, elimination of indoor air pollutant sources, and connection to the outdoors.

Integrating SD into construction projects at SNL/NM involves the collaborative effort of project managers, building owners, operations, maintenance personnel, environmental professionals, engineers and architects. Design Team members look at materials, components, and systems from different perspectives and work together for optimum solutions. The solutions are based on the following parameters:

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

As part of the P2 outreach program, SNL/NM sponsored the "Sustainable Design Integrated Educational Series." This program was offered to both the SNL/NM workforce and subcontractors who are involved with design and construction activities at the lab. The educational series, consisting of seven separate workshops, was held each month highlighting the U. S. Green Building Council's (USGBC) LEED criteria for sustainable building design. The workshops were well received drawing a total of 286 design and construction professionals from SNL/NM, the DOE, the UNM, the City of Albuquerque, and local firms.

SNL/NM has taken steps to ensure that all construction projects institutionalize SD principles as part of the basic design requirements. Architect and engineering firms are evaluated and chosen to design new facilities partially based on their experience with SD. Construction specifications require the use of environmentally preferable products and the selection of energy and water efficient equipment. At the end of projects, required reports summarize the sustainable elements that were included in the completed building. SNL/NM has implemented SD into recent projects using the U.S. Green Building Council's LEED rating system. Five SNL/NM buildings are currently registered with the USGBC as green buildings under the LEED rating system. SD was integrated into the following buildings at SNL/NM:

JCEL

SD principles were incorporated early in the design of the 56,000 square foot facility. Design charrettes emphasized mutual agreement on performance metrics for evaluation of SD. An SD report was included as part of the project's deliverables. Some of the key aspects of the JCEL design include extensive use of daylighting, a water efficient, native landscape, selection of environmentally preferable materials and recycling 82% of construction waste.

Microsystems and Engineering Sciences Application (MESA)

The MESA project is currently under construction and consists of three separate buildings: a semi-conductor fabrication plant, a laboratory, and an office complex. This 377,000 square foot complex is projected to have a \$1.9 million energy bill and use 100 to 125 million gallons of water annually. Advanced energy efficiency incorporated into the design criteria are expected to reduce energy use by 30%. Process water will be recycled and reclaimed, eliminating the need to withdraw additional water from the regional aquifer. The MESA complex features a sustainable landscape that links the buildings together in a campus design. The Design Team also agreed to follow the "Labs for the 21st Century" approach that includes whole building design, lifecycle cost analysis as a decision-making tool, and whole building commissioning. Each building incorporated SD features through an integrated process and will be LEED certified.

Center for Integrated Nanotechnologies (CINT)

Construction has begun on CINT, which incorporated sustainability and respect for New Mexico's cultural past into the buildings operation and architecture. Located outside the secured technical areas (TAs), it will be a feature building for SNL/NM, emphasizing public/private collaboration on nanotechnology research and education. The building includes a healthy working environment, efficient heating and cooling, environmentally preferable material selection, whole-building commissioning and a landscape that complements the surrounding short grass prairie.

3.4.4 Waste Reduction and Recycling

SNL/NM continues to reduce volumes of generated waste and improve recycling programs. Through an analysis known as P2 Opportunity Assessments (PPOA), processes generating wastes are assessed and waste stream methods are established.

In 2004, construction was completed on an expansion to the SWTF to collect small on-site construction/remodeling project waste materials for recycling. Previously, small projects did not have a place to collect materials for recycling. Now scrap metal, wood, wallboard, carpet, cardboard, and wire from these on-site construction projects are deposited at the new recycling collection facility. The materials are accumulated and eventually sent to off-site facilities for recycling.

Large construction projects, such as the JCEL, maintain project recycling programs. Collection containers are conveniently located on site to easily facilitate recycling.

SNL/NM is interested in continuing to expand recycling capabilities. An assessment was conducted to investigate several waste materials for recycling potential and evaluate options and priorities. Sixteen materials were reviewed for diversion from the solid waste stream and the two highest priority items, mixed paper and concrete, are being investigated for future implementation. SNL/NM then completed a benchmark survey to compare the performance of our recycling program with that of other federal facilities and to identify activities and programs that could be implemented at SNL/NM to improve its performance. The results of this survey provided additional evidence to support implementation of recycling the two materials identified in our internal assessment.

A recycling awareness campaign was initiated in November 2004 in observation of the New Mexico Recycling Awareness Month. Articles discussing aspects of the recycling program were issued in on-site publications and 150 pledges were submitted by individuals to increase their recycling efforts.

As described under the Waste Management sections of this chapter, SNL/NM routinely recycles a variety of materials at our waste management facilities. Additionally, Fleet Services sends tires to be retreaded and the Facilities Department sends construction materials and demolished building components, such as concrete, for recycling. Computers that are usable are donated to local schools and toner cartridges are sent for remanufacturing. Table 3-3 summarizes the quantities of materials that SNL/NM recycled during 2004 in all categories. In 2004, 45% of routinely generated materials that could have become solid waste disposed in a landfill were diverted for recycling.

3.5 BIOLOGICAL CONTROL ACTIVITIES

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.

3.6 NEPA COMPLIANCE ACTIVITIES

NEPA Program

Sandia Corporation's NEPA Compliance Program provides DOE/NNSA/SSO with technical assistance on NEPA 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 NEPA Module software facilitates SNL/NM internal project reviews (citing existing NEPA documentation such as the Site-Wide Environmental Impact Statement [SWEIS]), and streamlines DOE/NNSA/SSO's review and approval of NEPA checklists, when required. The NEPA Module also supports NEPA review 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 Air Force Form 813 is prepared for DOE review and determination, if the proposed action:

(1) Does not fall within the analysis of an existing SNL/NM NEPA document, or

(2) Would occur on USAF property (permitted, or requested to be permitted, for SNL/NM use).

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), usually ES&H Coordinators. Once qualification requirements are met, and the candidate is approved by DOE/NNSA/SSO, QNRs are able to use the ISMS NEPA Module software (under the supervision of NEPA Subject Matter Experts [SMEs]) to review proposed 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 1999a), and in December 1999, issued the Record of Decision (ROD) selecting "Expanded Operations" as the preferred alternative for analyzing SNL/NM operations.

The SWEIS allows DOE to "tier" subsequent NEPA documents to the larger analysis and reduce the need for new impact analysis for project work consistent with activities analyzed in the SWEIS. In accordance with the agency's regulations (10 CFR 1021), DOE will perform a five-year assessment of the SWEIS in 2005 to decide whether the analysis continues to cover SNL/NM operations, or if a new or supplemental SWEIS should be prepared.

2004 NEPA Documentation

In 2004, the NEPA Team compiled 2003 data for use in updating the SNL/NM Environmental Information Document (EID) and the SNL/NM Facilities and Safety Information Document (FSID). The EID provides comprehensive baseline data to support an assessment of changes to the existing environment at SNL/NM. The FSID summarizes changes at major SNL/NM facilities since publication of the SNL/NM SWEIS in December 1999. These documents will be used in performing this five year assessment of the SWEIS in 2005.

In December 2003, DOE approved the NEPA review for the C&D Recycle Center, which became operational in mid-2004. NEPA reviews for the Heating System Modernization, a Concrete/Asphalt Recycling Area, and a new Consolidated Waste Management Facility were initiated or ongoing in 2004.

In 2004, SNL/NM performed a total of 387 NEPA compliance reviews, transmitting 74 NEPA checklists to DOE/NNSA/SSO for review and determination. Summary data for SNL/NM NEPA reviews performed in 2004 are detailed in Table 3-4.

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.

TABLE 3-4. Summary Data for SNL/NM NEPA Reviews Performed in 2004

NEPA Reviews	Review Breakouts	Quantity
NEPA Module Reviews[1]	Total Reviewed by NEPA Team	257
	DOE Checklist Submittals[2]	69
EDP Reviews[3]	Total Reviewed by NEPA Team	41
	DOE Checklist Submittals[2]	5
	SNL/NM Reviews (Total)	372
Air Force (AF) NEPA Reviews[4]	Land Use Permit Renewals	10
	Land Use Permit Terminations	3
	Land Use Permit Modifications	2
	AF-813 Submittals (Total)	15
GRAND TOTAL of ALL NEPA REVIEWS		387
PERCENTAGE of TOTAL REVIEWS REQUIRING SUBMITTAL to DOE[5]		20%
Verification of Work For Others (WFO) NEPA Citations[6]		517

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]These are projects that, after initial review, needed to be transmitted to DOE for review.
[3]Experiment Development Plan (EDP): An electronic system used by the Albuquerque Full-Scale Experimental Complex (AFSEC) to record project information, including NEPA reviews. DOE/SSO has approved the EDP review process to be equivalent to the NEPA module reviews. The NEPA Team subsequently reviews all EDPs.
[4]The NEPA Team, in cooperation with the project originator, prepares all Air Force NEPA documents.
[5]DOE/SSO requests verification of WFO NEPA citation accompanying funding requests.
[6]Represents a percentage of only DOE NEPA reviews (372) because all Air Force NEPA documents must be transmitted through DOE/SSO to the U.S. Air Force.

In 2004, Sandia Corporation participated in the following events:

- The School to World Conference
- Dia del Rio at the Albuquerque Aquarium
- School presentations throughout Albuquerque
- New Mexico Environmental Health Conference.

Sandia also co-sponsors the Annual Youth Conference on the Environment. Additional sponsors included the Environmental Education Association of New Mexico (EEANM), and the City of Albuquerque's South Broadway Cultural Center. The 2004 conference theme was "Drip, Drip, Drop…the Tap is Running Dry." Students attended a "Water Use in New Mexico" panel discussion during which representatives from government, business, environment, and agriculture, shared their viewpoints regarding water use in New Mexico. Students also attended breakout sessions addressing animal-water interactions and xeriscaping.

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chapter four

TERRESTRIAL AND ECOLOGICAL SURVEILLANCE

In This Chapter ...

Environmental Snapshot

Data are collected on mammal, reptile, amphibian, bird, and plant species currently inhabiting SNL/NM. Data collected includes information on presence, abundance, species diversity, and land use patterns.

Townsend's Warbler

4.1 TERRESTRIAL SURVEILLANCE PROGRAM

Terrestrial surveillance is conducted at Sandia National Laboratories, New Mexico (SNL/NM) to detect the possible deposition of or 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.

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 450.1, *Environmental Protection Program* (DOE 2005):

- 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 prevention (P2) and 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 2002), or local/regional surface soil average concentrations, published in Elements in North American Soils (Dragun and Chekiri 2005), or site-specific surface soil concentrations (Dinwiddie 1997). These results are tabulated in Table 4-14.

The DOE Oversight Bureau of the New Mexico Environment Department (NMED) normally splits samples with SNL/NM, at several locations, for an added measure of verification. However, due to NMED funding constraints, no split samples were collected in 2004.

Statistical Analysis

Samples are generally collected from fixed locations to effectively enable 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. In addition, a qualitative, visual inspection of a graphical presentation of the data is conducted to compare sampling results to regional/local and site-specific concentrations. This step is performed to ensure that anomalous data that would otherwise pass statistical scrutiny is flagged for further investigation.

Beginning in 2001, the analysis was limited to a five-year period. The reason for the change was that SNL/NM changed analytical laboratories in 2000, with lower detection capabilities for many of the metals. As a result, a large number of false decreasing trends were noted for non-radiological parameters when the whole data set was analyzed. By limiting the analysis to a five-year period, the trend analyses will be more meaningful. The analysis in 2004 utilized data from the same analytical laboratory for the five-year period.

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 SNL/NM field operating procedures. In 2004, soil samples were collected from a total of 51 locations (30 on-site, 15 perimeter, and six off-site locations). A soil sample was not collected at one on-site location (32E) 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 2004, three new on-site sediment locations were added. Sediment samples were collected from all fourteen locations (eight on-site, three perimeter, and three off-site locations) during the 2004 sampling period.

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 2004, vegetation was collected at a total of 25 locations (13 on site, seven perimeter, and five off-site locations). Due to the drought and the resulting lack of vegetation, samples were not collected at six locations in 2004. Because of recurring difficulties in collecting vegetation samples, an investigation

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.

by project staff to determine if recovery can be improved by changing sample locations and/or changing the time of year that vegetation sampling was conducted for 2003 and 2004. Several additional samples were collected by sampling the vegetation during early September while the majority of samples were taken during June. Project staff will continue to evaluate means to optimize vegetation collection during the year.

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 are collected from all 36 locations (14 on-site, two operational, eight perimeter, and 12 off-site).

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 2004, one perimeter soil location (82) and three on-site sediment sampling locations were added (locations 83, 84, and 85) for additional characterization of Arroyo del Coyote. These locations are shown in Figure 4-1. Since only one sample has been collected at these locations, no statistical analyses were performed using this data. Locations sampled are show in Tables 4-2 through 4-4.

On-site

On-site locations (Figure 4-1 and Table 4-2) are selected within or near areas of past or current 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 (Figure 4-1 and Table 4-3) 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 (Figure 4-2 and Table 4-4) 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 2004 radiological parameters and analytical results are found in Appendix C of this report. The detailed statistical analyses are documented in *2004 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2005g). It was decided that tritium would not be collected from the soil samples due to the low moisture content. Due to human error, no tritium analysis was requested for vegetation at most locations.

Radiological Results

The results of the statistical analysis showed no on-site or perimeter soil, sediment, or vegetation locations that were Priority-1 (both higher than off-site and with an increasing trend). Several locations were identified as either Priority-2 (higher than off-site) or Priority-3 (increasing trend). The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-5 and 4-6.

Cesium-137

Two perimeter locations (12 and 64) continue to be identified as Priority-2 for Cesium-137 in surface soils. 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. These locations are at slightly higher elevation, which receive greater precipitation, which results in slightly higher Cesium-137 levels from fallout. Cesium-137 is prevalent in surface soils worldwide as a result of historical nuclear weapons testing. Over the past five years, the values for

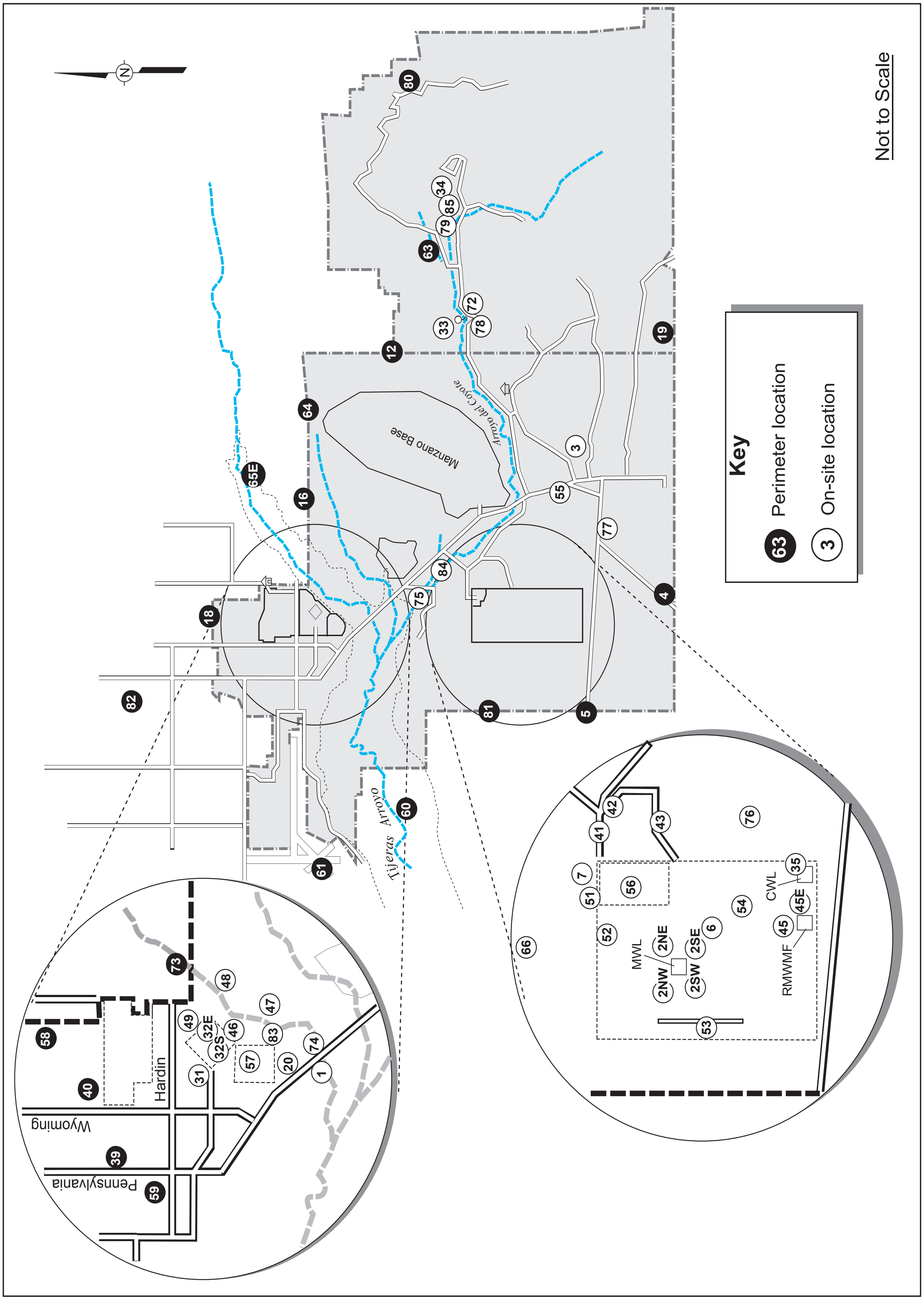

FIGURE 4-1. Terrestrial Surveillance Program On-site and Perimeter Sampling Locations
On-site locations are within areas of SNL/NM operations. Perimeter locations are located both on and off KAFB property.

TABLE 4-2. On-site Terrestrial Surveillance Locations and Sample Types

There are 42 on-site sampling locations.

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
1	Pennsylvania Ave.	X			X
2NW	Mixed Waste Landfill (MWL) (northwest)	X		X	X
2NE *	MWL (northeast)	X		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	X
7 *	Unnamed Arroyo (north of TA-V)	X			X
20 *	TA-IV (southwest) (KAFB Skeet Range)	X		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)	--			
33	Coyote Springs	X		X	
34	Lurance Canyon Burn Site	X		X	
35	Chemical Waste Landfill (CWL)	X		X	
41	TA-V (northeast fence)	X			X
42	TA-V (east fence)	X		--	X
43	TA-V (southeast fence)	X		X	X
45	Radioactive and Mixed Waste Management Facility (RMWMF), TA-III (northwest corner)	X		X	X
45E	RMWMF, TA-III (east fence)				X
46	TA-II (south corner)	X		X	X
47	Tijeras Arroyo (east of TA-IV)				X
48	Tijeras Arroyo (east of TA-II)				X
49	Near the Explosive Components Facility (ECF)	X		--	
51	TA-V (north of culvert)	X		X	
52	TA-III, northeast of Bldgs. 6716 and 6717	X		X	
53 *	TA-III south of long sled track	X			
54	TA-III, Bldg. 6630	X			
55	Large Melt Facility (LMF), Bldg. 9939	X		X	
56	TA-V, Bldg. 6588 (west corner)	X	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		
83	Tijeras Arroyo GW Well		X		
84	Storm Water Monitoring Point (SWMP)-10		X		
85	Arroyo del Coyote Cable Site		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 2004 sampling period.

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

There are 19 perimeter sampling locations.

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
4	Isleta Reservation Gate	X		X	X
5	McCormick Gate	X		X	X
12	Northeast Perimeter	X		--	
16	Four Hills	X			X
18	North Perimeter Road				X
19	USGS Seismic Center Gate	X		X	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	X	
61	Albuquerque International Sunport (west)	X			
63	No Sweat Boulevard	X		X	
64 *	North Manzano Base	X		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
82	Commissary	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 2004 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	Soil	Sediment	Vegetation	TLD
8	Rio Grande, Corrales Bridge (up-gradient)	X	X	X	
9	Sedillo Hill, I-40 (east of Albuquerque)	X		X	
10	Oak Flats	X		--	X
11 *	Rio Grande, Isleta Pueblo (down-gradient)	X	X	X	X
21	Bernalillo Fire Station 10, Tijeras				X
22	Los Lunas Fire Station				X
23	Rio Rancho Fire Station, 19th Ave.				X
24	Corrales Fire Station				X
25	Placitas Fire Station	X		X	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		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 2004 sampling period.

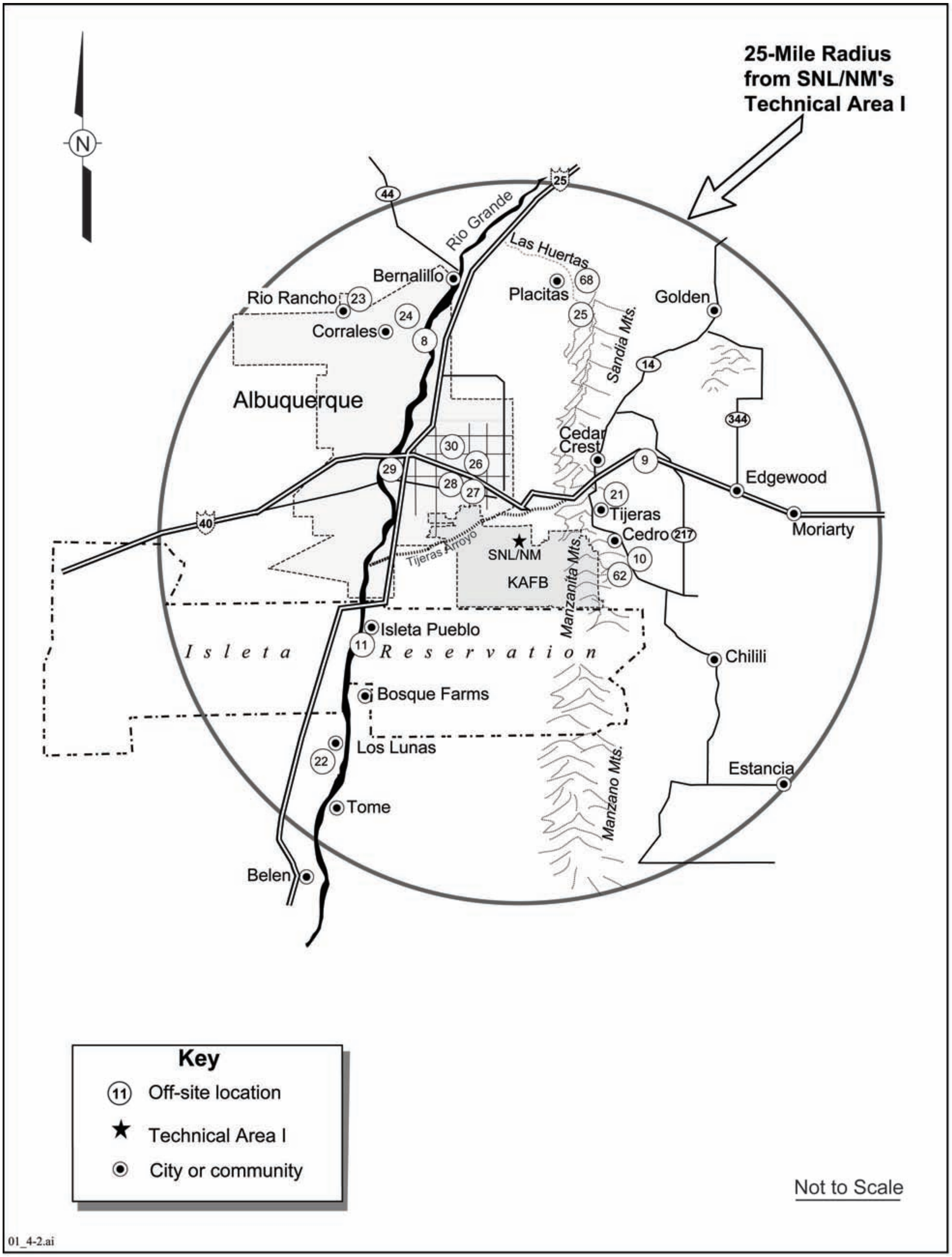

FIGURE 4-2. Terrestrial Surveillance Program Off-site Sampling Locations

Cesium-137 at these perimeter locations ranged from 0.435 to 1.54 picocurie per gram (pCi/g). These levels are not cause for concern.

One perimeter location (19) was identified as Priority-3 (increasing trend) for Cesium-137 in surface soils. Location 19 is located at the USGS Seismic Center Gate which is towards the southern portion of KAFB. Over the past five years, the values for Cesium-137 have ranged from 0.176 to 0.704 pCi/g (note: no sample was taken in 2002 due to human error).

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

Tritium

Due to the drought, many of the soil samples collected had such low soil moisture content that meaningful tritium in soil moisture measurements were frequently not possible. Tritium is not a significant indicator radionuclide for operations at SNL/NM and the low soil moisture in the area will always make low activity assay difficult. In 2004, it was decided to not sample for tritium in soil.

Due to human error, tritium analysis was not requested for many of the vegetation samples collected. There was not enough data for the past five years to statistically evaluate the data.

Total Uranium

There was one on-site location (79) identified as Priority-2 (higher than off-site) for sediment. Location 79 is located up-gradient in the Arroyo del Coyote. The values observed at this location ranged from 0.826 to 1.46 μg/g. This location is at a higher elevation, where slightly higher natural concentrations are expected. The levels are not cause for concern.

There was one perimeter location (59) identified as Priority-3 for total uranium in surface soils. Location 59 is located near the southeast quadrant of Zia Park; a housing area for KAFB. The values for this perimeter location ranged from 0.360 to 0.475 micrograms per gram (μg/g).

All vegetation sample locations as well as the remaining soil and perimeter sampling locations were identified as Priority-4 (consistent with off-site values and no increasing trends).

TABLE 4-5. Radiological Results Summary Statistics for Sample Locations (2000-2004) Noted as PRIORITY-2 During 2004

Sample Media	Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Soil	Cesium-137	pCi/g	12	5	1.10	1.07	0.413	0.498	1.540
			64	5	0.685	0.573	0.327	0.435	1.240
Sediment	Total Uranium	μg/g	79	5	1.186	1.230	0.284	0.826	1.460

NOTE: Std Dev = Standard deviation
pCi/g = picocurie per gram
μg/g = microgram per gram

TABLE 4-6. Radiological Results Summary Statistics for Sample Locations (2000-2004) Noted as PRIORITY-3 During 2004

Sample Media	Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Soil	Cesium-137	pCi/g	19	4	0.474	0.507	0.237	0.176	0.704
	Total Uranium	μg/g	59	5	0.590	0.598	0.128	0.403	0.728

NOTE: Std Dev = Standard deviation
pCi/g = picocurie per gram
μg/g = microgram per gram

TLDs

TLD exposure by quarter and exposure rate for each location class for 2004 is shown in Appendix C, Table C-19. Overall for 2004, five TLD locations were excluded from any analysis because one quarter was missing (TLD was not returned); these were community locations 11, (Q1), 27 (Q2), and 28 (Q2) and on-site locations 41 (Q1) and 48 (Q1). SNL/NM makes every effort to collect TLD's at the end of every quarter and these were not located in or around their associated posts (they are sometimes stolen or vandalized). The exposure rate summary statistics for each location class are presented in Appendix C, Table C-20.

Data for 2000 through 2004 was analyzed to determine if any statistical differences were observed for either location class (on-site, perimeter, or community) or year. If a TLD was missing a quarter in any of the five years of interest, it was deleted from the analysis. Operational locations are also excluded from the statistical analysis. The statistical analysis showed two distinct groupings for year; 2003 showed a higher average exposure than 2004, 2002, 2001, and 2000. There was no statistical difference between on-site, perimeter, or off-site locations. Table 4-7 shows the overall exposure rate summary statistics for 2000 - 2004. Figure 4-3 shows the TLD exposure rates by year and location class.

4.1.5 Non-Radiological Parameters and Results

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

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silver, Thallium, Vanadium, and Zinc.

The 2004 analytical results are found in Appendix C of this report. The detailed statistical analyses are documented in *2004 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2005g).

Non-Radiological Results

Several locations were noted to be Priority-1 (higher than off-site with an increasing trend). Table 4-8 lists the location and the summary statistics for all the Priority-1 analytes. Each analyte is discussed in detail in the sections below and graphical representation of values observed are at the end of the chapter.

Several locations were identified as either Priority-2 (higher than off-site) for soil samples, one location was identified as Priority-2 for sediment, and two locations were identified as Priority-2 for vegetation. There were several samples identified as Priority-3 (increasing trend) for all sample media; soil, sediment, or vegetation. The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-12 and 4-13.

Antimony

Location 20 was noted to be a Priority-1 location for antimony in surface soils. Location 20 is situated near the KAFB Skeet Range near the southwest corner of TA IV. It is assumed that lead shot was collected with the soil sample, causing the high values of antimony (antimony and arsenic are frequently found as a component of lead in shot pellets). Figure 4-4 is a graphical representation of the values observed over the last five years. Toxic Characteristics Leaching Procedure (TCLP) analysis in the past has shown that the antimony is not leaching into the soils. TCLP is a method used to extract and decompose bound metals in soil samples. Additional analysis of the 2004 samples after standard TCLP processing resulted again in antimony levels that do not present a risk to human

TABLE 4-7. Summary Statistics for TLD Exposure Rates, 2000 - 2004

Location Class	No. of Obs	Units	Mean	Median	Std Dev	Min	Max
Community	55	μR/hr	91.0	88.9	12.4	73.2	121.8
Perimeter	37	μR/hr	93.8	91.3	9.7	78.9	119.2
On-Site	66	μR/hr	93.3	93.3	8.2	82.7	119.7

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

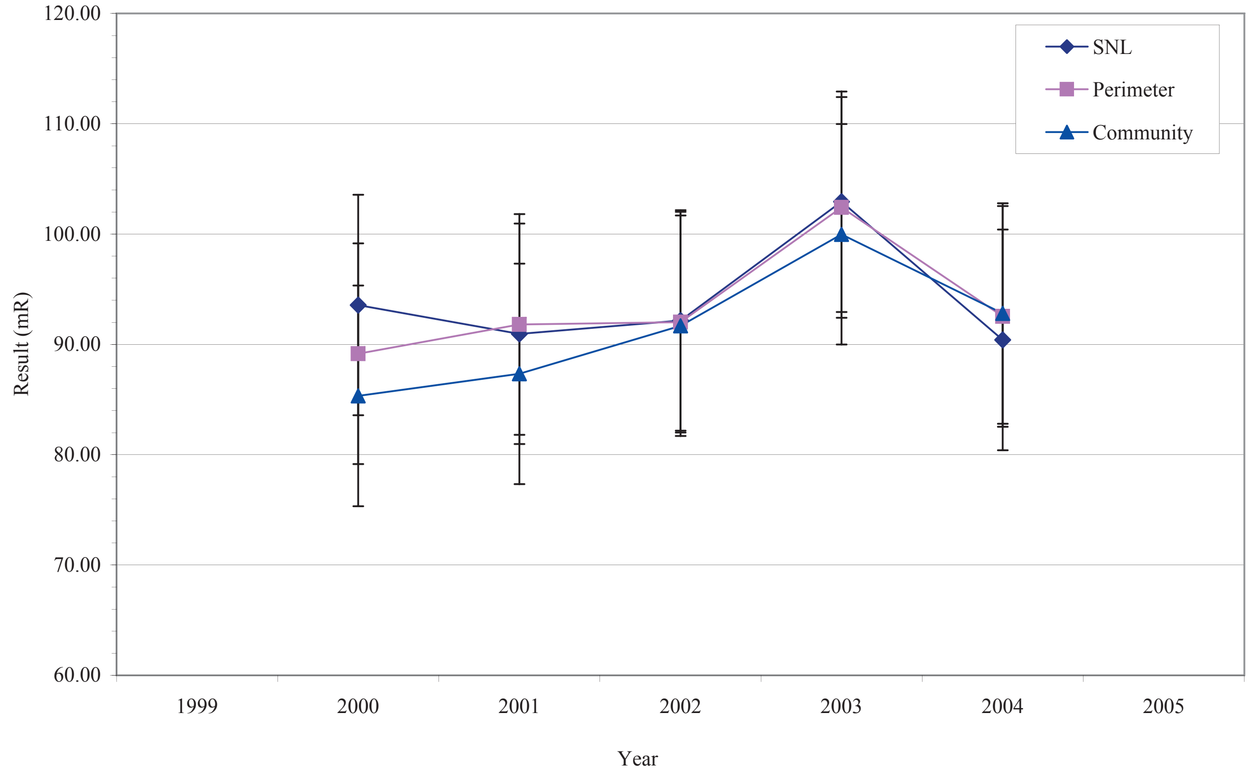

FIGURE 4-3. TLD Exposure Rates by Year and Location Class

TABLE 4-8. Summary Statistics for All Locations (2000-2004) Identified as PRIORITY-1 for Metals During 2004 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Median	Std Dev	Min	Max
Soil	Antimony	On-site	20	5	1202.5	983.0	1661.0	0.2	4040.0
	Arsenic	On-Site	20	5	314.1	77.1	452.8	2.1	1060.0
	Copper	On-site	6	5	30.4	26.8	14.9	11.0	51.5
	Lead	On-site	20	5	36287	34300	39489	62.6	94000
	Iron	Perimeter	64	5	22280	22700	2720.7	18100	25500
		Perimeter	65E	5	24300	23750	4173.7	19800	29900
	Vanadium	Perimeter	65E	5	42.7	41.1	7.9	34.9	53.8

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

health or the environment. In 2005, soil samples will be run through a sieve (in accordance with EPA-approved protocol) to preclude inclusion of lead pellets with antimony in the samples. A report of metals in soils is being prepared in 2005.

It should be noted that location 20 is a replicate sampling location, which means that three samples were taken to validate the results. Table 4-9 shows the replicate samples as well as the TCLP results taken at this location as well. As can be observed from the values, the 2nd and 3rd replicate sample results did not have a lead pellet in the sample. The TCLP results for all three samples are well below ER background levels of 3.9 mg/kg. The TCLP test was run using the same sample as the replicate sample; this means that only three samples were taken even though it appears that six results are reported. The results of the TCLP indicate that antimony is not leaching into the soil and the high antimony results are associated with the lead pellets being included in the soil sample.

Arsenic

Location 20 was noted to be a Priority-1 location for arsenic in surface soils. Location 20 is situated near the KAFB Skeet Range near the southwest corner of TA IV. It is assumed that lead shot was collected

TABLE 4-9. Antimony Replicate Sampling and TCLP Results from Location 20

Analyte	Type	Units	Sample ID	Result
Antimony	Replicate	mg/kg	065131-001	4040
			065131-002	0.853
			065131-003	1.0
	TCLP	mg/L	065131-001	1.59
			065131-002	1.05
			065131-003	2.37

TABLE 4-10. Arsenic Replicate Sampling Results from Location 20

Analyte	Type	Units	Sample ID	Result
Arsenic	Replicate	mg/kg	065131-001	1060
			065131-002	3.07
			065131-003	3.13

TABLE 4-11. Lead Replicate and TCLP Sampling Results at Location 20

Analyte	Type	Units	Sample ID	Result
Lead	Replicate	mg/kg	065131-001	94000
			065131-002	71.2
			065131-003	147
	TCLP	mg/L	065131-001	99.2
			065131-002	31.1
			065131-003	2.37

with the soil sample causing the high values of arsenic (arsenic and antimony are frequently found as a component of lead in shot pellets). Figure 4-5 is a graphical representation of the values observed over the last five years.

It should be noted that location 20 is a replicate sampling location which means that three samples were taken to validate the results. Table 4-10 shows the replicate sample results taken at this location as well. As can be observed from the values, the 2nd and 3rd replicate sample results did not have arsenic in the sample. The results for two of the three samples are well below ER background levels of 5.6 mg/kg.

Copper

Location 6 was noted to be a Priority-1 location for copper in surface soils (51.5 mg/kg). Location 6 is situated in TA III, east of the water tower. Figure 4-6 is a graphical representation of the values observed over the last five years. Even though these values are below NMED residential screening levels of less than 2,800 mg/kg, additional sampling and investigation will be conducted in 2005.

Lead

Location 20 was noted to be a Priority-1 location for lead in surface soils. Location 20 is situated near the KAFB Skeet Range in the southwest corner of TA IV. It is assumed that lead shot was collected with the soil sample causing the high values of lead. Figure 4-7 is a graphical representation of the values observed over the last five years. Additional analysis in 2004 of the sample after standard TCLP processing resulted in lead levels that do not present a risk to human health or the environment. These results are consistent with past TCLP analysis.

It should be noted that location 20 is a replicate sampling location, which means that three samples were taken to validate the results. Table 4-11 shows the replicate samples as well as the TCLP results taken at this location as well. As can be observed from the values, the 2nd and 3rd replicate sample results did not have a lead pellet in the sample. The TCLP results for two of the three samples are below ER background levels of 39 mg/kg. The TCLP test was run using the same sample as the replicate sample; this means that only three samples were taken even though it appears that six results are reported. The results of the TCLP indicate that lead is not leaching into the soil and the high results are a result of lead pellets being included in the soil sample. In 2005, soil samples will be run through a sieve (in accordance with EPA-approved protocol) to preclude inclusion of lead pellets in the samples. A report of metals in soils is being prepared in 2005.

Iron

Perimeter locations 64 and 65E were noted to be Priority-1 locations for iron in surface soils.

Location 64 is near the foothills of the Manzano Mountains near Four Hills. Location 65E is up-gradient Tijeras Arroyo. Figure 4-8 is a graphical representation of the values observed over the last five years. Although higher than "normal," the observed values fell within the expected range of data from this local area.

Vanadium

Perimeter location 65E was noted to be a Priority-1 location for vanadium in surface soils. Location 65E is situated up-gradient Tijeras Arroyo. Figure 4-9 is a graphical representation of the values observed over the last five years. These elevated values seem to be attributed to elevated levels found in soils of this area. They are no cause for concern since they are well below NMED's residential screening levels.

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;

• 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 450.1 (DOE 2005). Data are collected on mammal, reptile, amphibian, bird, and plant species currently inhabiting SNL/NM. Data collected includes information on presence, abundance, species diversity, and land use patterns. No contaminant analysis of radionuclides and metals on wildlife were performed in 2004. Table 1-1 represents common species identified at KAFB.

These data are primarily utilized to support NEPA documentation and land use decisions on a corporate level. Data also support wildlife communication campaigns to ensure safe work environments and sustainable decision making strategies.

TABLE 4-12. Summary Statistics for All Locations (2000-2004) Identified as PRIORITY-2 for Metals During 2004 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	Beryllium	On-site	33	5	1.20	0.33	0.786	1.59
	Cadmium	On-site	20	5	2.84	1.22	2.03	4.92
	Chromium	On-site	51	5	24.3	11.9	6.92	36.4
	Cobalt	Perimeter	64	5	8.6	0.81	7.30	9.35
		Perimeter	65E	4	9.3	1.30	7.91	10.60
	Magnesium	Perimeter	64	5	7494	378	7030	7830
		Perimeter	65E	4	8465	1447	6800	10300
	Manganese	Perimeter	64	5	609	34	588	638
		Perimeter	65E	4	599	88	527	720
	Potassium	Perimeter	65E	4	5315	641	4510	5970
	Zinc	Perimeter	64	5	79.9	3.7	75.7	85.3
		Perimeter	65E	4	81.0	12.5	67.8	97.5
Sediment	Beryllium	On-site	72	5	0.89	0.27	0.60	1.25
Vegetation	Copper	On-site	6	3	10.52	11.28	3.03	23.50
	Magnesium	Perimeter	60	3	2043	965	1070	3000

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

TABLE 4-13. Summary Statistics for Soil Locations (1998-2004) Identified as PRIORITY-3 for Metals During 2004 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	Aluminum	On-site	32S	4	8172	1142	6820	9600
		On-site	34	5	14162	4004	8410	17700
		On-site	35	5	8180	1401	6580	10100
		On-site	43	5	8398	1761	6220	9870
		On-site	45	5	8114	2914	5370	12700
		On-site	55	5	8872	2086	6140	11200
		On-site	66	5	10622	2006	8810	13000
		On-site	76	5	10322	2718	7440	14000
		Perimeter	4	5	7700	1472	6040	9600
		Perimeter	61	5	5888	1517	4040	7900
		Perimeter	64	5	13160	1810	10500	15000
	Arsenic	On-site	2NW	4	2.12	0.84	1.25	3.25
		On-site	34	5	6.83	3.64	3.69	13.10
		On-site	45	5	2.85	1.37	1.56	5.07
		On-site	49	5	2.43	0.41	1.74	2.77
		On-site	54	5	2.72	0.50	2.10	3.16
		On-site	56	5	2.96	1.06	1.29	4.13
		On-site	77	5	3.46	0.84	2.08	4.32
		Perimeter	58	5	3.07	0.33	2.55	3.39
		Perimeter	65E	4	4.21	0.55	3.70	4.99
	Barium	On-site	2NW	4	62.8	3.4	58.1	66.2
		On-site	45	5	68.3	11.5	57.5	85.4
		On-site	51	5	113.4	16.4	87.1	128.0
		Perimeter	59	5	186.6	67.0	96.9	278.0
	Beryllium	On-site	1	5	0.532	0.183	0.237	0.702
		On-site	34	5	0.741	0.161	0.549	0.940
		On-site	41	5	0.472	0.098	0.320	0.558
		On-site	55	5	0.443	0.102	0.311	0.550
		On-site	66	5	0.653	0.116	0.521	0.806
		On-site	76	5	0.502	0.117	0.390	0.647
		On-site	77	5	0.530	0.120	0.374	0.693
		Perimeter	63	5	0.638	0.053	0.572	0.706
		Perimeter	64	5	0.634	0.117	0.528	0.832
	Chromium	On-site	6	5	11.44	1.52	9.61	13.80
		On-site	35	5	8.46	1.31	6.55	10.10
		On-site	45	5	7.94	2.24	5.24	11.30
		On-site	55	5	8.53	2.12	5.35	11.00
		On-site	76	5	9.78	2.78	6.20	13.70
		On-site	77	5	10.08	1.99	6.81	12.10
		Perimeter	4	5	7.66	1.72	5.42	9.48
		Perimeter	61	5	6.51	2.18	3.84	9.69
		Perimeter	64	5	9.56	2.15	5.92	11.40
		Perimeter	65E	4	13.95	3.13	11.10	18.20
	Cobalt	On-site	33	5	5.83	0.71	5.12	6.64
	Copper	On-site	2SW	4	4.93	0.64	4.03	5.53
		On-site	3	5	8.36	3.43	4.79	13.40
		On-site	20	5	12.40	2.60	9.49	16.50
		On-site	45	5	6.17	1.38	4.83	7.81
		On-site	77	5	8.77	1.97	6.59	10.80
	Iron	On-site	6	5	11182	1211	9910	13100
		On-site	33	5	13362	3108	8510	15900
		On-site	35	5	8626	1561	6700	10800
		On-site	45	5	8156	2167	5610	11200
		On-site	55	5	9128	2322	5770	11800
		On-site	76	5	10740	3147	6790	14900
		On-site	77	5	10814	2739	6810	14100
		Perimeter	4	5	7626	1802	5470	9570
		Perimeter	58	5	13914	3354	8370	17500
		Perimeter	61	5	7152	1586	4630	8590
	Lead	On-site	56	5	10.98	1.29	9.22	12.80
		Perimeter	65E	4	17.30	3.07	13.30	20.70
	Magnesium	On-site	34	5	3802	537	3110	4370
		On-site	35	5	2098	249	1870	2470
		On-site	45	5	2258	768	1580	3450
		On-site	51	5	3200	644	2270	3900
		On-site	55	5	3000	490	2290	3510
		On-site	76	5	2752	807	2070	4050
		Perimeter	58	5	4182	333	3740	4680

TABLE 4-13. Summary Statistics for Soil Locations (1998-2004) Identified as PRIORITY-3 for Metals During 2004 (all units in mg/kg) *concluded*

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
	Manganese	On-site	55	5	191	27	164	236
		On-site	56	5	131	36	88	186
	Nickel	On-site	2NW	4	4.92	0.81	3.72	5.49
		On-site	2SW	5	4.72	0.49	4.03	5.20
		On-site	6	5	12.59	2.82	8.67	16.30
		On-site	45	5	5.74	1.01	4.62	7.27
		On-site	55	5	6.58	1.05	4.98	7.87
		On-site	76	5	7.42	1.57	5.81	9.97
		Perimeter	4	5	5.86	0.55	5.36	6.71
		Perimeter	65E	4	13.57	2.47	11.70	17.20
	Potassium	On-site	1	5	3992	1707	1020	5160
		On-site	2NW	4	1590	298	1190	1910
		On-site	34	5	2998	1047	1790	4090
		On-site	45	5	1948	447	1390	2470
		On-site	51	5	2324	829	1370	3400
		On-site	54	5	2138	615	1470	2920
		On-site	55	5	2440	536	1650	3040
		On-site	66	5	2590	665	1900	3390
		On-site	76	5	2370	577	1690	3050
		On-site	78	5	1940	360	1380	2260
		Perimeter	4	5	2336	189	2110	2630
		Perimeter	59	5	1634	247	1240	1920
		Perimeter	64	5	3774	483	3080	4410
	Vanadium	On-site	45	5	15.3	4.4	9.6	21.6
		On-site	54	5	18.3	4.8	11.9	23.5
		On-site	56	5	19.1	5.3	10.3	23.3
		On-site	76	5	20.3	7.1	11.7	31.1
		Perimeter	4	5	16.2	2.4	12.7	18.3
		Perimeter	60	5	27.2	5.0	19.2	31.0
		Perimeter	61	5	18.9	4.3	12.5	23.0
		Perimeter	64	5	35.5	5.4	26.9	41.1
	Zinc	On-site	34	5	39.6	6.1	29.6	45.0
		On-site	45	5	24.9	4.8	19.9	32.6
		On-site	57	5	66.4	26.8	42.0	111.0
		On-site	76	5	29.1	5.6	24.8	38.8
Sediment	Aluminum	Perimeter	60	5	7242	2709	5000	10700
	Chromium	Perimeter	60	5	9.02	2.23	6.31	11.40
	Copper	Perimeter	60	5	8.36	1.79	7.12	11.40
	Iron	On-site	75	5	12006	2346	8230	14400
	Magnesium	On-site	79	4	4685	792	3550	5390
	Manganese	Perimeter	60	5	250	35	213	289
Vegetation	Barium	On-site	34	4	13.1	5.9	8.2	21.3
	Copper	On-site	51	5	4.15	2.34	2.01	8.11
		On-site	52	4	3.93	1.05	2.95	5.23

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

TABLE 4-14. Metal in Soil Concentration Data (compiled from various sources)

		NM Soil Concentrations[2]		NMED Soil Screening Levels[3]		US Soil Concentrations[4]	
Analyte	**ER Background[1]**	**Lower Limit**	**Upper Limit**	**Residential**	**Industrial**	**Lower Limit**	**Upper Limit**
Aluminum		5000	10000	74000	100000	4500	100000
Antimony	3.9	0.2	1.3	30	92	0.25	0.6
Arsenic	5.6	2.5	19	4	17	1	93
Barium	200	230	1800	5200	15000	20	1500
Beryllium	0.8	1	2.3	150	440	0.04	2.54
Cadmium	1	ND	11	70	190	0.41	0.57
Calcium		600	320000				
Chromium	17.3	7.6	42	230	660	7	1500
Cobalt	7.1	2.1	11	4500	13000	3	50
Copper	17	2.1	30	2800	8500	3	300
Iron		1000	100000	23000	69000	5000	50000
Lead	39	7.8	21	400	1000	10	70
Magnesium		300	100000				
Manganese		30	5000	7800	14000	20	3000
Mercury	0.25	0.01	0.06	7	20	0.02	1.5
Molybdenum		1	6.5	380	1200	0.8	3.3
Nickel	25.4	2.8	19	1500	4400	5	150
Potassium		1900	63000				
Selenium	1	0.2	0.8	380	1200	0.1	4
Silica (Silicon)		150000	440000			24000	368000
Silver	1	0.5	5	380	1200	0.2	3.2
Sodium		500	100000				
Strontium		88	440	37000	89000	7	1000
Thallium	1.1			6	18	0.02	2.8
Titanium	10	910	4000			20	1000
Vanadium	33	15	94	530	1600	0.7	98
Zinc	76	18	84	23000	69000	13	300

NOTES: ND = not detectable
(1) Dinwiddie
(Dinwiddie, 1997) *Request for Supplemental Information: Background Concentrations Report, SNL/KAFB*, Letter from S. Dinwiddie, State of New Mexico E
Energy, Kirtland Area Office (These values were a negotiated update of background values originally presented in Background Concentration of Constituents of Concern to the Sandia National Laboratories/New Mexico, Environmental Restoration Project,1994 [IT Corp1994])
(2) NM Soil Surface Concentrations
Dragun, J., Chekiri, K., Elements in North American Soils, 2005, The Association for Environmental Health and Sciences.
(Used San Juan Basin, A Horizon to determine values. * Western US values used.)
(3) NMED Soil Screening Levels (SSL)
Technical Background Document for Development of Soil Screening Levels, NMED 2004a
(4) US Soil Surface Concentrations
Kabata-Pendias, A., Pendias, H., CRC, Trace Elements in Soils and Plants, 3rd Edition, 2002

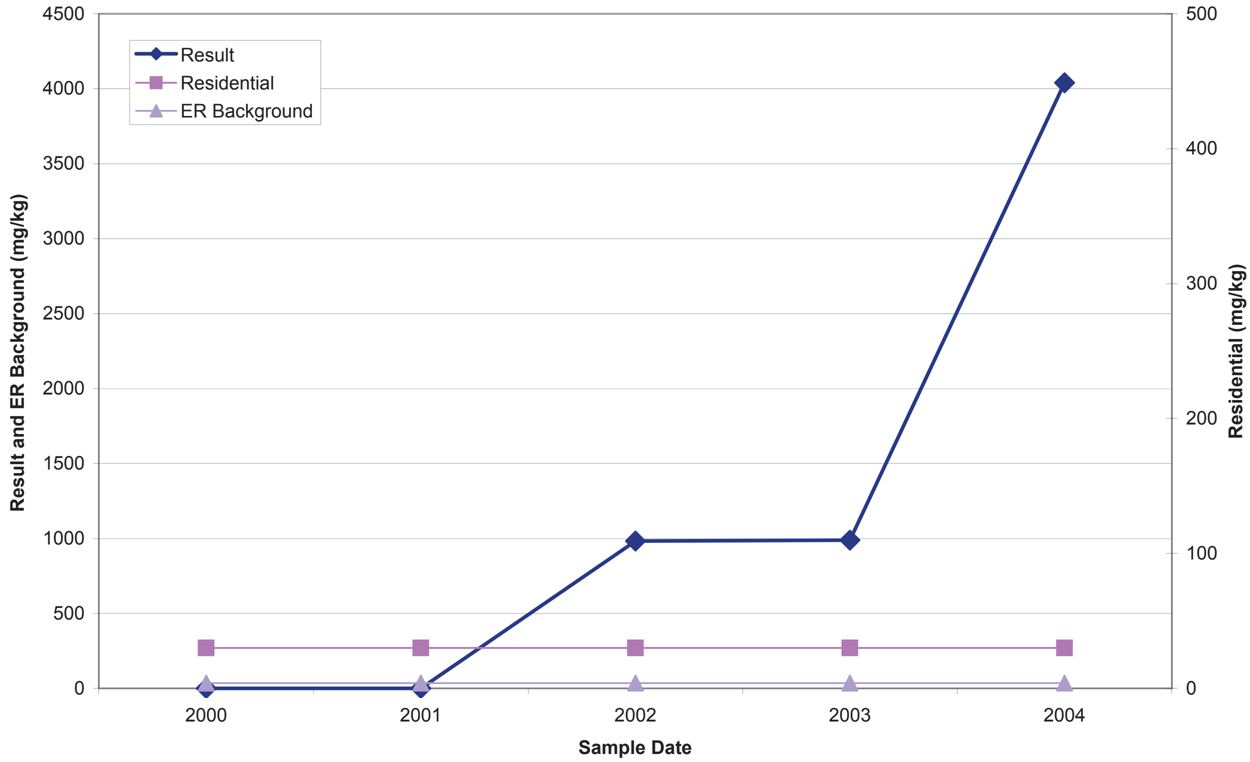

FIGURE 4-4. Antimony Results at Location 20 Compared to RCRA Residential Levels and Environmental Restoration Background Levels

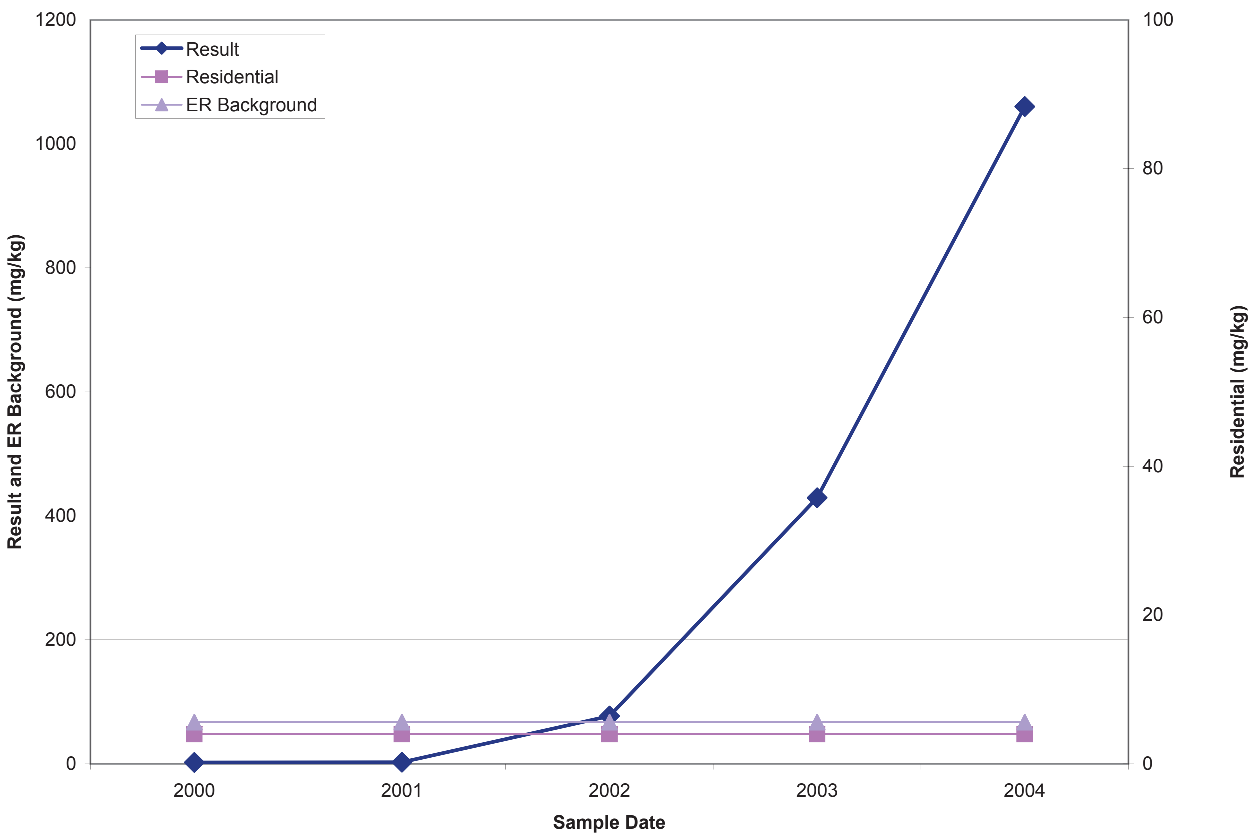

FIGURE 4-5. Arsenic Results at Location 20 Compared to RCRA Residential Levels and Environmental Restoration Background Levels

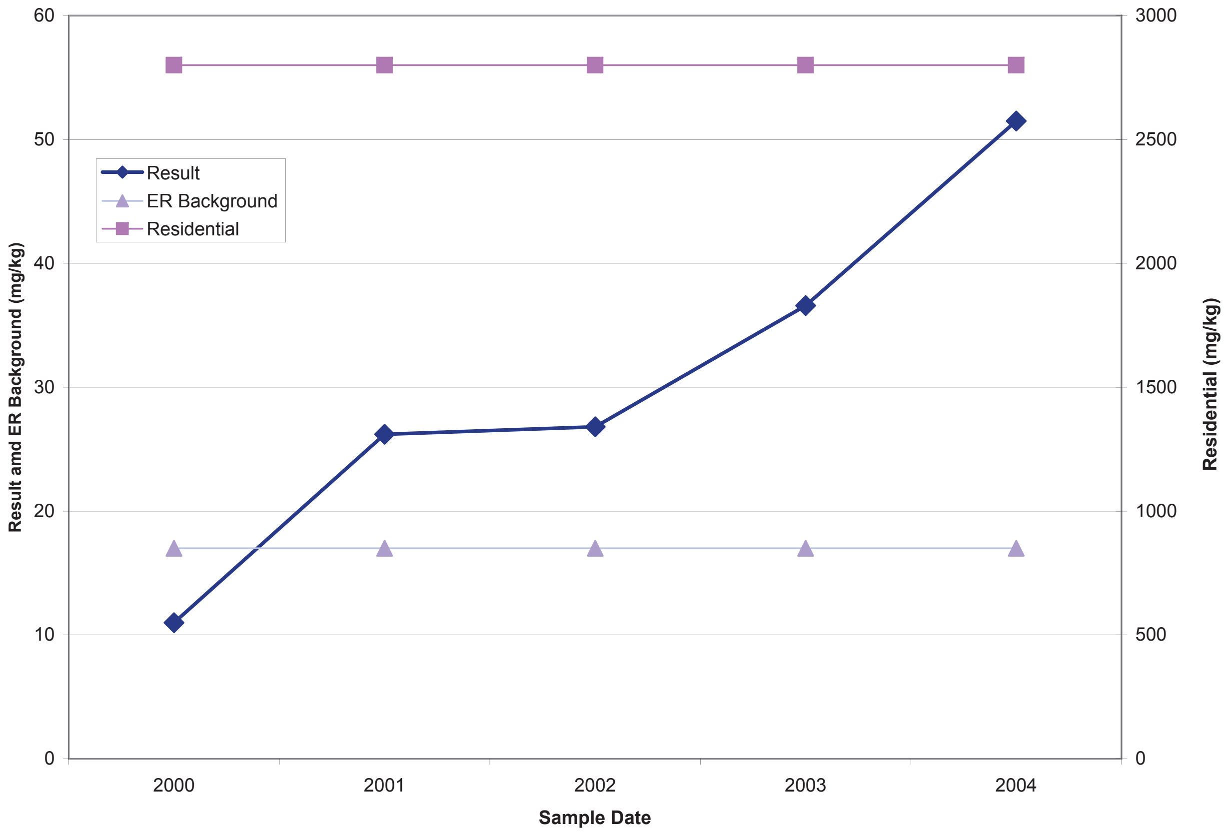

FIGURE 4-6. Copper Results at Location 6 Compared to RCRA Residential Levels and Environmental Restoration Background Levels

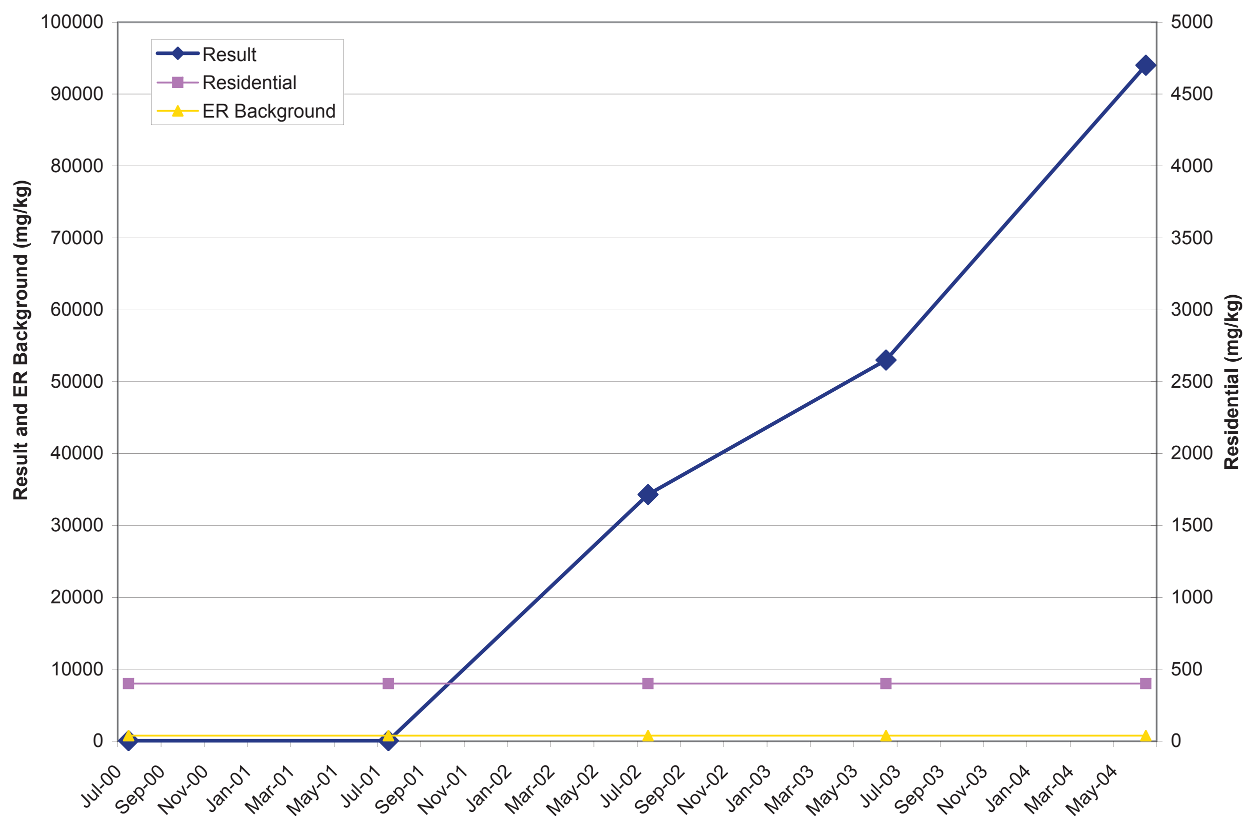

FIGURE 4-7. Lead Results at Location 20 Compared to RCRA Residential Levels and Environmental Restoration Background Levels

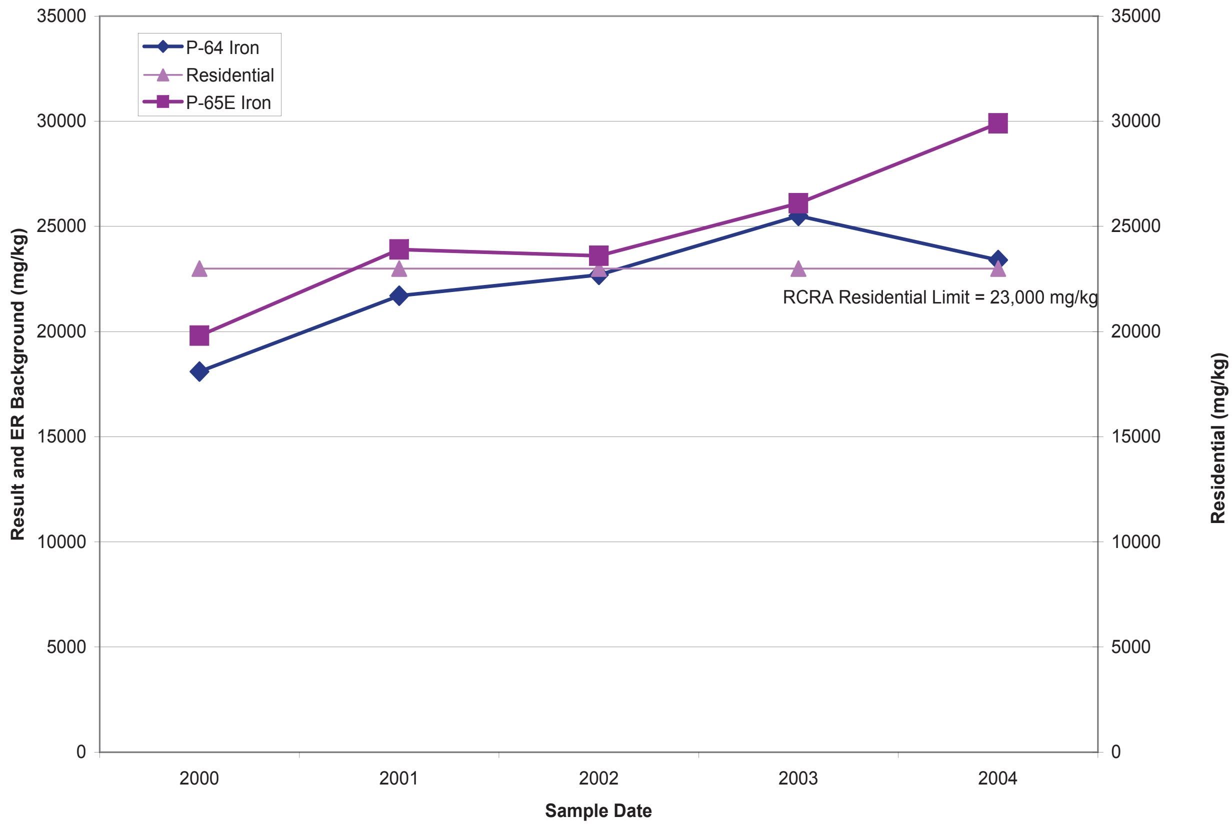

FIGURE 4-8. Iron Results at Perimeter Locations 64 and 65E Compared to RCRA Residential Levels (Note: there are no Environmental Restoration background levels)

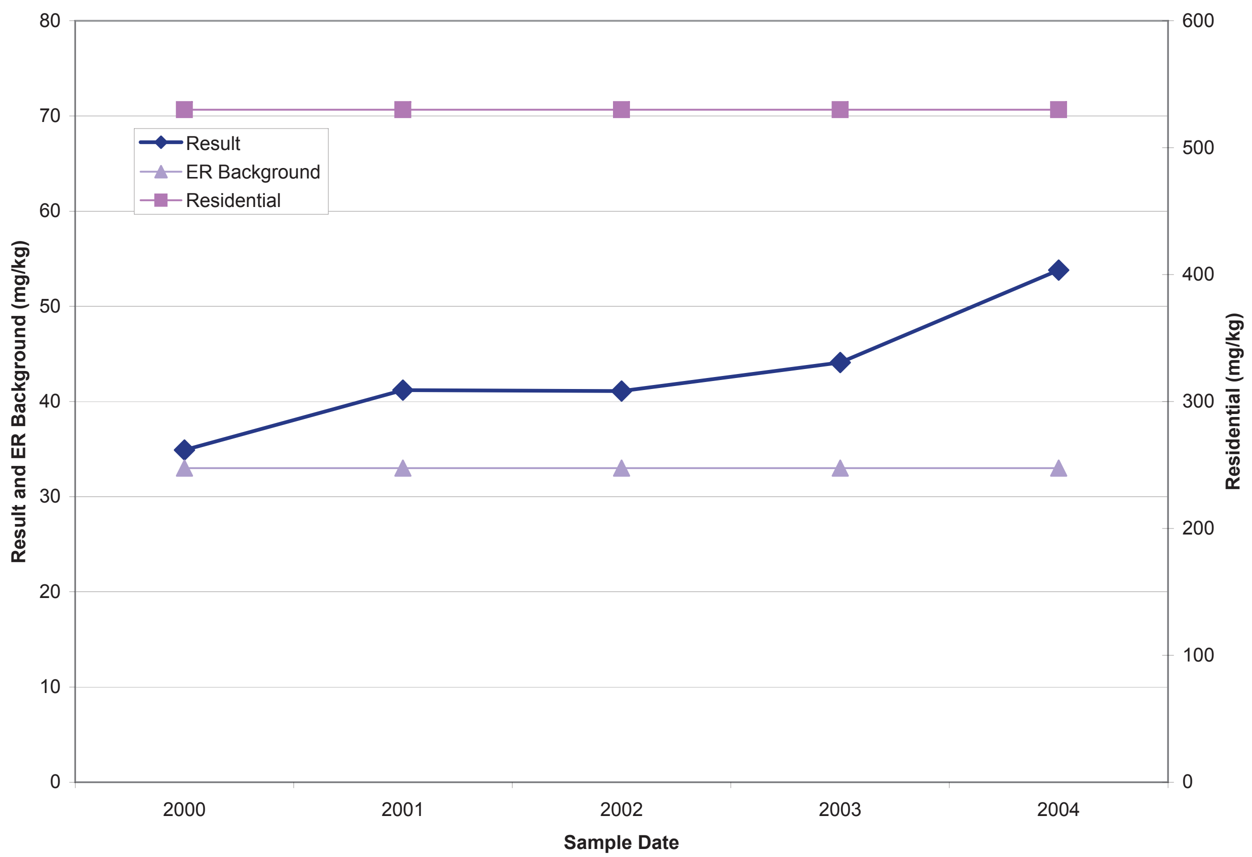

FIGURE 4-9. Vanadium Results at Perimeter Location 65E Compared to RCRA Residential Levels and Environmental Restoration Background Levels

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chapter five

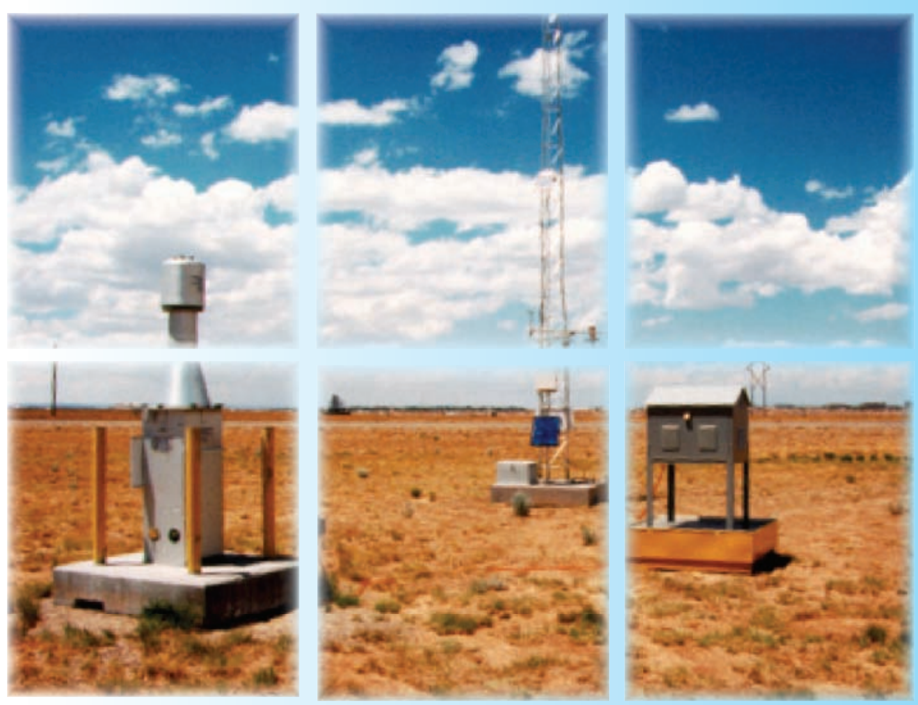
AIR QUALITY COMPLIANCE AND METEOROLOGICAL MONITORING

In This Chapter ...

Meteorological Monitoring Program
Ambient Air Surveillance Program
Radiological Air Emissions
Assessment of Potential Dose to the Public
Air Quality Requirements and Compliance Strategies

Environmental Snapshot

The particulate matter (PM) concentrations for 2004 are lower than the results for 2003. Greater than average rainfall, and a few less windy days help produce lower respirable PM (diameter equal to or less than 10 microns ([PM_{10}]) concentrations in 2004.



Meteorological Tower at SNL/NM

Sandia National Laboratories, New Mexico (SNL/NM) conducts air quality monitoring and surveillance under three programs:

Clean Air Network (CAN) Program - conducts meteorological monitoring and ambient air surveillance.

National Emission Standards for Hazardous Air Pollutants (NESHAP) Program - coordinates with facility owners to meet radiological air emission regulations.

Air Quality Compliance (AQC) Program - ensures that all non-radiological air emission sources at SNL/NM, such as generators, boilers, chemical users, and vehicles meet applicable air quality standards and permitting requirements.

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.

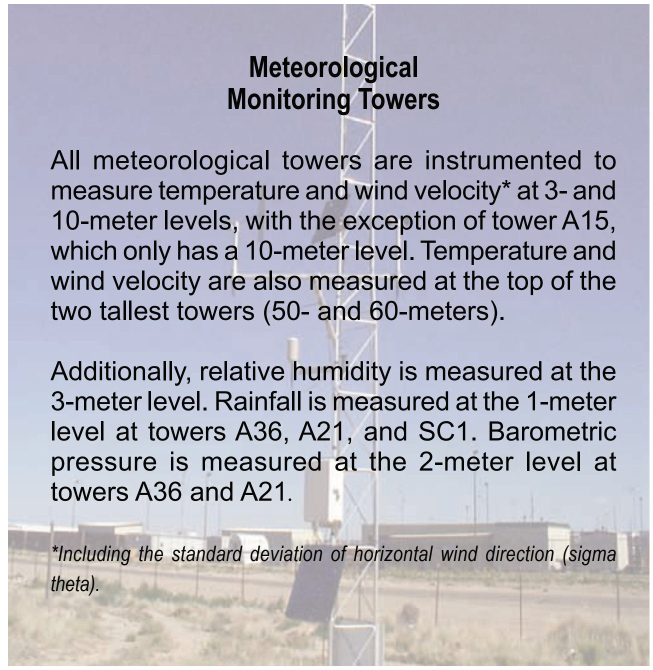
Tower Instrumentation
Sandia Corporation conducts meteorological monitoring through a network of eight meteorological towers located throughout Kirtland Air Force Base (KAFB) on or near SNL/NM property. The network includes:

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

Routine instrument calibrations and weekly tower site visits are performed as part of the Quality Assurance (QA) Program for the monitoring network. 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 2004 annual climatic summary for tower A36 is shown in Table 5-1.



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).*

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 variations and extremes found in meteorological measurements across SNL/NM.

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

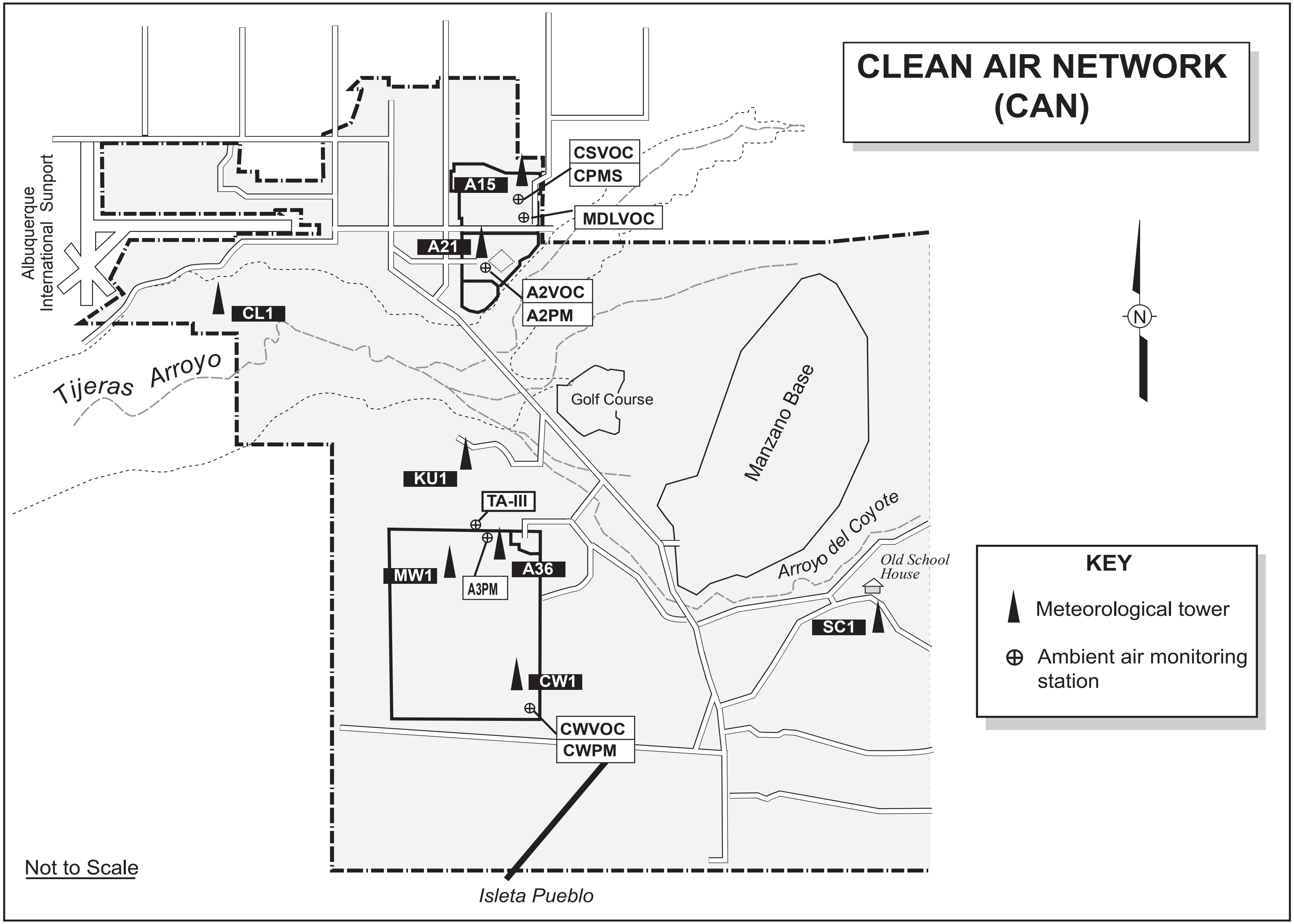


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FIGURE 5-1. The Clean Air Network (CAN) of Meteorological Towers and Ambient Air Monitoring Stations

TABLE 5-1. 2004 Annual Climatic Summary from Tower A36

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (°C)													
Average Daily High	8.25	8.13	17.48	17.64	26.72	30.59	31.43	29.19	25.94	19.07	11.11	7.74	19.44
Average Daily Low	-2.45	-2.50	5.01	5.51	12.13	15.88	16.99	15.80	12.78	6.82	0.92	-3.13	6.98
Monthly Average	3.18	2.76	11.51	11.82	19.94	23.37	24.32	22.13	19.43	13.09	6.20	2.66	13.37
Extremes (°C)													
High	13.49	17.99	26.69	24.70	31.19	34.26	34.98	32.83	31.73	24.61	21.10	16.22	34.98
Low	-10.40	-12.14	-1.42	-0.02	0.74	11.65	12.82	11.68	7.24	0.69	-10.92	-14.72	-14.72
Relative Humidity (%)	51.07	49.72	40.38	43.63	20.23	24.42	36.55	46.05	39.92	53.24	57.72	56.08	43.25
Precipitation (cm)													
Monthly	0.43	3.71	1.73	2.84	0.00	2.57	6.43	1.42	1.80	2.77	2.54	0.91	27.15
24 Hour Max	0.25	1.78	1.35	1.75	0.00	1.83	3.40	0.48	0.91	0.61	1.32	0.56	3.40
Wind (m/sec)													
Monthly	2.74	3.52	4.14	4.98	4.23	4.42	3.82	3.96	3.71	3.73	3.85	2.79	3.82
24 Hour Max	5.95	7.67	8.88	11.23	7.48	7.90	5.49	6.72	6.81	7.51	8.27	6.07	11.23
Maximum Gust	18.26	24.18	26.38	29.26	21.18	29.30	22.82	27.62	18.54	22.10	19.50	19.14	29.30
Barometric Pressure (mb)	834.86	832.94	835.70	833.52	833.35	834.51	836.50	837.77	836.34	835.28	836.46	839.02	835.52

NOTE: Barometric Pressure sensor slow degradation produced approximately 0.5 mb increase in Oct-Dec values

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

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) (20.2.3 NMAC). 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.

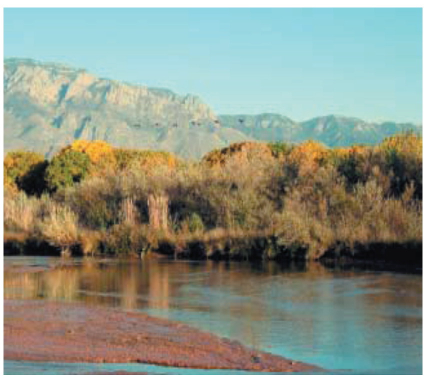
Ambient air surveillance is performed at six locations (illustrated in Figure 5-1).

- ***Criteria Pollutant Monitoring Station (CPMS)*** There is one CPMS in the CAN network. The CPMS is located in the NE corner of TA-I. Criteria pollutants are the set of six common pollutants for which the

Wind Speed

	Minimum (m/sec)	Maximum (m/sec)	Spread (m/sec)
•Average Annual Wind Speed	3.00 tower A15	3.97 tower CW1	0.97
• Greatest Difference in Wind Speed over 24 hours	6.17 tower KU1	9.88 tower A21	3.71 in Dec.
• Greatest Difference in Daily Maximum Wind Speed	15.98 tower A15	29.86 tower MW1	13.88 in Aug.
• Average Difference in Daily Wind Speed	1.32 (all towers)		

Temperature



	Minimum (°C)	Maximum (°C)	Spread (°C)
• Average Annual Temperature	13.10 tower SC1	13.81 tower A15	0.71
• Network Annual Temperature Extremes	-15.56 tower SC1	35.84 tower KU1	51.4
• Greatest Difference in Daily Minimum Temperature	5.0 tower KU1	11.5 tower A15	6.5 in April
• Greatest Difference in Average Daily Temperature	2.6 tower SC1	6.5 tower A15	3.9 in March
• Greatest Difference in Daily Maximum Temperature	14.6 tower A36	17.9 tower KU1	3.3 in Feb.

Precipitation

	Minimum (cm)	Maximum (cm)	Spread (cm)
• Annual Precipitation (Extremes)	27.15 tower A36	33.86 tower A21	6.71
• Daily Rainfall Variation	0.56 tower SC1	3.40 tower A36	2.84 in July
• Greatest Monthly Precipitation Difference	2.85 tower A36	6.10 tower SC1	3.25 in April
•Greatest in Monthly Rainfall occurred in July		6.43 tower A36	

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

FIGURE 5-2. Variations and Extremes in Meteorological Measurements Across the Meteorological Tower Network During Calendar Year 2004.

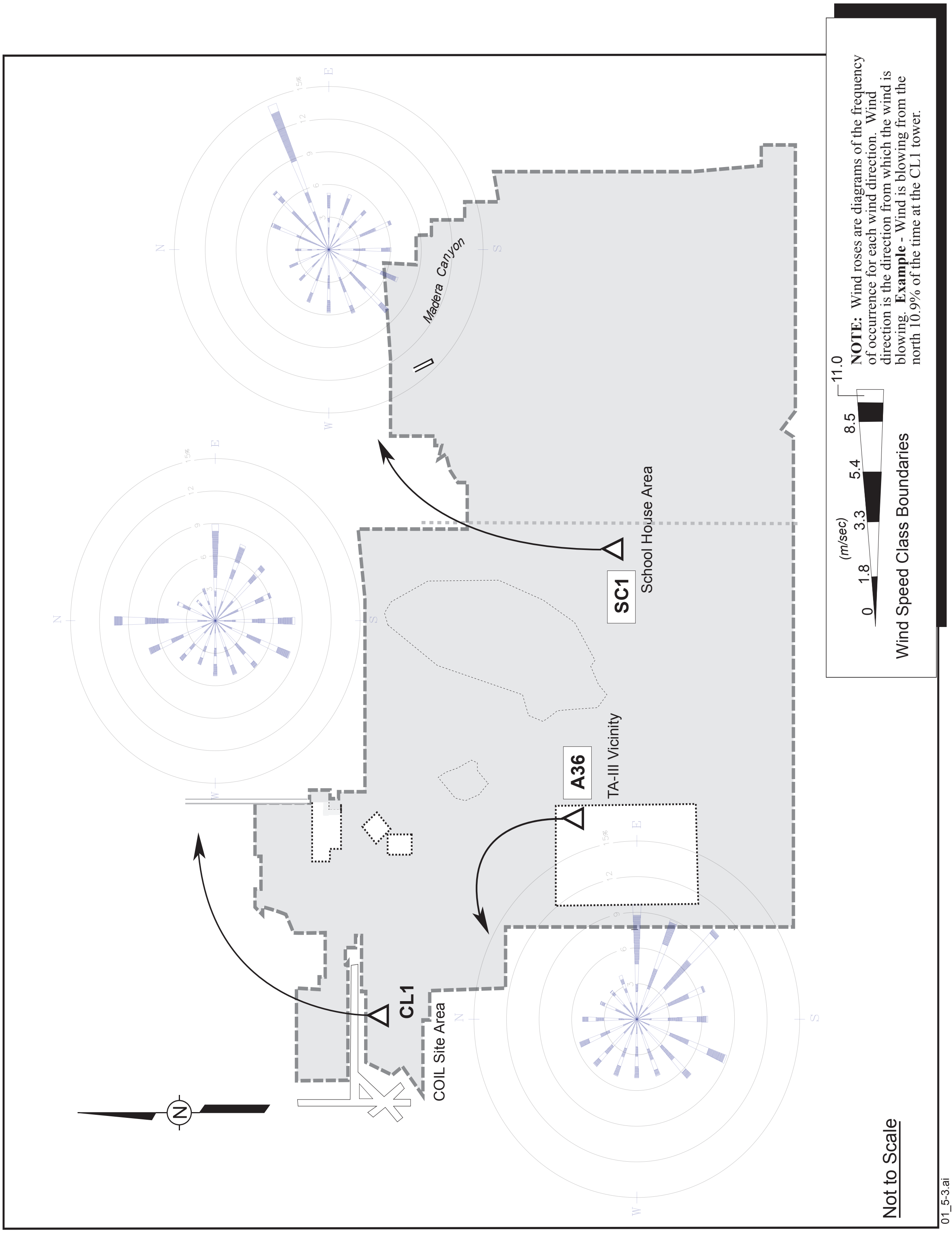


FIGURE 5-3. 2004 Annual Wind Roses for Towers CL1, A36, and SC1

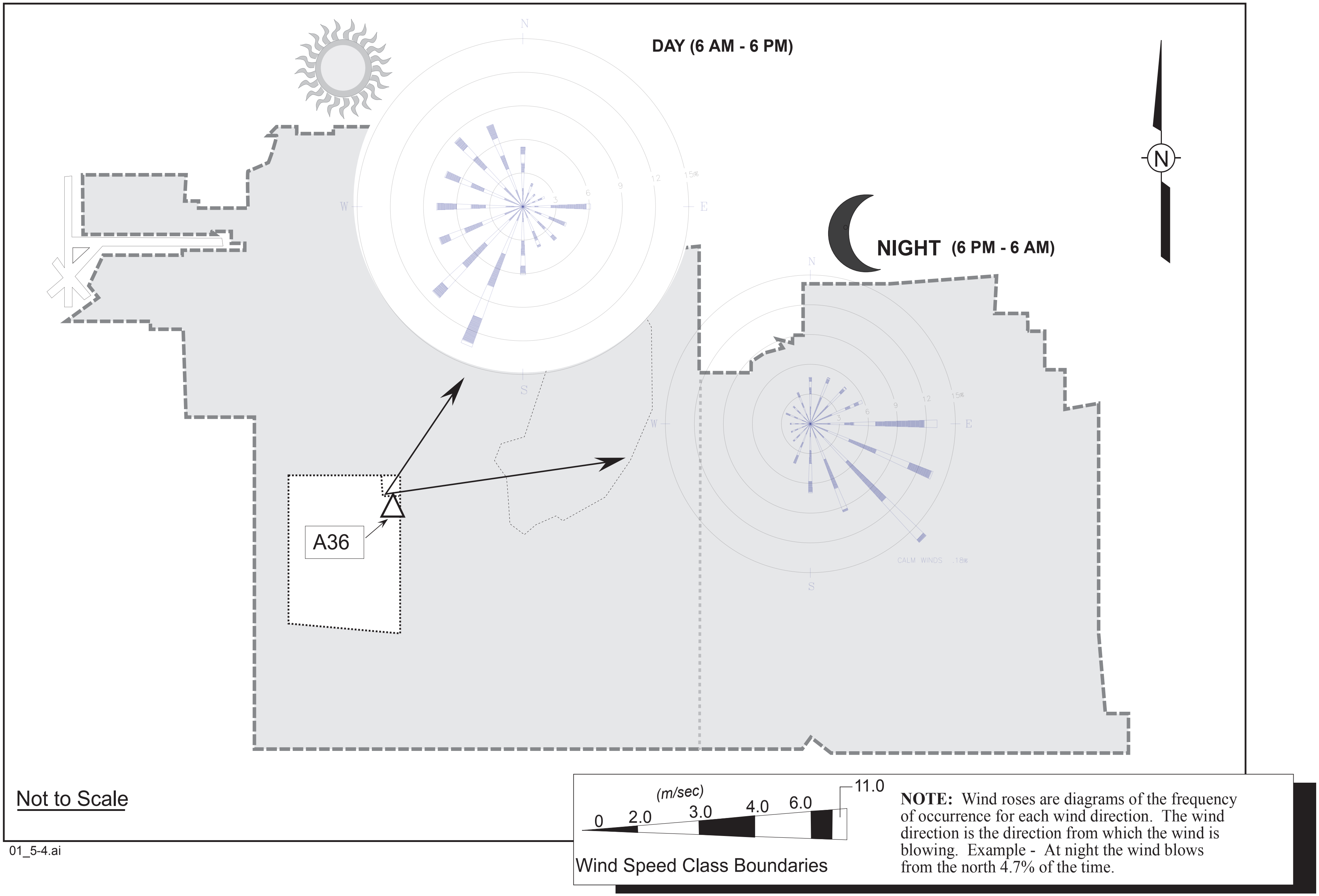


FIGURE 5-4. 2004 Annual Wind Roses for Daytime and Nighttime Wind Frequency at the A36 Tower

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_{10} Stations*** – PM with a diameter equal to or less than 10 microns are measured at four monitoring locations (CPMS, A2PM, A3PM, and CWPM). 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, and are radiologically screened using gross alpha, gross beta and gamma spectroscopy.
- ***$PM_{2.5}$ Stations*** – PM with a diameter equal to or less than 2.5 microns is measured at two locations (CPMS and TA-III) at SNL/NM. $PM_{2.5}$ is measured continuously, and recorded in hourly concentrations 24 hours a day, 365 days a year. Filters are not manually weighed with this system. The mass is calculated with microprocessor measurements. $PM_{2.5}$ and PM_{10} measurements at SNL/NM are done with different instruments, and should not be quantitatively compared with each other due to the differing instrument limitations and processing techniques. $PM_{2.5}$ filters are not sent to a laboratory for chemical analysis.
- ***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.

5.2.1 Ambient Air Monitoring Results

Criteria Pollutants

In 2004, the automated data recovery for criteria pollutants was greater than 99% except for SO_2, which was 98%. Table 5-2 lists the results from the CPMS, PM_{10} and $PM_{2.5}$ monitors and compares them to NAAQS and NMAAQS for criteria pollutants.

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 were no exceedances of the criteria pollutants in 2004.

PM_{10}

Data recovery for PM_{10} (with a diameter equal to or less than 10 microns) was 98 percent complete based on an every-sixth-day sampling schedule. The highest daily particulate loading occurred at the CPMS site. A PM_{10} concentration of 50 ug/m^3 occurred in June 2004.

In March 2004, the A3PM site was established to characterize the particulate air quality prior to, and after commencement of new operations in the northern portion of TA-III. The monitoring site at KSSPM was discontinued at the same time. The KSSPM site was decommissioned so the monitor could be relocated to the strategically located A3PM site location.

The monthly and annual averages for PM_{10} are listed in Table 5-3. The PM concentrations for 2004 are lower than the results for 2003. Greater than average rainfall, and a few less windy days help produce lower PM_{10} concentrations in 2004. Trending of the particulate data is not presented here due to the effects natural phenomena have on trending results, which mask SNL/NM operations' influence on particulate concentrations.

All filters collected from the PM_{10} stations that have complete field data are analyzed for 23 metals, plus the radiological analyses. Filters are collected every sixth day and are consolidated into monthly composites for analyses. In 2004, monthly composites varied from three 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 than the radiological decision levels or instrument detection limits. Table 5-5 lists the averaged results of the PM_{10} analysis. It should be noted that the radionuclides are naturally occurring or remnants, and are not emitted from sources at the SNL/NM.

An Analysis of Variance (ANOVA) was performed to determine if statistical differences existed between stations. The results of the ANOVA indicated that lead and nickel were statistically higher at the CPMS site. These heavy metals are found together in storage batteries, electrodes, and electronics, all of which can be found in the proximity of the CPMS station. The concentrations are very low, but do provide a good example of how local activities may effect particulate constituents.

$PM_{2.5}$

This is the first year that $PM_{2.5}$ is reported in the Annual Site Environmental Report (ASER). $PM_{2.5}$ is also known as "fine particulate." Fine particulates are thought to be a greater health hazard than PM_{10} because the smaller sized particles can lodge deep in the lungs. Most $PM_{2.5}$ is created either directly from combustion of all types of fossil fuels, including wood burning, or by secondary reactions of gases created in the combustion process with other gases in the atmosphere. The data recovery for $PM_{2.5}$ measurements was approximately 99%.

The monthly and annual averages for $PM_{2.5}$ are listed in Table 5-4. In 2004, the highest concentrations were found in the summer months and were most likely the result of wildland fire smoke transported from areas outside of SNL/NM. There were two days in June 2004 at the CPMS station where high particulate concentrations for several hours were severe enough to impact the monthly average. It is believed these concentrations were produced by moving trucks and roofing work that was in close proximity to the monitoring station.

VOCs

The VOCs generally observed at SNL/NM are products or by-products of fossil fuels or are from lab operations.

TABLE 5-2. 2004 Criteria Pollutant Results as Compared to Regulatory Standards

Criteria Pollutant	Averaging Time	Unit	NMAAQS Standard	NAAQS Standard	Maximum or Measured Concentrations
Carbon Monoxide	1 hour	ppm	13.1	35	7.42
	8 hours	ppm	8.7	9	2.15
Nitrogen Dioxide	24 hours	ppm	0.10	-	0.036
	Annual	ppm	0.05	0.053	0.013
Sulfur Dioxide§	3 hours	ppm	-	0.50	0.007
	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	0.078
	8 hour	ppm		0.08	0.069[a]
PM_{10}	24 hours	µg/m^3	-	150	50[b]
	Annual	µg/m^3	-	50	12.36
$PM_{2.5}$	24 hours	µg/m^3	-	65	23.58[c]
	Annual	µg/m^3	-	15.0	9.19
Lead	30 days	µg/m^3	-	-	0.0031
	Any quarter	µg/m^3	1.5	1.5	0.0019

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 – per regulatory standards.
[b] Reported as the 99th percentile value - per regulatory standards
[c] Reported as the 98th percentile value - per regulatory standards

TABLE 5-3. Monthly and Annual Averages for PM_{10}

Sample Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
A2PM	8	8.6	10	8.6	11.2	18.2	16.8	10.2	11	6.25	4.4	6.2	9.95
CPMS	10.2	11.6	13	7.75	11.4	24.6	17.8	12.3	15.6	8.4	7	8.6	12.36
CWPM	5.4	6.8	7.6	8	9.2	15.3	14.6	11.8	8.8	6	3.4	4	8.41
A3PM	NA	NA	NA	10	8.8	15	14	8.0	8.4	4.8	3.8	5	8.64

TABLE 5-4. Monthly and Annual Averages for $PM_{2.5}$

Sample Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
CPMS	7.80	6.99	7.56	8.35	10.35	20.41	11.33	8.71	8.13	6.83	6.66	7.12	9.19
TA-III	6.37	5.67	6.60	8.11	9.66	11.62	9.57	6.91	6.91	6.43	5.44	5.77	7.42

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

Analyte	Units	A2PM	CPMS	CWPM	A3PM	TLV
Aluminum	ug/m^3	0.183	0.218	0.314	0.237	2000
Antimony	ug/m^3	0.000	0.000	0.000	0.000	500
Arsenic	ug/m^3	0.000	0.000	0.000	0.000	10
Barium	ug/m^3	0.027	0.057	0.044	0.024	50
Cadmium	ug/m^3	0.000	0.000	0.000	0.000	10
Calcium	ug/m^3	0.398	0.692	0.451	0.416	2000
Chromium	ug/m^3	0.001	0.001	0.000	0.000	10
Cobalt	ug/m^3	0.000	0.000	0.000	0.000	20
Copper	ug/m^3	0.013	0.011	0.009	0.012	1000
Iron	ug/m^3	0.130	0.183	0.113	0.103	5000
Lead	ug/m^3	0.001	0.002	0.001	0.001	150
Magnesium	ug/m^3	0.104	0.142	0.131	0.122	10000
Manganese	ug/m^3	0.003	0.005	0.003	0.003	200
Nickel	ug/m^3	0.000	0.000	0.000	0.000	50
Potassium	ug/m^3	0.161	0.159	0.110	0.158	2000
Selenium	ug/m^3	0.000	0.000	0.000	0.000	200
Silver	ug/m^3	0.000	0.000	0.000	0.000	10
Sodium	ug/m^3	6.884	4.921	5.133	2.306	5000
Vanadium	ug/m^3	0.000	0.001	0.000	0.001	50
Zinc	ug/m^3	0.006	0.015	0.010	0.009	10
Uranium	ug/m^3	0.003	0.000	0.000	0.001	200
RADIONUCLIDES						
Alpha	Gross Alpha	0.004	0.009	0.007	0.004	
Beta	Gross Beta	0.015	0.016	0.017	0.018	
Beryllium-7	pCi/m3	0.145	0.159	0.132	0.153	40000
Bismuth-214	pCi/m3	0.002	0.002	0.002	0.003	2000
Cesium-137	pCi/m^3	0.001	0.004	0.001	ND	400
Lead-212	pCi/m3	0.002	0.001	0.002	0.002	80
Lead-214	pCi/m^3	0.002	0.001	0.002	0.001	2000
Potassium-40	pCi/m3	0.013	0.011	0.010	0.006	900
Radium-226	pCi/m^3	0.002	0.002	0.002	0.003	1
Radium-228	pCi/m3	0.002	0.002	0.004	0.002	3
Thorium-232	pCi/m^3	0.002	0.001	0.002	0.002	0.01
Thorium-234	pCi/m3	0.046	0.054	0.022	0.054	400
Uranium-238	pCi/m^3	0.046	0.054	0.022	0.054	0.1

NOTE: $\mu g/m^3$ = 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 2005).
The TLVs listed for the radionuclides are derived from DOE Order 5400.5 dose concentration guidelines defined for 100 m/rem.
ND = not detected

TABLE 5-6. VOC Average Concentrations Compiled from Monthly Results at Four Stations
Average was computed using only detected results.

Compound	CSVOC	CWVOC	MDLVOC	A2VOC	TLV
1,1,1-Trichloroethane **	ND	7.25	19.49	ND	350000
1,1,2-Trichlorotrifluoroethane**	0.11	ND	ND	ND	1000000
1-Butene/Isobutene	0.78	0.19	0.99	1.93	NA
2,2,4-Trimethylpentane	0.12	0.17	ND	0.10	NA
2-Butanone (MEK)	0.94	ND	1.00	3.13	200000
2-Methylbutane	3.69	0.72	6.86	2.63	1770000
3-Methylpentane	0.80	0.14	0.53	0.74	500000
Acetone	4.10	3.97	4.93	4.50	500000
Benzene	0.55	0.15	0.29	0.21	500
Carbon tetrachloride**	0.11	0.11	ND	ND	5000
Chlorobenzene	0.06	ND	ND	ND	10000
Chloromethane	0.61	0.56	0.60	0.62	50000
Dichlorodifluoromethane**	0.60	0.59	0.64	0.60	1000000
Ethylbenzene	0.17	ND	0.20	ND	100000
Isohexane	0.56	ND	0.28	0.25	100000
Methylene chloride	2.00	1.78	2.95	1.07	50000
n-Butane	3.55	0.50	1.26	0.84	800000
n-Hexane	1.33	0.64	0.54	1.05	50000
n-Pentane	1.47	0.74	3.14	1.28	600000
o-Xylene	0.14	ND	0.17	ND	100000
p-Xylene/m-Xylene	0.35	ND	0.36	0.25	100000
Tetrachloroethene	0.21	ND	ND	ND	25000
Toluene	2.17	0.25	1.35	0.66	50000
Trichlorofluoromethane**	0.33	0.28	0.30	0.31	1000000
TNMHC	37.03	14.20	24.77	28.58	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 2005)
** Ozone depleting compounds.

In 2004, the data recovery for VOC monitoring was 100 percent. Monthly VOC samples were analyzed for 26 VOC species plus total non-methane hydrocarbon (TNMHC). Table 5-6 shows the compiled results for compounds detected.

The concentrations in Table 5-6 show that there is no one site that has the highest concentration for all analytes. The VOC 1,1,1–Trichloroethane at the Microelectronics Development Lab (MDL) was driven by higher summer concentrations.

An ANOVA was performed to determine if statistical differences existed between locations for each VOC. The ANOVA revealed that there were no statistically valid differences. The 1,1,1-TCA at the MDLVOC did not pass the statistical difference test.

5.3 RADIOLOGICAL AIR EMISSIONS

The U.S. Environmental Protection Agency (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 maximally exposed individual (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's Environmental Health Division. The NESHAP report is complemented 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 City of Albuquerque upon request. The NESHAP reports prepared in 2004 include the *NESHAP Annual Report for CY04, Sandia National Laboratories, New Mexico* (SNL 2005a) and the *Radiological Dose Calculations and Supplemental Dose Assessment Data for NESHAP Compliance, Sandia National Laboratories, New Mexico 2004* (SNL 2005c).

5.3.2 SNL/NM NESHAP Facilities

SNL/NM currently has 15 potential NESHAP facilities that may be defined as either point or diffuse emissions sources. Three secondary facilities (Saturn, SPHNIX, and STAR) have been removed from the facility list in this years ASER due to the lack of airborne releases for consecutive years. 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 5-7 lists the radionuclides and the total reported emissions (in curies) from each SNL/NM NESHAP source in 2004. Of the 15 sources, 14 were point sources and one was a diffuse source (landfill). Two of the 15 facilities reported no emissions in 2004.

The 15 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 2004.

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. This facility currently emits only tritium. The facility has two stacks, but only utilizes the main stack in the Tritium Envelope North Wing. In 2004, 0.11 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).

Emissions from NGF are expected to increase over the next few years due to an increase in their production.

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 2004, the facility reported emissions of cobalt-60 and cesium-137.

TANDEM Accelerator – This is an ion solid interaction and defect physics accelerator facility. Although the

TABLE 5-7. Summary of Radionuclide Releases from the 15 NESHAP Sources in 2004

TA	Facility Name	Monitoring Method *	Used in Dose Calculation?	Radionuclide	Reported Release (Ci/yr)
I	Sandia Tomography and Radionuclide Transport (START) Laboratory	Calculation	No	^{60}Co ^{137}Cs	2.5E-08 5.0E-09
I	Radiation Laboratory	Calculation	No	^{3}H ^{13}N ^{41}Ar	1.0E-05 1.0E-06 1.0E-09
I	Calibration Laboratory	Calculation	No	^{3}H	6.9E-05
I	Neutron Generator (NGF)	Continuous	Yes	^{3}H	0.11
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	2.7E-04
II	Explosive Components Facility (ECF)	Calculation	No	^{3}H	8.4E-04
III	Mixed Waste Landfill (MWL)	Periodic	Yes	^{3}H	0.09
III	Radioactive & Mixed Waste Management Facility (RMWMF)	Continuous	Yes	^{3}H ^{241}Am ^{90}Sr ^{137}Cs	1.1 1.0E-05 3.9E-07 3.6E-08
IV	HERMES III	Periodic	No	^{13}N ^{15}O	1.3E-03 1.3E-04
IV	Z-Facility (Accelerator)	Calculation	No	^{3}H ^{238}U ^{234}U ^{235}U	1.6E-07 2.0E-07 9.2E-09 2.1E-07
V	Hot Cell Facility (HCF)	Periodic	Yes	N/A	N/A
V	Annular Core Research Reactor (ACRR)	Periodic	Yes	^{41}Ar	4.5
V	Sandia Pulsed Reactor (SPR)	Periodic	Yes	N/A	N/A

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
Ci/yr = curies per year
TA= Technical Area
N/A = not available

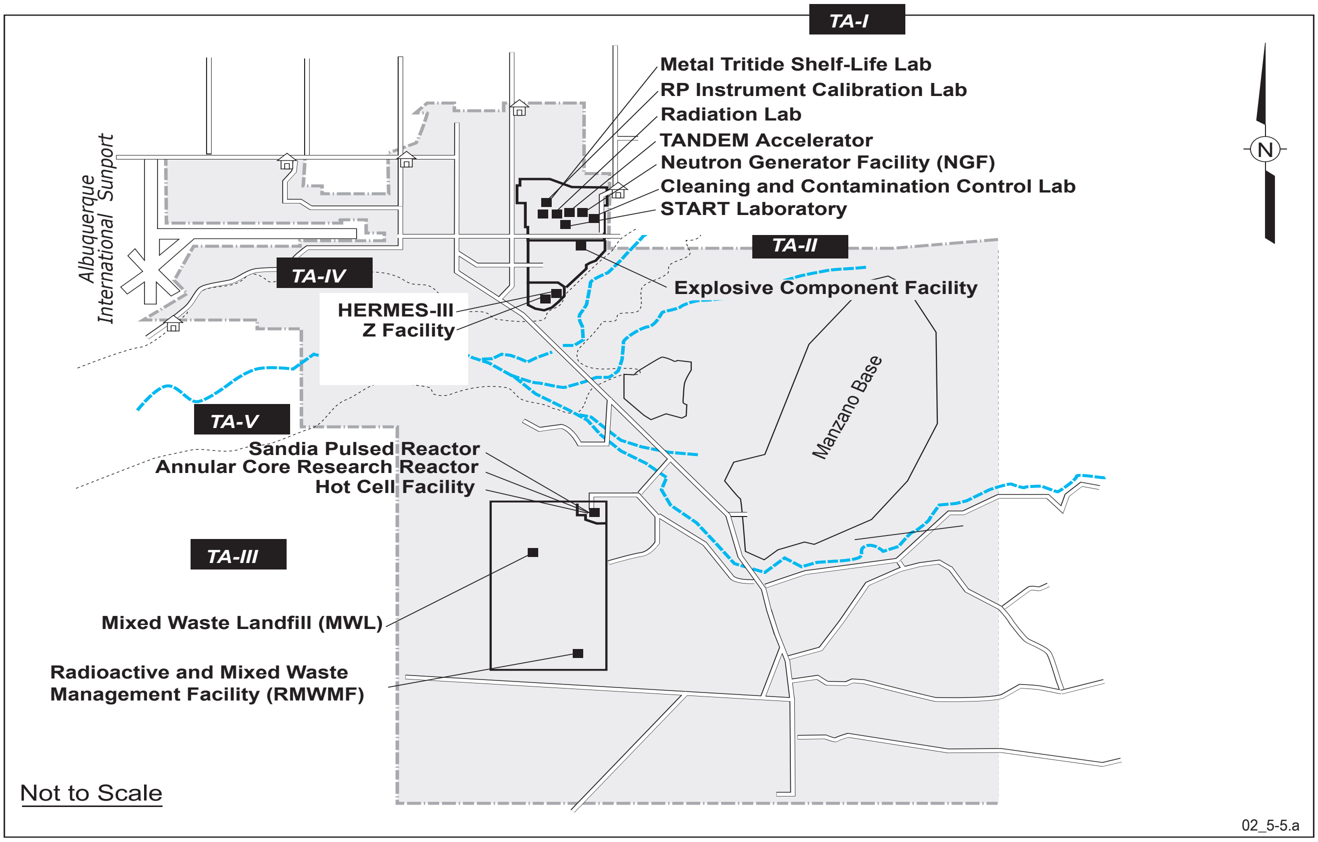


FIGURE 5-5. Locations of the 15 Facilities at SNL/NM that Provided Radionuclide Release Inventories in 2004

TANDEM did not operate in 2004, the facility reported potential emissions of tritium that were being housed in the facility.

TA-II Sources

Explosive Components Facility (ECF) – The ECF conducts destructive testing on neutron generators. In 2004, the facility reported emissions of tritium.

TA-III Sources

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, 1993, and 2003, three special studies were conducted to quantify the tritium emissions (Anderson 2004). The most recent value, from 2003, is used for their annual inventory.

Radioactive and Mixed Waste Management Facility (RMWMF) – The RMWMF primarily handles low-level waste (LLW), mixed waste (MW), and some transuranic (TRU) waste. In 2004, 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. In 2004, the facility reported releases of nitrogen-13 and oxygen-15.

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 2004, the facility reported releases of tritium, uranium-234, uranium-235, and uranium-238.

TA-V Sources

Annular Core Research Reactor (ACRR) – This reactor is used primarily to support defense program projects. If required in the future, the facility also has the capability to support the Medical Isotope Production Project (MIPP). Argon-41, an air activation product, was the only reported release in 2004.

Hot Cell Facility (HCF) – The HCF provides full capability to remotely handle and analyze radioactive materials such as irradiated targets. In 2004, the facility was used for the 7% enriched project and the lead characterization program. The 7% enriched project is done in a fully enclosed and filtered glovebox, therefore there were no reportable emissions. The lead characterization program work is done where there is triple HEPA filtration, so again there were no reportable emissions.

Sandia Pulsed Reactor (SPR) – The SPR is used to produce intense neutron bursts for effects testing on materials and electronics. There were no reportable emissions released in 2004.

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 seven "primary" sources (ACRR, SPR, HCF, Z Facility, NGF, RMWMF, and MWL) are modeled using EPA's CAA Assessment Package-1988 (CAP88) (EPA 2002) to estimate the annual dose to each of 35 identified public receptors. Primary sources are those that determine their emissions by direct measurements or by calculations based on measured operational parameters. The HCF and SPR were the only primary sources to report no emissions in 2004.

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 2004, 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 14 years. There was a sharp decrease of tritium from 2003 because of a reduction in the amount of tritiated oil that needed treatment for 2004.

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 2004, the NESHAP calculation for resident population was based on the state's 2000 to 2001 estimated urban and county population data and U.S. Census Bureau data (DOC 2005). The beef and dairy cattle numbers and food crop area fraction were calculated using 1998 agricultural statistics. The statistics were supplied by the New Mexico Department of Agriculture (NMDOA 2005). The following values were used in the 2004 CAP88 calculation:

1.927	Dairy cattle/km^2
1.156	Beef cattle/km^2
8.1E-04	Acres of food crops/m^2
793,740	Population (within 50-mi radius)

On-site and Off-site Public Receptors

A total of 35 receptor locations (24 on-site at KAFB and 11 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 Pueblo, 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.

Meteorology

Data from four meteorological towers (CW1, A36, A21, and MW1) in the proximity of NESHAP emission sources were used in 2004. 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 5-8 and 5-9, respectively. Dose assessment results are summarized in Table 5-10.

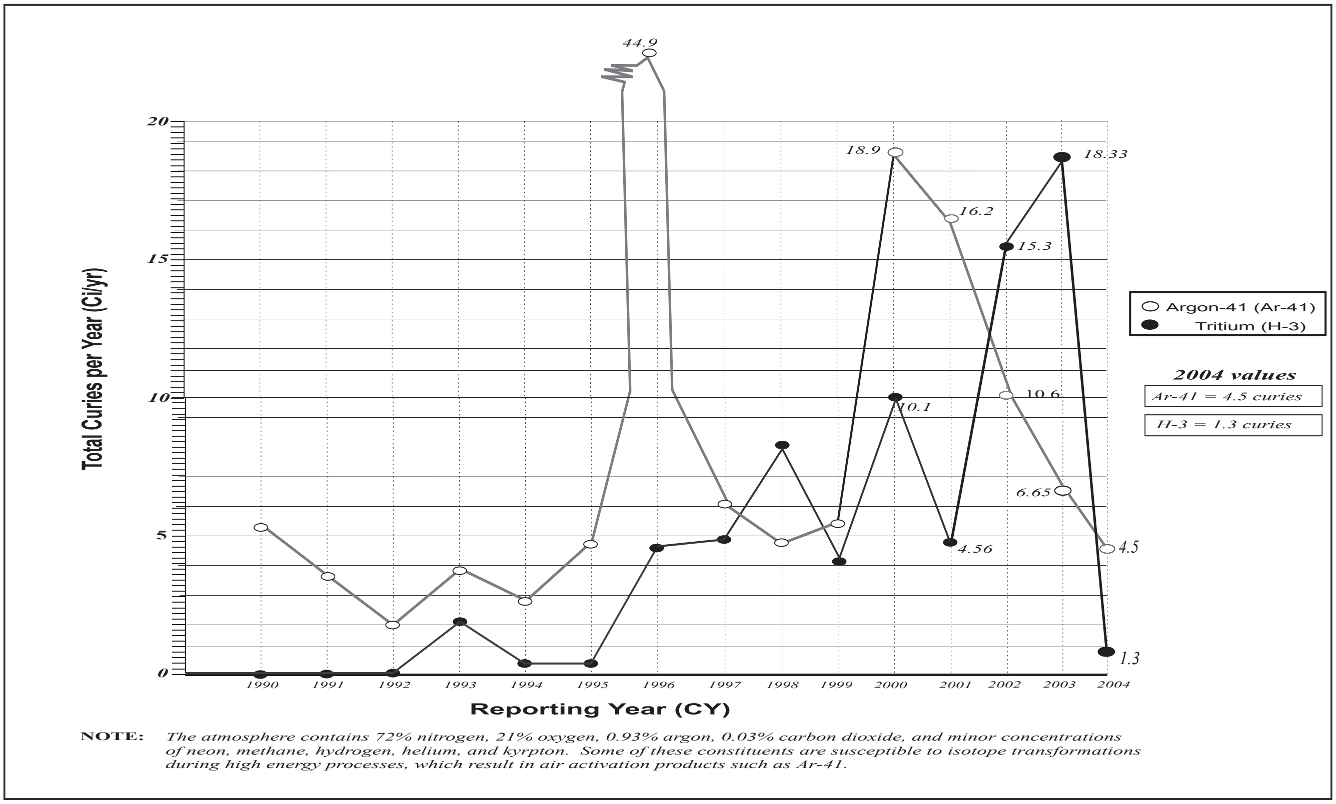


FIGURE 5-6. Summary of Atmospheric Releases in Argon-41 and Tritium from SNL/NM Facilities Since 1990 (Emissions vary from year to year based on operations within the facility)

TABLE 5-8. Annual Source-Specific Effective Dose Equivalent (EDE) to Off-site Receptors in 2004

Receptor	ACRR	MWL	NGF	SPR	RMWMF	Z Facility	EDE (mrem/yr)
Albuquerque City Offices	3.1E-06	6.2E-07	2.1E-06	0.0	2.2E-05	1.7E-07	**2.8E-05**
East Resident	2.7E-06	6.0E-07	2.1E-06	0.0	1.4E-05	1.2E-07	**1.9E-05**
Eubank Gate Area	6.8E-05	9.4E-07	4.7E-06	0.0	6.7E-05	4.2E-06	**1.4E-04**
Four Hills Resident	1.5E-06	5.9E-07	2.1E-06	0.0	1.2E-05	1.1E-07	**1.6E-05**
Isleta Casino	2.5E-06	6.1E-07	2.1E-06	0.0	2.8E-05	1.8E-07	**3.3E-05**
La Luz Childcare	2.3E-05	6.6E-07	2.2E-06	0.0	3.5E-05	5.5E-07	**6.1E-05**
Manzano Mesa Apartments	6.5E-06	6.4E-07	2.2E-06	0.0	2.1E-05	2.5E-07	**3.1E-05**
Tijeras Arroyo (West)	3.1E-06	6.2E-07	2.1E-06	0.0	2.2E-05	1.7E-07	**2.8E-05**
USGS	2.0E-05	7.0E-07	2.2E-06	0.0	4.0E-05	2.4E-07	**6.3E-05**
VA Hospital	1.0E-05	7.0E-07	2.2E-06	0.0	3.6E-05	3.3E-07	**1.9E-05**
Willow Wood Housing	7.4E-06	6.2E-07	2.1E-06	0.0	2.3E-05	2.3E-07	**3.3E-05**

NOTE: mrem/yr = millirem per year
SPR = Sandia Pulsed Reactor
RMWMF = Radioactive Mixed Waste Management Facility
ACRR = Annular Core Research Reactor
MWL = Mixed Waste Landfill
NGF = Neutron Generator Facility

TABLE 5-9. Annual Source-Specific Effective Dose Equivalent (EDE) to On-site Receptors in 2004

Receptor	ACRR	MWL	NGF	SPR	RMWMF	Z Facility	EDE (mrem/yr)
Airport	1.30E-04	4.30E-07	1.40E-06	1.20E-08	7.80E-05	5.00E-06	2.15E-04
ANG Communications Flight	7.70E-05	3.50E-07	1.40E-06	1.00E-08	6.70E-05	4.00E-06	1.50E-04
Bernalillo County Sheriff Training	1.40E-04	3.90E-07	2.70E-07	3.30E-09	1.20E-04	9.30E-07	2.62E-04
Capeheart West	6.30E-06	8.60E-08	8.80E-08	7.80E-10	2.40E-05	2.10E-07	3.07E-05
Chestnut Site	1.30E-04	7.70E-07	1.60E-07	1.60E-09	9.10E-04	6.30E-07	1.04E-03
Child Development Center	5.60E-06	8.30E-08	7.70E-08	6.80E-10	2.00E-05	1.70E-07	2.59E-05
Golf Course Club House	3.70E-04	8.50E-07	4.50E-07	7.30E-09	1.50E-04	4.00E-06	5.25E-04
Golf Course Maintenance Area	2.50E-04	6.50E-07	6.10E-07	1.20E-08	1.20E-04	5.40E-06	3.77E-04
Honeywell Systems\Support Site	8.20E-05	3.70E-07	8.60E-06	4.80E-08	6.80E-05	1.40E-05	1.73E-04
ITRI/Lovelace	4.40E-05	2.00E-07	1.10E-07	1.10E-09	8.10E-05	3.80E-07	1.26E-04
KAFB Fire Station	7.80E-05	3.10E-07	2.50E-06	2.40E-08	5.80E-05	6.40E-06	1.45E-04
KAFB Landfill	3.40E-05	1.50E-07	1.50E-07	1.80E-09	4.60E-05	6.60E-07	8.10E-05
Kirtland Elementary	5.00E-06	7.80E-08	7.10E-08	6.30E-10	1.90E-05	1.50E-07	2.43E-05
Kirtland Storage Site	7.70E-04	2.00E-06	4.40E-07	5.80E-09	1.80E-04	3.80E-06	9.56E-04
Manzano Fire Station	1.60E-04	4.10E-07	2.60E-07	3.20E-09	1.20E-04	8.90E-07	2.82E-04
Maxwell Housing	5.80E-06	8.40E-08	7.80E-08	6.90E-10	2.00E-05	1.70E-07	2.61E-05
Pershing Park Housing	5.90E-05	2.50E-07	1.20E-06	1.10E-08	5.00E-05	3.30E-06	1.14E-04
Riding Club	3.80E-04	6.50E-07	3.20E-07	4.10E-09	1.50E-04	1.40E-06	5.32E-04
Sandia Area Federal\Credit Union	9.20E-05	3.50E-07	5.40E-06	3.10E-08	6.50E-05	1.00E-05	1.73E-04
Sandia Elementary School	5.20E-05	2.70E-07	2.00E-06	1.60E-08	5.20E-05	4.10E-06	1.10E-04
Shandiin Childcare	8.80E-05	3.50E-07	2.60E-06	1.80E-08	6.40E-05	7.00E-06	1.62E-04
Vehicle Maintenance Flight	7.50E-05	3.50E-07	1.30E-06	1.10E-08	6.70E-05	3.80E-06	1.47E-04
Wherry Elementary	1.80E-05	1.70E-07	1.70E-07	1.50E-09	4.30E-05	4.90E-07	6.18E-05
Zia Park Housing	8.10E-05	3.30E-07	2.20E-06	1.50E-08	6.70E-05	5.60E-06	1.56E-04

NOTE: ACRR = Annular Core Research Reactor
SPR = Sandia Pulsed Reactor
RMWMF = Radioactive Mixed Waste Management Facility
mrem/yr = millirem per year
LLRI = Lovelace Respiratory Research Institute
ANG = Air National Guard
MWL = Mixed Waste Landfill
NGF = Neutron Generator Facility
USGS = U.S. Geological Survey
KAFB = Kirtland Air Force Base
USAF = U.S. Air Force

TABLE 5-10. Calculated Dose Assessment Results for On-site and Off-site Receptors and for Collective Populations in 2004

Dose to Receptor	Location	2004 Calculated Dose	NESHAP Standard
Individual Dose			
On-site Receptor EDE to the MEI	Chestnut test-site	0.0010 mrem/yr *(0.000010 mSv/yr)*	10 mrem/yr *(0.1 mSv/yr)*
Off-site Receptor EDE to the MEI	Eubank Gate Area	0.00045 mrem/yr *(0.0000045 mSv/yr)*	10 mrem/yr *(0.1 mSv/yr)*
Collective Dose			
Collective Regional Population[1]	Residents within an 80-km (50-mi) radius	0.051 person-rem/yr *(0.00051 person-Sv/yr)*	No standard available
Collective KAFB Population[2]	KAFB housing	0.00078 person-rem/yr *(0.000078 person-Sv/yr)*	No standard available

NOTE: [1]Based on a population of 793,740 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

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 2004, the on-site MEI was located on KAFB, at the Chestnut Test Site southwest of TA-V. The MEI dose of 0.0010 mrem/yr resulted primarily from releases of tritium and argon-41. The off-site MEI was located at the Eubank Gate Area. The MEI was 0.00045 mrem/yr. This has changed from Tijeras Arroyo West due to meteorological data, as well as source data. The dose difference in the locations is extremely minor.

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 5-10). 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 2004 was 0.051 person-rem/yr. For the purpose of calculating the collective dose, all releases are assumed to occur from a location centered in TA-V. The population dose was calculated by multiplying 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 953. This resulted in an estimated population dose of 0.000263 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. 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 implementation 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 20.11.08NMAC "Ambient Air Quality Standards." 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 threshold limit values (TLVs) and standards 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. 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 2004. The volume of fuel throughput used in the boilers is reported to the City of Albuquerque. In 2004, fuel throughput reported at the Steam Plant was as follows:

Natural Gas (scf)	Diesel (gal)
399,504,000	153

NOTE: scf = standard cubic feet gal = gallon

As defined by 20.11.67 NMAC, "Equipment, Emissions, Limitations," the Steam Plant Boilers 1, 2, and 3 fall below the applicable minimum emission limits for NO_x; however, Boilers 5 and 6 cannot 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 required for the Steam Plant since Permit No.1705 was issued November 10, 2004. 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 Permit No. 1705 was issued to limit the potential-to-emit to less than 100 tons per year (tpy) of criteria pollutants. As a "grandfathered" existing source, Title V did not require the Steam Plant to change or replace equipment. However, Sandia Corporation voluntarily 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 633 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 20.11.100 NMAC, "Motor Vehicle Inspection-Decentralized," Sandia Corporation submits an annual vehicle inventory update and inspection plan to the City of Albuquerque for only two SNL/NM-owned vehicles.

Emergency Generators
Sandia Corporation operates four main standby diesel generators for emergency power supply at key locations in TA-I. 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. An additional generator was added to the Microsystems and Engineering Sciences Applications (MESA) Facility in 2004.

In 2004, the generator fuel throughput was 6,283 gallons of diesel. Sandia Corporation is permitted 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 11.21 NMAC, "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 2004. 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 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 used to be 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.

Background
The DOE/NNSA/SSO submitted Sandia Operating Permit application 515 (DOE 2002a) on March 1, 1996. The City of Albuquerque has yet to issue the final permit. A synthetic minor permit application for the Steam Plant was submitted in 2003 and issued as Authority-to-Construct Permit No. 1705. Since the Steam Plant is now officially a synthetic minor source, DOE will petition the City to have the Title V Permit Application withdrawn from consideration.

Small Business Assistance
In 2004, the New Mexico Small Business Assistance (NMSBA) Program, which is managed by SNL/NM, continued assisting a Las Cruces, New Mexico concrete plant in reaching air permitting compliance. Assistance was also provided in 2004 to a brick manufacturer in Sunland Park, NM.

Permit Fee Structure
The City of Albuquerque's regulation requires source owners to pay air emission fees, which are implemented under 20.11.02 NMAC, "Permit Fees." Since 1997, source owners were able to submit an inventory of their actual emissions or fuel throughput for the year and pay

an annual fee based on this amount. This fee reduction provision was eliminated in a modification to 20.11.02 NMAC 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. For example, the Steam Plant would be assessed on the assumption that it operated at full capacity year-round. Sandia Corporation, through DOE, applied 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 steps towards that goal in 2002 by amending its Title V application, and again in 2003 by submitting a synthetic minor permit application for the Steam Plant. Permit No. 1705 was issued for the Steam Plant in 2004, which permanently reduced annual permit fees.

5.5.3 Ozone Depleting Substance (ODS) Reductions

Sandia Corporation did not make any progress in 2004 towards the DOE secretarial goal of replacing Class I refrigerant chillers greater than 150 tons capacity, manufactured prior to 1984, by 2005. Replacement is part of a larger upgrade to improve the reliability and the overall efficiency of the associated chilled water system. Buildings 806 (FY05) and 807 (FY09) are scheduled for demolition, so their chillers will be removed.

chapter six
WASTEWATER, SURFACE DISCHARGE, STORM WATER MONITORING PROGRAMS & OIL STORAGE AND SPILL CONTROL

<u>**In This Chapter ...**</u>

Wastewater Discharge Program
Surface Discharge Program
Storm Water Program
Oil Storage and Spill Control

Environmental Snapshot

Sandia Corporation controls the potential contaminants that may be picked up by storm water runoff by routing all industrial wastewater to the sanitary sewer and storing most chemicals indoors.

Crews Repair Water Line Break at SNL/NM

Sandia National Laboratories, New Mexico (SNL/NM) conducts effluent monitoring through wastewater, surface water, and storm water monitoring and surveillance programs. 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 National Pollutant Discharge Elimination System (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 450.1, *Environmental Protection Program* (DOE 2005) and 5400.5, *Chg 2, Radiation Protection of the Public and the Environment* (DOE 1993a).

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 3.4.

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 location, City of Albuquerque Permit 2069I. 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 during 2004.

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 2003 to 2004 reporting year (November 2003 through November 2004). A "Gold Pre-treatment Award" is given based on a facility's 100 percent compliance with reporting requirements and discharge limits set in permits or exceptional source reduction and P2. As a first time recipient, SNL/NM also received the City of Albuquerque Award of Excellence for the 2003-2004 City of Albuquerque pre-treatment year (November 2003 through November 2004) in the large volume discharger category. This award was presented to SNL/NM for its outstanding efforts in wastewater pre-treatment compliance, P2 and waste minimization and is only presented to one discharger in each of the two categories (small volume dischargers and large volume dischargers). The large volume discharger category includes dischargers such as INTEL Corp., General Electric Aircraft Engines, Presbyterian Healthcare Services, and Kirtland Air Force Base (KAFB).

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

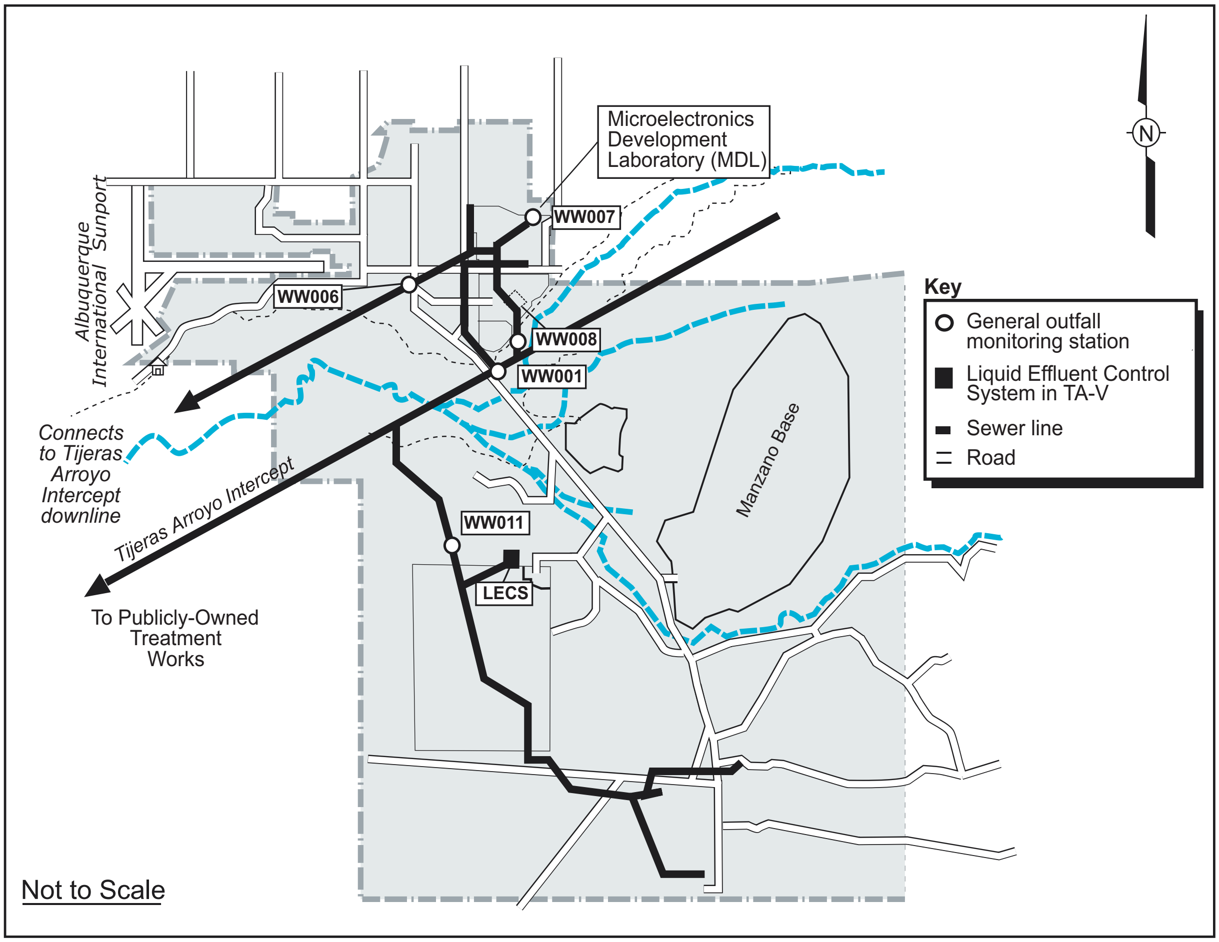


FIGURE 6-1. Wastewater Monitoring Station Locations

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 800,000-1,000,000 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 (City of Albuquerque Permit 2069G) monitors the wastewater discharged from the Acid Waste Neutralization (AWN) System at the MDL in Technical Area (TA) I.

Wastewater Analyte Parameters

Metals

Aluminum, Arsenic, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Zinc

Radiological

Gamma spectroscopy, Gross alpha, Gross beta, Tritium

General Chemistry

chemical oxygen demand (COD), Cyanide, Formaldehyde, Oil and grease, Phenolic compounds, semi-volatile organic compounds (SVOCs), Soluble fluoride, volatile organic compounds (VOCs)

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

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

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 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 above).

Septic Systems

Sandia Corporation maintains five active septic tank systems in remote areas on 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

SNL/NM maintains research and engineering reactors in TA-V. These reactors and support facilities have the potential to produce radioactive process wastewater that includes liquids from floor drains, lab sinks and other drains located in buildings that use, process or store radioactive materials. To ensure that all wastewater from these facilities meets regulatory standards, liquid effluent is separated into two process streams defined as reactor and non-reactor wastewater. Non-reactor wastewater is water from restrooms and non-radioactive laboratory activities. Reactor process wastewater from areas that use, process or store radioactive materials is channeled to holding tanks where it can be screened for radiological contaminants within the Liquid Effluent Control System (LECS).

LECS was developed as a control system to maintain the integrity of the City of Albuquerque's sanitary sewer system by collecting, analyzing, and handling SNL/NM reactor process wastewater from TA-V reactor activities. 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 regulatory limits, the water will not be released to the sanitary sewer system 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 medical radioisotopes. Once the activity is at or below regulatory levels, the water can be safely discharged to the public sewer system. The LECS, which became operational in 1994, consists of three 5,000-gallon holding tanks with liquid level and radioactive alarm systems, a control room, and an ion exchange/ filtration unit (treatment processor). The LECS is an engineered facility operating within an established safety envelope. Discharges to the sanitary sewer from the LECS and other SNL/NM activities have not exceeded standards for radionuclides at any of SNL/ NM's wastewater monitoring stations.

6.1.5 Summary of Monitoring Results

During 2004, Sandia Corporation split SNL/NM wastewater samples with both the City of Albuquerque and the NMED. In 2004, 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 2004 also met federal regulatory standards and DOE Orders for radiological levels in wastewater. All analytical results can be found in Appendix A.

Reportable occurrences and environmental releases in 2004 are discussed in Sections 2.2.1 and 2.2.2 (please note that the definitions for reportable occurrences and environmental releases have been changed, which is discussed in Chapter 2). There were no reportable events (City of Albuquerque permit violations) in 2004.

During 2004, two fluoride excursions were investigated and reported to the City of Albuquerque. The first occurred on March 19, 2004 and lasted approximately 45 minutes with a peak value of 50 mg/L. The second occurred on May 5, 2004 and lasted approximately 2.5 hours with a peak value of less than 200 mg/L. Neither excursion exceeded the City of Albuquerque's daily composite limit of 300 mg/L, but was reported to the City of Albuquerque as a courtesy.

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.

2004 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 2004, seven individual surface discharge requests were made; all met state standards and were approved.

6.2.2 Surface Discharge Releases in 2004

The Surface Discharge Program must be contacted in the event of an accidental release or spill to the ground surface. In 2004, six reportable surface discharge releases occurred. Environmental releases and occurrences are briefly summarized in Section 2.2.2 (please note that the definitions for reportable occurrences and environmental releases have been changed, which is discussed in Chapter 2). Three of these releases also met ORPS criteria as an occurrence.

On February 17, 2004, a 550-gallon gasoline tank used to fuel portable equipment was discovered leaking at the fuel-dispensing nozzle in TA-III. The nozzle contained ½ to 1 ounce of fuel after being shut off. (If the nozzle is not handled properly, this fuel is discharged to the ground at the base of the secondary containment.) Due to the nature of the discharge, it is not possible to get an accurate estimation of the volume of gasoline discharged. Leakage only occurred if there was fuel remaining in the nozzle after fueling equipment and the nozzle was mishandled. It is possible that leakage occurred over several years as indicated by the rust on the outside of the secondary containment. The tank is approximately 10 years old. It is estimated that less than 10 gallons of gasoline was released. The nozzle was replaced and is secured to reduce the loss of fuel remaining in the nozzle after fueling.

On February 26, 2004, a 125- gallon diesel tank that was being transported on a flat bed truck near the Live Fire Range on Coyote Springs Road rolled off the bed of the truck on to the road. The filler cap had a vent hole from which the diesel fuel leaked. Approximately 10 to 15 gallons of diesel fuel was released to the surface. The soil in the spill area was excavated to an initial depth of six inches. Deeper excavation was conducted at locations where staining was evident and the odor of fuel could be detected. The stained soil was containerized and was disposed as petroleum contaminated soil. Clean soil from an adjacent location was used to back fill the excavation.

On March 12, 2004, a discharge originated from a parts washer that was being transported on a flat bed truck. The washer contained Bio T, a terpene-based solvent, which is classified a hazardous substance due to a flashpoint of 130 F with a Reportable Quantity (RQ) of 110 lbs (14.9 gallons). The volume of the discharge was calculated to be 6.4 gallons. The truck operator noticed the spill and stopped the vehicle. Incident Command (IC) called out a Haz-Mat team and the KAFB Fire Department. Traffic was routed around the area and absorbent materials were distributed on all contaminated areas. The absorbent materials were removed by hand and packaged for disposal. After the removal of the absorbent material, a street sweeper was used to provide additional cleaning. The remainder of the Bio T in the parts washer was transferred to a closed top 55-gallon drum.

On July 15, 2004, a spill from a portable 500-gallon diesel fuel tank occurred at the top of the west ridge of Sol se Mete Canyon for an unknown duration of time. The cause of the discharge was a faulty valve on the bottom of the tank, which contained approximately 300 gallons of diesel fuel. Based on the amount of fuel remaining in the tank, it is estimated that 50-200 gallons of fuel were released. There was no fuel leaking from the tank at the time of discovery. The visible contamination covered a circular area approximately 3.5 feet in diameter. The tank was removed from the site and the contaminated area was covered with plastic to prevent the further spread of contamination from precipitation. SNL/NM applied for a no further action (NFA) determination from the NMED and are still awaiting a response. SNL/NM will continue to monitor the site.

On August 3, 2004, a release of diesel fuel occurred in TA-V that lasted approximately two minutes. A fork lift released diesel fuel from a worn fuel line as it was being relocated at the work site. Approximately 12 gallons of diesel fuel leaked from the fork lift and was contained in the immediate area. Approximately 12 gallons of diesel fuel was collected and drummed for proper disposal. Absorbent material was laid down on the residual fuel and the waste absorbent material was collected and placed in drums for proper disposal. The worn fuel line was repaired and the equipment was removed from the site.

On November 2, 2004, a release of Industrial Water Engineering cleaner occurred within the MESA construction zone over a period of three days during the cleaning and flushing of the building heating system. The crew discharged the cleaning solution and flush water to a storm drain manhole assuming it was a sanitary sewer. Approximately 75 gallons of CL-483 containing three pounds of sodium hydroxide and 12 pounds of sodium metasilcate was mixed with about 10,000 gallons of water. The resulting cleaning solution was circulated through the system. After removing the cleaning solution, another 10,000 to 20,000 gallons of water was used to flush the system. Due to the dilute nature of the discharge and the fact that the discharge occurred to an underground storm sewer, no further actions were taken. Between channel and evaporation loss, only a portion of the released water reached Tijeras Arroyo. The majority of the water that reached the outfall passed through the sediment basin and infiltrated into the channel soil. None of the water reached the flow channel of Tijeras Arroyo, which is approximately 0.4 mile from the sediment pond. The regional aquifer in this area is 400 feet below the surface and there is a perched groundwater layer at approximately 220 feet.

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 in Discharge Plan (DP-530). 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 secondary containments are designed to hold the entire contents of a tank in the event of an accidental release. Significant volumes of precipitation can collect in the containments during storm events. The water is visually inspected for oil contamination and any oil present is skimmed off prior to discharge to the TA-IV lagoons.

The Discharge Plan (DP-530) was approved for SNL/NM Pulsed Power Development Facilities located in TA-IV for Lagoons 1 and 2 on March 8, 1988. The discharge plan was submitted pursuant to 20.6.2.3106 NMAC of the NMWQCC Regulations and was approved pursuant to 20.6.2.3109 New Mexico Administrative Code (NMAC). DP-530 was last modified by NMWQCC on September 21, 2001, to include monitoring and reporting requirements (Table 6-2).

During 2004, both lagoons were drained, cleaned, and inspected (the lagoons were drained to the sanitary sewer after testing prior to discharge). Monthly inspections were performed and documented in checklists filed in the Environment, Safety, and Health (ES&H) Records Center and with DOE/Sandia Site Office (SSO). Also during 2004, the original Lagoon #2 was excavated and backfilled due to slope stability project requirements designed to protect facilities within TA-IV that are along the slope of the Tijeras Arroyo. A new Lagoon #2 was reduced in size to a maximum of 10,000 gallons and relocated to the east of the original. This project was started on July 1, 2004, and was completed on September 1, 2004. This activity did not impact Lagoon #1, which still has its original capacity of 137,000 gallons.

TABLE 6-2. NMWQCC Monitoring and Reporting Requirements

Action	Frequency	Reporting
Inspection of Lagoons	Monthly	Documented in checklists
Drain, clean and inspect lagoon and liner	Annual	Annual
Water-level readings	Annual	Annual
Major cations, anions, and TDS	Biennial	Biennial
Purgeable organics using EPA Method 8240	Biennial	Biennial
Extractable organics using EPA Method 8270	Biennial	Biennial

NOTE: NMWQCC = New Mexico Wather Quality Control Commission
TDS = total dissolved solids
EPA = U.S. Environmental Protection Agency

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);
- 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 routing all industrial waste water to the sanitary sewer and storing most chemicals indoors. SNL/NM also limits storm water contact with chemical storage containers and carefully controls 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 these basins 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. Appropriate approvals must be granted by the state for discharges to the storm drain system or by the City of Albuquerque for discharges to the sanitary sewer. Required approval to outside agencies is obtained through the DOE.

NPDES Regulations

NPDES regulations, under the CWA, require any point source discharges to be permitted. Any runoff that flows into the Tijeras Arroyo through a channel, arroyo, conduit, or pipe is considered a discharge point. Overland surface flow or "sheet" flow that drains into Tijeras Arroyo is not considered a point source discharge.

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.

Watersheds 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-V, and several remote sites are located in this area.

A new NPDES industrial permit was issued in January 2001. Four stations were added to monitor runoff in the Arroyo del Coyote watershed at that time.

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 Permit for Storm Water Discharges Associated With Industrial Activities" issued by the EPA in January

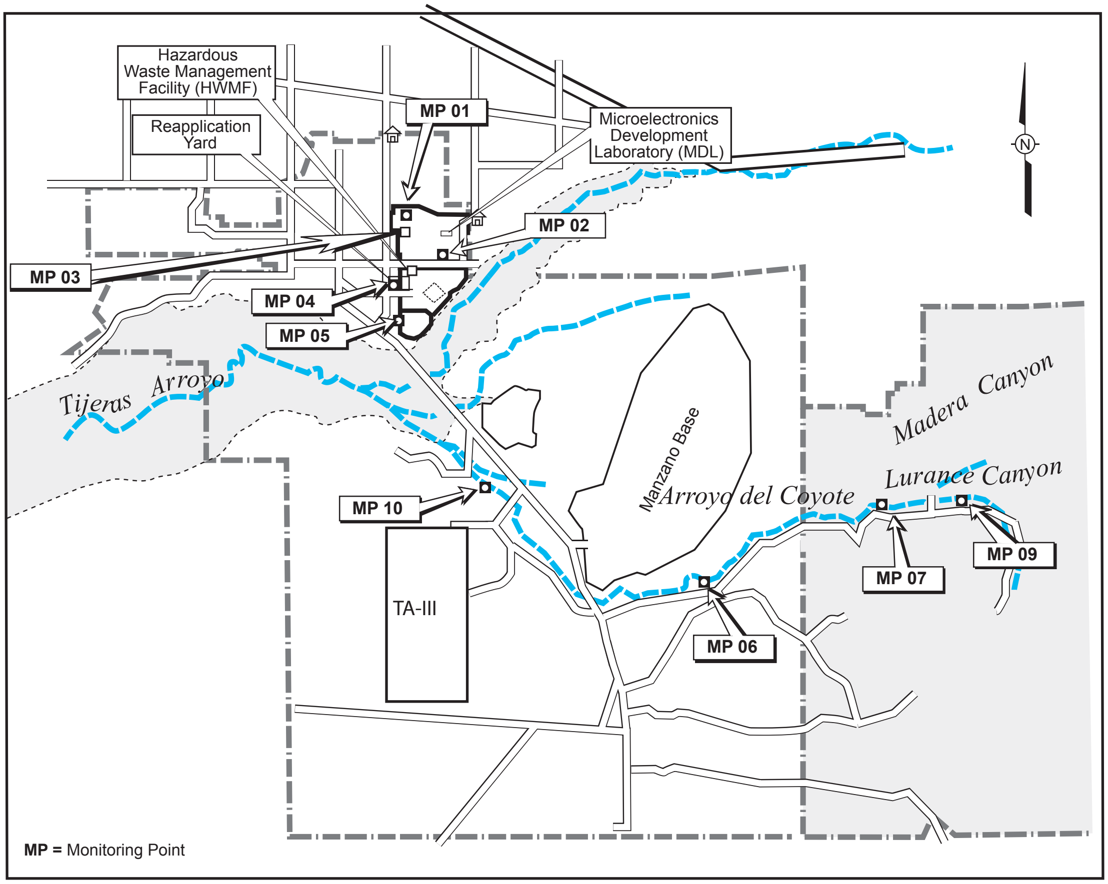


FIGURE 6-2. Storm Water Monitoring Point Locations at Nine Sites

2001 (EPA 2001). Currently, there are nine SNL/NM monitoring points (MPs) on the permit, eight of which collect samples for analytical analysis. This 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 6-3. Chapter 9 lists all applicable regulations and program documents.

Beginning in 2003, construction activities that disturb over one acre (previously was five acres) also require permitting under NPDES. A construction permit requires protection of storm water runoff during and after construction. All areas of the site that are susceptible to erosion must be stabilized upon completion of the project. In December 2004, 11 storm water construction permits were in effect: and two were pending. There were also construction sites under waivers. Storm water permits are listed in Chapter 9, Table 9-1.

6.3.2 Storm Water Monitoring Stations

Figure 6-2 illustrates the location of the nine MPs. 1 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 the following:

- ***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.

TABLE 6-3. 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
Fabricated Metal Products	- Metal Fabrication - Drilling - Turning - Milling	- Building 840 Machine Shop
Short-Term Construction Permits		
Construction Activities in 2004	- Building material pollutants - Disturbed soil	- MESA - CINT

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
CINT = Center for Integrated Nano-Technologies
MDL = Microelectronics Development Laboratory
MESA = Microsystems and Engineering Sciences Applications
SNL/NM = Sandia National Laboratories, New Mexico

- ***Wet weather inspections*** are conducted quarterly during a storm event, if possible, but generally during the rainy season from April through September. Samples are collected and visually inspected for foaminess, clarity, and the presence of oil. These inspections also provide an opportunity to check for broken levees and floating debris.

- ***Dry weather inspections*** are conducted quarterly when storm drains and ditches are dry primarily to detect illicit discharges. In general, only storm water is allowed in the storm drain system; however, with approval from the Surface Discharge Program, water that meets NPDES permit conditions can be discharged to storm drains. An example of NPDES permit-approved discharges would be water used during fire training exercises or 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

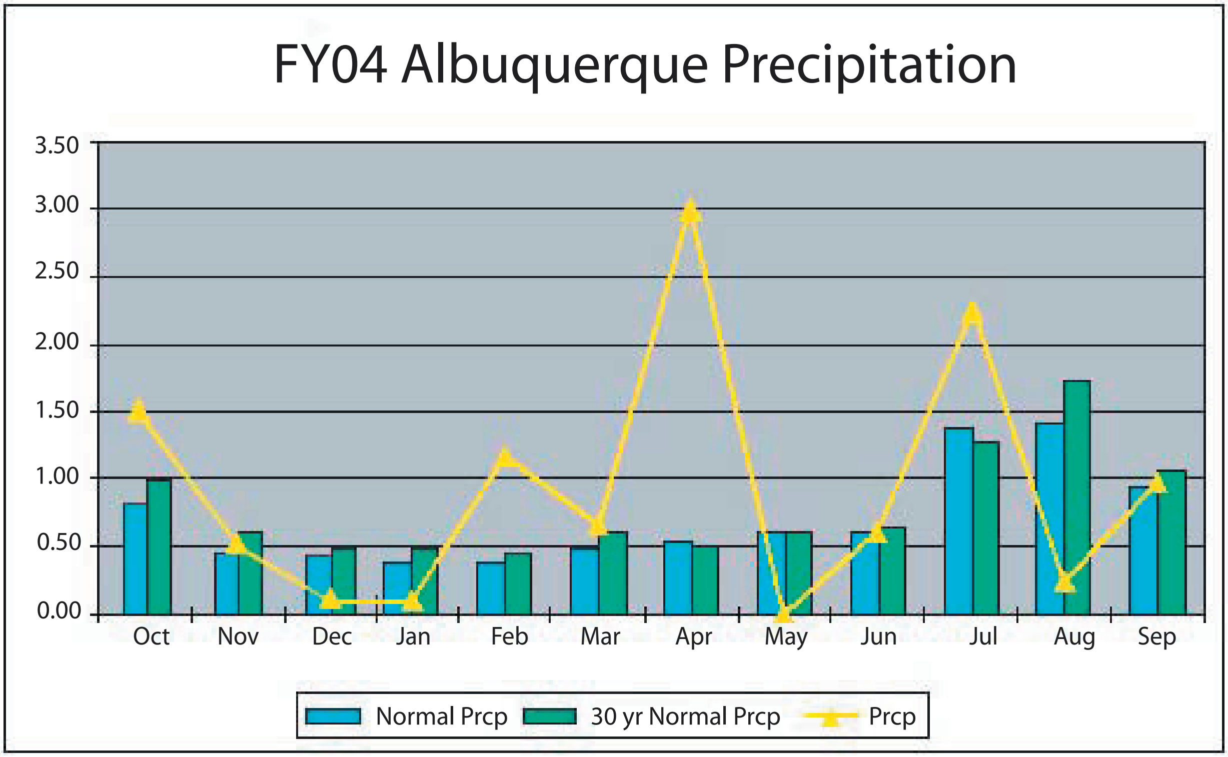


FIGURE 6-3. FY04 Albuquerque Precipitation

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 2004 Activities

2004 Sampling Results

Both analytical and quarterly visual sampling was conducted in 2004. The analytical results are listed in Appendix A, Table A-12.

Visual samples were collected at the five MPs in the developed TAs in the first three quarters of FY04. Visual observations are not conducted at the remote MPs due to personnel safety concerns in the remote areas during inclement weather. No visual observations were made during the fourth quarter of FY04 due to lack of runoff during normal business hours. The visual observations that were performed in the first three quarters of FY04 were conducted as described under “wet weather inspections.” No unusual characteristics were noted.

Analytical Sampling Results

Collecting analytical samples at SNL/NM has always been a challenge due to Albuquerque’s climatic condition and FY04 was no exception. Figure 6-3 illustrates FY04’s rainfall. Overall, Albuquerque’s rainfall was above normal for FY04, but five months were well below their normal.

It is not uncommon to have three or less rainfall events in any given quarter that produce adequate runoff for sampling. A large number of runoff events occur after normal business hours due to thunderstorms that build from the day’s heat. In these cases, equipment failures are not detected until the sampling opportunity has passed. Failure of automated equipment to collect a sample under these conditions may result in no analytical information for that MP during that quarter.

MP 04 was the only MP that produced samples for all four quarters. The drought, low runoff conditions and equipment malfunctions prevented collection of a full set of samples from the remainder of the stations. The results from the samples that were collected are summarized in Appendix A, Table A-12.

It should be noted that in several instances, equipment at a given MP did not collect an adequate amount of water to conduct the full analytical suite. Under those circumstances, the equipment would be reset and runoff from another storm collected and analyzed for the missing parameters so the data reported in these cases is compiled from two storm events. Also, some samples were collected within 72 hours of a precipitation event greater than a half of an inch, which does not comply with section 5.2.2.1 "When and How to Sample" of the NPDES Permit. This data is reported if no other samples were collected for the quarter. SNL/NM strives to collect suitable samples, but will report on substandard samples if that is the only available data from a given MP for that quarter.

There are two constituents that consistently exceed EPA's benchmark values by a large percentage: total suspended solids (TSS) and magnesium. Albuquerque's semiarid climate with sparse vegetative cover and high erosion rates naturally produce high TSS levels. SNL/NM has reduced TSS levels in developed areas through BMPs such as retention and detention ponds, landscaping conducive to infiltration and lining of storm drain channels for erosion reduction. All work in the sparsely developed remote areas of SNL/NM is conducted in a manner that minimizes erosion.

The magnesium constituent of runoff is leached from soils in the area that contain magnesium minerals. This can be verified by noting that all MPs at SNL/NM record high levels of magnesium even though they are separated by several miles and collect runoff from several different drainage areas. Also, MPs 06, 07 and 09 are in sparsely developed areas of SNL/NM with no history of magnesium use or contamination by SNL/NM, yet all these MPs show high levels of magnesium.

An investigation was conducted by NMED personnel to further confirm SNL/NM is not contributing to the magnesium contamination. SNL/NM's Chemical Inventory System (CIS) was quarried for all magnesium metal and compounds that contain magnesium in use at SNL/NM. All buildings that housed 20 pounds or more of any material that contained magnesium were inspected for potential contaminate sources. There was no evidence any SNL/NM building or activity contributes to the magnesium levels in storm water runoff. Additionally, runoff samples will be collected in 2005 from several drainages upstream of any potential SNL/NM influence to further confirm that SNL/NM is not contributing to the magnesium levels in storm water runoff.

6.4 OIL STORAGE AND SPILL CONTROL

SNL/NM has an oil storage capacity of 3.5 million gallons in 45 above ground storage tanks (ASTs) and underground storage tanks (USTs). This does not include oil-containing equipment and transformers. Additional oil storage capacity in fifty-five gallon drums occurs throughout the site on an as needed basis. All oil storage sites with regulated containers must be equipped with secondary spill containment. Secondary containment structures include concrete lined basins, retaining walls, containment reservoirs, earthen berms, sloped pads, trenches, and containment pallets.

A Spill Prevention Control and Countermeasures (SPCC) Plan is required under the Clean Water Act (CWA). SNL/NM's SPCC Plan was revised in 2003 to incorporate changes to 40 CFR 112 that EPA made in 2002. 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, and 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. Facilities at SNL/NM subject to the regulations include:

- Oil storage tanks (USTs and ASTs),
- Bulk storage areas (multiple containers),
- Temporary or portable tanks

Table 9-1 lists the permit numbers for those tanks that are registered with the NMED. SNL/NM's State of New Mexico Owner ID Number is 14109.

USTs

There are two, 20,000 gallon, fiberglass USTs at SNL/NM that are registered with the State of New Mexico. One additional UST that is used solely for emergency power generation is exempt from the New Mexico requirements but is covered by federal regulations in 40 CFR 280. Two USTs in TA-III are exempt from state and federal requirements because they contain insignificant quantities of regulated substances.

ASTs

SNL/NM currently operates 40 ASTs. In 2002, the State of New Mexico passed oil storage regulations that required the registration of all oil storage tanks with a storage capacity greater than 1,320 gallons but less than 55,000. SNL/NM has seven ASTs that are subject the New Mexico specific regulations.

In 2004, SNL/NM reduced its oil storage capacity by 625,000 gallons by closing five bulk storage tanks. Four storage tanks were removed from the Steam Plant Tank Farm in September due to reduced demand for emergency power. SNL/NM has requested a NFA determination for the Steam Plant Tank Farm from the NMED for a spill that occurred in 1991.

One 25,000 gallon tank was closed at the Burn Site in 2004. Soil samples from under the old tank confirmed that there were no spills or releases from the tank during its operational life. A new 5,500 gallon double walled tank will be installed at the Burn Site in 2005 to support ongoing thermal tests.

There were four reportable petroleum spills in 2004. All contaminated soil was removed from three of the sites. SNL/NM completed a partial clean up of a site in Sol Se Mete Canyon, but clean up activities were stopped when bedrock was encountered during the soil excavation. Soil samples from site contained approximately 3,000 parts per million total petroleum hydrocarbons. SNL/NM has requested a “NFA” determination from the NMED.

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chapter seven

GROUNDWATER PROGRAMS

<u>In This Chapter ...</u>

Environmental Snapshot

During June and July 2004, annual sampling of groundwater was conducted by the Groundwater Protection Program Groundwater Surveillance Task. Samples were collected from 14 wells and one spring.

Groundwater Drilling at SNL/NM

The Groundwater Protection Program (GWPP) and the Environmental Restoration (ER) Project collect groundwater data at Sandia National Laboratories, New Mexico (SNL/NM). Both programs coordinate to monitor wells throughout SNL/NM, operational areas, and environmental remediation sites. 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 2004 Annual Groundwater Monitoring Report* (SNL 2004). Specific tasks performed in Fiscal Year (FY) 2004 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 FY04, 87 wells were sampled by the GWPP or the ER Project and are shown in Figure 7-2.

Please note, groundwater data is reported for the FY04 (from October 1, 2003 through September 2004).

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.

In 2004, the Groundwater Surveillance network consisted of 14 wells and one spring. One new well (SWTA3-MW3) was installed and sampled. The new well replaces the SWTA3 monitor well that was previously plugged and abandoned.

U.S. Department on Energy (DOE) Orders, the New Mexico Environment Department (NMED) Compliance Order on Consent (COOC), and regulations applicable to the GWPP are listed in Chapter 9 and are discussed in Chapter 2.

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 best management practices (BMPs) for groundwater protection.

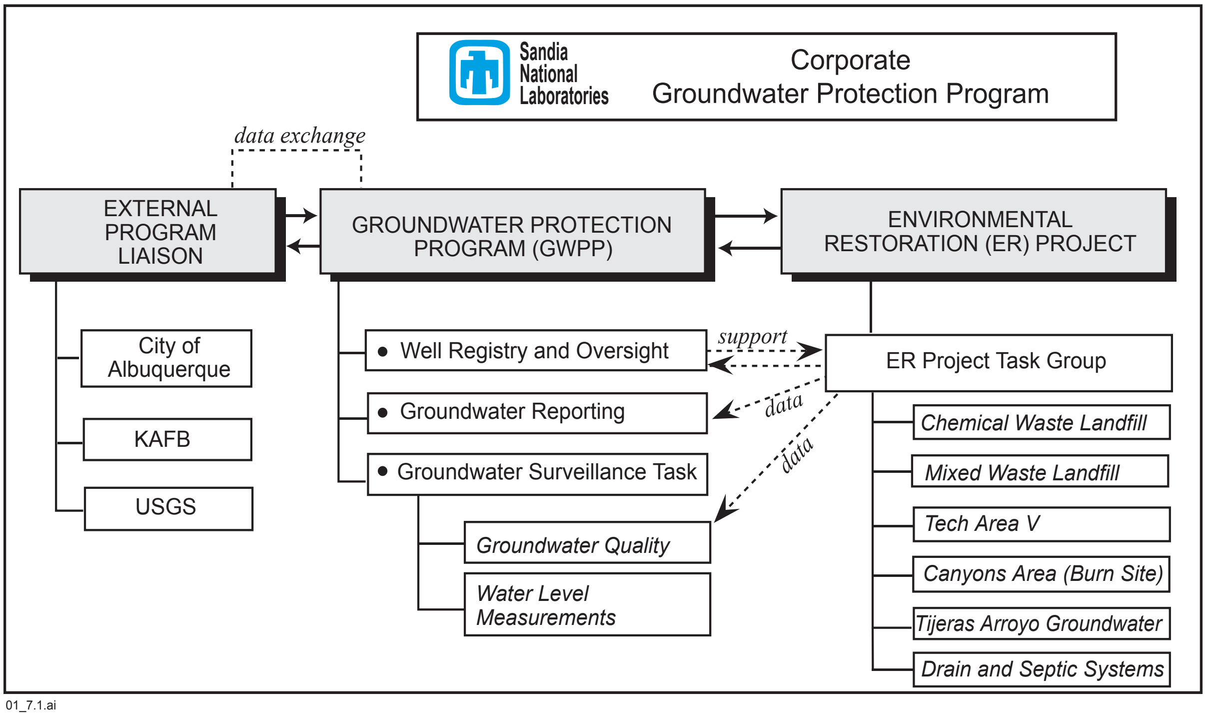

FIGURE 7-1. SNL/NM's Groundwater Programs and Interfaces

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. The NMED COOC also provides requirements. Applicable regulations are listed in Chapter 9. The regulatory basis for the ER Project is discussed in Section 3.2.1.

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

Chemical Waste Landfill (CWL)
Mixed Waste Landfill (MWL)
Technical Area (TA) V Groundwater Investigations
Tijeras Area Groundwater (TAG) Investigations (TA-1, TA-II & Tijeras Arroyo)
Canyons Area (Lurance Canyon Burnsite Groundwater Investigations)
Drain and Septic Systems (DSS)

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 the NMED. Currently, there are nine active wells in the network. Two of the wells are background (upgradient) wells and three wells have two screened intervals.

A Corrective Action Management Unit (CAMU) was established adjacent to the CWL to facilitate site cleanup as described in Section 3.2.2. CAMU operations were formally closed in October of 2003. The CAMU containment cell, which contains contaminated soil from the CWL that was treated to required action levels, but not to background levels. Extensive vadose zone monitoring for soil moisture and soil gases is conducted to provide assurance the waste is safely contained within the cell.

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 of concern (COC) at this site. The groundwater monitoring network at the MWL consists of seven wells.

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 COCs at the LWDS are nitrates and volatile organic

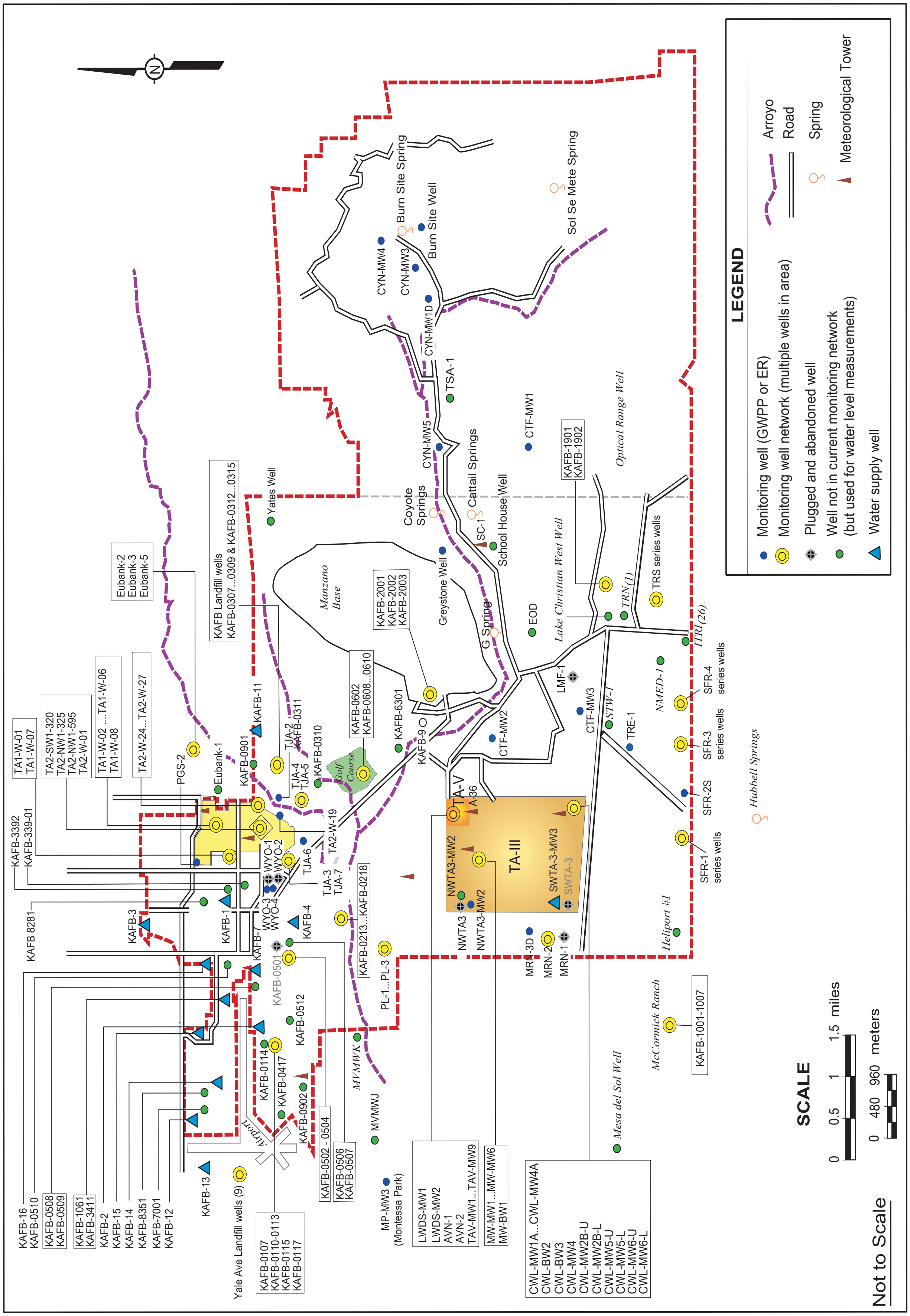

FIGURE 7-2. Wells and Springs on SNL/NM and KAFB

compounds (VOCs) such as trichloroethene (TCE), which was first detected in the groundwater in 1993. There are currently 13 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 located above the regional groundwater system (water table) that have not been developed for domestic use. TCE and nitrates are the COCs 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 and monitor 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 site (Solid Waste Management Unit [SWMU] 154) at which samples were collected. The 23rd site (SWMU 139) was granted a non-sampling administrative 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 consequent to analysis of previously collected soil gas samples 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. In June 2004, SNL/NM completed the eighth and final round of quarterly sampling at four DSS monitoring wells as required in the "Field Implementation Plan Characterization of Non-Environmental Restoration Drain and Septic Systems," SNL/NM, November 2001.

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 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, and is on-going.

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. Detailed data is published in the *FY 2004 Annual Groundwater Monitoring Report for SNL/NM* (SNL 2004).

7.2.1 GWPP Surveillance Results

During June and July 2004, annual sampling of groundwater was conducted by the GWPP Groundwater Surveillance Task. Samples were collected from 14 wells and one spring. Groundwater surveillance samples for the GWPP were analyzed for the following parameters: VOCs, dissolved metals (except for mercury), selected radionuclides, gross alpha & beta activity, major ions including nitrate, alkalinity/total phenols, total halogenated organics (TOX), gamma spectroscopy, selected radionuclides, and gross alpha/beta activity.

The water samples from three wells, MRN-2, MRN-3D, and NWTA3-MW2 were analyzed for perchlorate in addition to the above listed analytes. The perchlorate analyses were conducted per the requirements of the

TABLE 7-1. Summary of SNL/NM Groundwater Monitoring Activities During Fiscal Year 2004

	REMEDIATION	Environmental Surveillance
Number of Active Wells Monitored	67	15
Number of Samples Taken	216	19
Number of Analyses Performed	17,936	2,110
% of Analyses that are Non-Detect	82.80%	75.60%

	REMEDIATION	Environmental Surveillance	MCL	MAC
Range of Results for Positive Detections				
Tritium (pCi/L)	-156 - 478	ND	N/A	N/A
TCE (µg/L)	0.3 – 18.2	1.5	0.005	100,000
Chloroform (µg/L)	0.22 - 0.6	0.993	0.005	100
Other VOCs (µg/L)				
Acetone	2.7 - 107	4.2 - 23	N/A	N/A
Methylene chloride	1.8 - 23	4.5	N/A	N/A
Trace Metals (mg/L) / (MCL, MAC)				
Aluminum	0.00928 - 0.542	0.0094 - 0.2	N/A	5
Antimony	0.000289 - 0.000832	0.000286 - 0.000446	0.006	N/A
Arsenic	0.00101 - 0.0738	0.00112 - 0.00592	0.01	0.1
Barium	0.0185 - 0.199	0.011 - 0.168	2	1
Beryllium	ND	0.000119 - 0.00712	0.004	N/A
Cadmium	0.00004 - 0.00295	0.000045 - 0.000185	0.005	0.01
Calcium	39.3 - 404	34 - 308	N/A	N/A
Chromium	0.000429 - 0.138	0.000418 - 0.00596	0.1	0.05
Cobalt	0.000081 - 0.00285	0.000092 - 0.0089	N/A	0.05
Copper	0.00071 - 0.0232	0.000763 - 0.0108	1.3	1
Fluoride	0.089 - 2.49	0.334 - 2.7	4	1.6
Iron	0.153 - 5.94	0.125 - 10.3	N/A	1
Lead	0.000051 - 0.00196	0.00011 - 0.000289	0.015	0.05
Magnesium	2.3 - 91.3	3.52 - 60.5	N/A	N/A
Manganese	0.00177 - 0.0891	0.011 - 1.27	N/A	0.2
Mercury	0.000081 - 0.000103	ND	0.002	0.002
Nickel	0.000991 - 0.421	0.000999 - 0.0585	N/A	0.2
Potassium	1.6 - 52.4	1.6 - 40.6	N/A	N/A
Selenium	0.000682 - 0.0174	0.000771 - 0.00301	0.05	0.05
Silver	0.000046 - 0.00898	ND	N/A	0.05
Sodium	14.1 - 494	0.751 - 417	N/A	N/A
Thallium	0.00002 - 0.00211	0.000085 - 0.00111	0.002	N/A
Uranium	0.00246 - 0.0103	0.000311 - 0.0315	0.03	5
Vanadium	0.0057 - 0.0095	0.00566 - 0.00624	N/A	N/A
Zinc	0.00136 - 0.0828	0.00118 - 0.528	N/A	10
Other Contaminants				
Nitrate as N (mg/L)	0.82-27	2.3-2.4	10	10
Nitrate plus Nitrite	0.01-29.8	0.01-6.15	10	10

NOTES: pCi/L = picocurie per liter
µg/L = micorgram per liter
mg/L = milligram per liter
ND = not detected
N/A = not applicable
MCL = maximum contaminant level
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 (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 6.2 NMAC)	Maximum allowable concentration (MAC)	NMWQCC
DOE Drinking Water Guidelines for Radioisotopes (2) (DOE Order 5400.5)	Derived concentration guide (DCG)	Department of Energy (DOE 1993a)

NOTE: (1) MACs for Human Health and Domestic Water Supply Standards are identified in the analytical results tables in the

(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 Collection Periods for Groundwater Quality Monitoring at SNL/NM During FY04

Sampling Period	GWPP	CWL	MWL	TA-V	TAG	Canyons Area	DSS
Oct 03					√		
Nov 03				√	√		
Dec 03		√		√		√	√
Jan 04					√		
Feb 04		√			√		
Mar 04		√		√		√	√
Apr 04			√	√	√		√
May 04		√			√		√
Jun 04	√			√		√	√
Jul 04	√				√		
Aug 04		√	√	√	√		
Sep 04		√	√	√		√	

COOC agreed to by NMED and DOE/SNL/NM in 2003. 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, pH, specific conductivity, oxidation reduction potential (or redox [Eh]), and temperature.

VOCs

No groundwater samples exceeded maximum contaminant levels (MCLs) for VOCs. Trace concentrations of acetone, toluene, TCE, and chloroform were detected. Acetone and toluene detects are 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 1.21 µg/L. TCE was detected in SWTA3-MW3 at a concentration of 1.5 µg/L. The MCL for TCE is 5.0 µg/L.

Although there is no specific MCL established for chloroform, an MCL of 0.1mg/L is established for total thihalomethanes. Chloroform is a trihalomethane. 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 established MCLs for any of the following non-metallic inorganic constituents: nitrate plus nitrite (NPN) (as nitrogen), phenolics, TOX, total cyanide, alkalinity (calcium carbonate), anions (bromide, chloride, fluoride, and sulfate).

Chloride exceeded the NMWQCC domestic use MAC for groundwater in water samples collected from Coyote Springs and the EOD monitor well. Sulfate in SFR-4T exceeded the domestic use MAC. The fluoride concentration in groundwater samples from Coyote Springs and SFR-4T exceeded the MAC for the Human Health Standard of 1.6 mg/L. The elevated concentrations are from natural sources and are consistent with background concentrations determined for this location.

FLUORIDE MAC = 1.6 mg/L		
Well	**Concentration**	**Period**
Coyote Springs	1.74 mg/L	June/July 2004
SFR-4T	2.7 mg/L	June/July 2004

NOTE: µg/L = micrograms per liter   mg/L = milligrams per liter
MCL = maximum contaminant level   MAC = maximum allowable concentration

No perchlorate was detected in the compliance wells MRN-MW2, MRN-MW3D, and NWTA3-MW2 at concentrations above the action level of 4.0 µg/L.

Metals

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

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.

Manganese exceeded the MAC of 0.2 mg/L in Coyote Springs, EOD Hill, MRN-3D, and SWTA3-MW2. Iron was determined above the MAC of 1.0 mg/L in the EOD Hill well. Manganese and iron have established MACs for aesthetic purposes and not for health considerations.

The EPA established MCL for Uranium is 30 µg/L. The Uranium concentration in EOD Hill groundwater exceeded the MCL. All other metals analyses were below drinking water standards, where established.

MANGANESE MAC = 0.2 mg/L		
Well	**Concentration**	**Period**
Coyote Springs	1.27 mg/L	June/July 2004
EOD Hill	1.22 mg/L	June/July 2004
MRN-3D	0.345 mg/L	June/July 2004
SWTA3-MW2	0.333 mg/L	June/July 2004

NOTE: mg/L = milligrams per liter   MAC = maximum allowable concentration

IRON MAC = 1.0 mg/L		
Well	**Concentration**	**Period**
EOD Hill	10.3 mg/L	June/July 2004

NOTE: mg/L = milligrams per liter   MAC = maximum allowable concentration

URANIUM MCL = 30 µg/L		
Well	**Concentration**	**Period**
EOD Hill	31.5 µg/L	June/July 2004

NOTE: µg/L = micrograms per liter   MCL = maximum contaminant level

Radionuclide Activity

Radioisotopic analyses were conducted on all samples. Specific analyses included: Gamma spectroscopy, gross alpha & beta, radium-226 and -228, uranium-233/234, and uranium-235 and -238.

Gamma spectroscopy analyses indicated the presence of radium, uranium, and thorium-isotopes 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 obtained by alpha spectroscopy.

Uncorrected gross alpha results for samples from EOD Hill, SFR-2S, and TRE-1 exceeded the MCL of 15.0 pCi/L. When the results are corrected by subtracting the uranium activity, the results for SFR-2 and TRE-1 are below the MCL.

GROSS ALPHA MCL = 15 pCi/L			
Well	**Activity**	**Corrected Activity***	**Period**
EOD Hill	96.6 pCi/L	-7.22	June/July 2004
SFR-2S	27.4 pCi/L	-1.33 pCi/L	June/July 2004
TRE-1	28 pCi/L	-4.55 pCi/L	June/July 2004

pCi/L = picocuries per liter MCL = maximum contaminant level

All groundwater samples were analyzed for uranium-234, -235/236, and -238. The activities for uranium-234 in samples from TRE-1, EOD Hill, and SFR-25 exceeded the DOE drinking water guideline of 20.0 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. 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).

URANIUM - 234 DOE Drinking Water Guideline = 20.0 pCi/L		
Well	**Concentration**	**Period**
EOD Hill	87.7 pCi/L	June/July 2004
SFR-2S	21.8 pCi/L	June/July 2004
TRE-1	25.4 pCi/L	June/July 2004

pCi/L = picocuries per liter

The results for radium-226 from the Greystone-MW2 sample exceeded the MCL of 5.0 pCi/L.

RADIUM MCL = 5.0 pCi/L MCL = 30 µg/L		
Well	**Concentration**	**Period**
Greystone –MW2	8.73 pCi/L	June/July 2004

pCi/L = picocuries per liter MCL = maximum contaminant level

7.2.2 ER Project Water Quality Results

<u>CWL Results</u>

Groundwater monitoring at the CWL is a compliance-driven activity with specific requirements mandated in Appendix G of the *Chemical Waste Landfill Postclosure Care Plan* (SNL 2003). Groundwater monitoring was performed at the CWL during December 2003, February/March, May, and August/September 2004. Samples were collected from 11 monitoring wells.

Analytes Sampled

Statistical trending data for groundwater contaminants that exceed regulatory limits is presented in Appendix B, Figures B-2 through B-4. Samples were analyzed for RCRA Appendix IX VOCs, semi-volatile organic compounds (SVOCs), herbicides, polychlorinated biphenyls (PCBs), and total metals. In addition, cyanide, sulfide, anions, and alkalinity analyses were performed. Not all samples were analyzed for the full suite of analytes. All analytical results were compared with MCLs and MACs.

VOC Analyses

No VOCs were detected above established MCLs and MACs, where applicable.

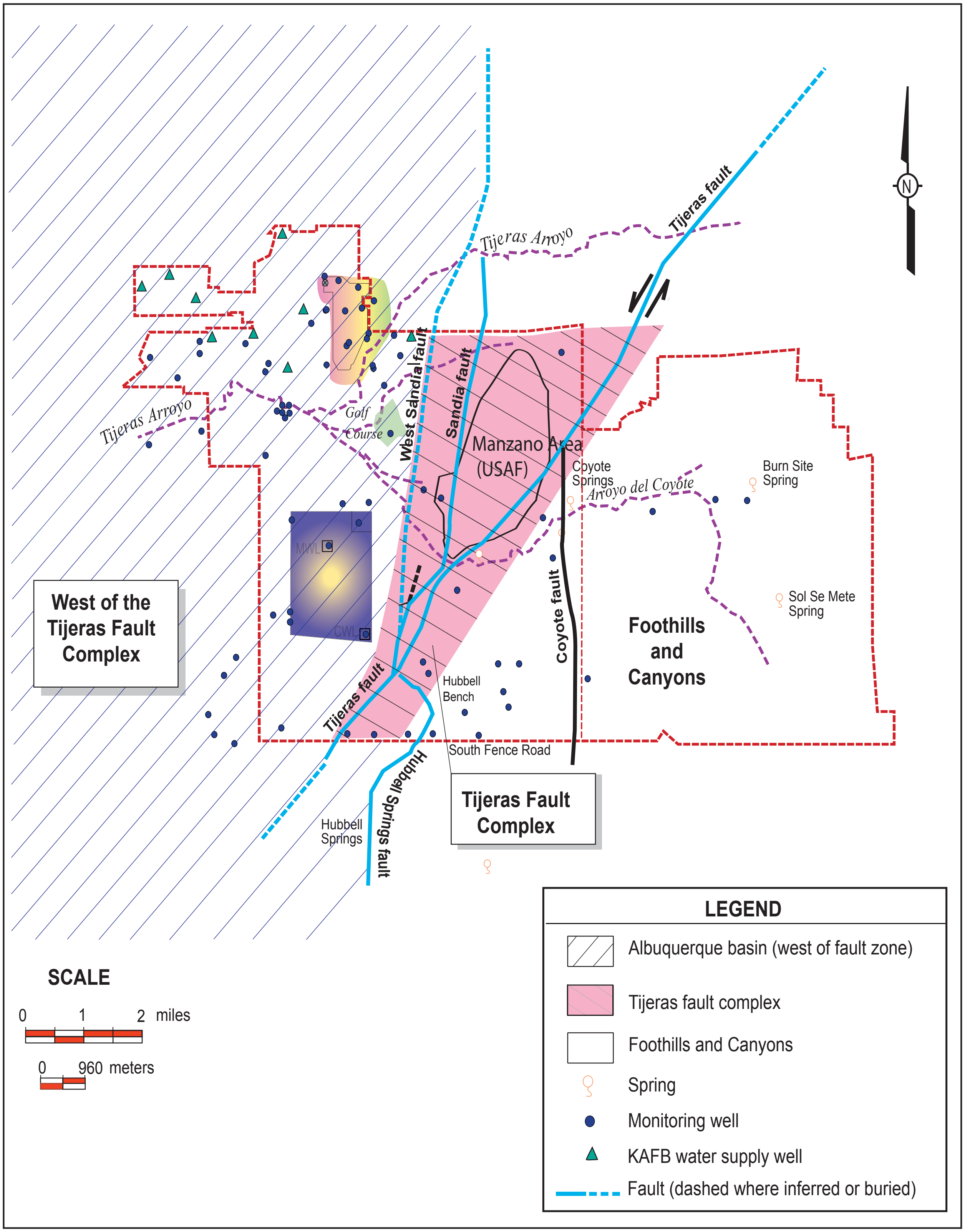

FIGURE 7-3. Hydrogeologically Distinct Areas at KAFB

SVOCs, Herbicides, and PCBs
No SVOCs were detected above established MCLs or MACs. Herbicides and PCBs were not detected at the laboratory determined minimum detection limit (MDLs).

Anions
Fluoride was determined at above the MAC of 1.6 mg/L in wells CWL-MW7 and CWL-MW8.

FLUORIDE MAC = 1.6 mg/L		
Well	**Concentration**	**Period**
CWL-MW7	1.69 mg/L	December 2003
CWL-MW7 (dup)	1.71 mg/L	December 2003
CWL-MW8	1.7 mg/L	June/July 2004

mg/L = milligrams per liter MAC = maximum allowable concentration

Metals
As required by the NMED's Hazardous Waste Bureau (HWB), all metal samples were analyzed for total metals. No RCRA Appendix IX metal parameters were detected above established MCLs or MACs, except chromium. Chromium was detected in the February 2004 sample from CWL-BW3.

Elevated chromium concentrations correlate to increased field turbidity measurements and are more common if sampling is less frequent than quarterly. Chromium is thought to be a result of corrosion of the stainless steel well screens used in these wells. Wells at the CWL constructed with PVC well screens have significantly lower chromium concentrations. The stainless steel corrosion product is in a particulate form. As such, the chromium is unlikely to migrate in the groundwater so as to present a hazard to a potential receptor.

CHROMIUM MCL = 0.1 mg/L MAC = 0.05 mg/L		
Well	**Concentration**	**Period**
CWL-BW3	0.138 mg/L	February 2004

mg/L = milligrams per liter MCL = maximum contaminant level
MAC = maximum allowable concentration

<u>MWL</u>
Annual groundwater sampling of the seven monitor wells at the MWL was conducted in April 2004. Two quarterly samples for perchlorate per the COOC were collected in April and August/September 2004 from wells MWl-BW1 and MWL-MW1. MWL groundwater samples were analyzed for VOCs, SVOCs, Target Analyte List (TAL) metals and total uranium, NPN, major ions including perchlorate in selected wells, tritium, and gross alpha-beta.

VOCs and SVOCs
No VOCs or SVOCs exceeded MCLs in any MWL wells in 2004.

Anions
NPN (reported as nitrogen) was detected in all monitoring wells at levels below the MCL of 10 mg/L. No perchlorate was detected at or above the action level of 4 mg/L as specified in the COOC.

Metals
No metals exceeded MCLs or MACs.

Radionuclide Activities
Radionuclide analysis of FY04 MWL groundwater samples included gross alpha/beta activities, gamma-emitting radionuclides, strontium-90 (in MWL-MW5 and MWL-MW6 only), tritium, and isotopic uranium. Gross alpha radioactivity in the MWL-MW5 sample was reported slightly greater than the MCL; however, when the gross alpha value is corrected for uranium activity, the value is below the MCL. No other radionuclides were detected above standards. Gamma spectroscopy analyses did not detect any isotopes above associated MDAs. Tritium was not detected above MDAs in any samples. Isotopic uranium ratios of uranium-235 to uranium-238 indicated that uranium in groundwater beneath the MWL is naturally occurring.

TA-V Results

Quarterly groundwater sampling at TA-V was performed in November/December 2003, March/April 2004, June 2004, and August/September 2004. Samples were collected from 13 monitor wells in the vicinity of TA-V.

Analytes Sampled

Groundwater samples were analyzed for VOCs, NPN, cations (calcium, magnesium, and sodium), anions (bromide, chloride, fluoride, and sulfate), and alkalinity. Additional samples were collected from wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 and analyzed for SVOCs, TAL, total uranium, tritium, gross alpha-beta, radionuclides by gamma spectroscopy, ethane, methane, ammonia, dissolved organic carbon, chemical oxygen demand, orthophosphate, manganese 2+, iron 2+, and carbon dioxide. The later set of analytes are used to interpret the potential and extent of natural degradation of organics at the site.

VOC Analyses

VOCs were detected in samples from TA-V wells at concentrations exceeding MCLs in monitoring wells LWDS-MW1 and TAV-MW8. The table below lists the concentrations and wells where the TCE MCL of 5 µg/L was exceeded. TCE concentrations in LWDS-MW1 are consistent with or demonstrate a slight decrease over previous sampling periods.

TRICHLOROETHENE (TCE)
MCL = 5 µg/L

Well	Concentration	Period
LWDS-MW1	18.2/17.0 µg/L (dup)	November/December 2004
LWDS-MW1	15.5/15.1 µg/L (dup)	April 2004
LWDS-MW1	13.1/15.5 µg/L (dup)	June 2004
LWDS-MW1	17.2/17.9 µg/L (dup)	August/September 2004
TAV-MW8	7.16 µg/L	November/December 2004

NOTE: dup = duplicate µg/L = micrograms per liter
MCL = maximum contaminant level

Inorganic and Other Chemical Analyses

Nitrate concentrations exceeded the MCL of 10 mg/L in LWDS-MW1 for all four quarters of FY04. Nitrate exceeded the MCL in the sample from AVN-2 in the fourth quarter of FY04.

NITRATE (AS NITROGEN)
MCL = 10 mg/L

Well	Concentration (mg/L)	Period
LWDS-MW1	12.0/12. 1 mg/L (dup)	November/December 2003
LWDS-MW1	14.9/15.0 mg/L (dup)	April 2004
LWDS-MW1	10.3/0.0 mg/L (dup)	June 2004
LWDS-MW1	12.2/12.0 mg/L (dup)	August/September 2004
AVN-2	10.7 mg/L	August/September 2004

NOTE: dup = duplicate mg/L = milligrams per liter
MCL = maximum contaminant level

Metals

In FY04, dissolved metal analyses were conducted for the four newer wells (TAV-MW3, TAV-MW4, TAV-MW5, and TAV-MW9). No metal concentrations exceeded established MCLs.

Radionuclide Activities

Groundwater samples were analyzed for gross alpha, gross beta, tritium, and gamma spectroscopy. Gamma spectroscopy analysis did not detect any isotopes above associated MDAs, except for short-lived unsupported daughter products.

All radionuclide activities in the samples collected from TA-V wells in FY04 were below MCLs and DOE drinking water guidelines, where established.

TAG

TAG wells are either screened in the regional aquifer or within a SGWS, perched several hundred feet above the regional aquifer. COCs include TCE and nitrate, which have been detected at concentrations exceeding the EPA's established MCLs for drinking water. Based on the requirements of the TAG Investigation Work Plan, five wells were dropped from routine sampling and three City of Albuquerque wells associated with the closed Eubank Landfill were added. In sum, samples were collected from 25 wells. There were 11 SGWS wells and 14 regional aquifer wells sampled in FY04.

Samples from each well were analyzed for VOCs, major ions, alkalinity, and nitrate. Additional analytes used to evaluate potential nitrate sources and evaluate the natural attenuation of contaminants were included. The additional analytes were: ferrous iron, manganese II, total phosphorous, total organic carbon (TOC), stable isotopes of hydrogen/oxygen/nitrogen, total Kjeldahl nitrogen, and ammonia.

VOC Analyses

TCE was detected in groundwater samples of several wells in the SGWS. Monitoring well WYO-4 had TCE concentrations above the MCL. Another SGWS well, TA2-W-19 had a TCE concentration above the MCL in the April 2004 sample.

TRICHLOROETHENE (TCE) MCL = 5 µg/L		
Well	**Concentration**	**Period**
Shallow Groundwater System Wells		
WYO-4	6.06/7.05 µg/L (dup)	October/November 2003
WYO-4	6.99/6.6 µg/L (dup)	January/February 2004
WYO-4	7.7/7.6 µg/L (dup)	April/May 2004
WYO-4	6.7/6.0 µg/L (dup)	July/August/September 2004
TA2-W-19	5.2/5.1 µg/L (dup)	April/May 2004

NOTE: µg/L = micrograms per liter MCL = maximum contaminant level
dup = duplicate

Inorganic Chemical Analyses

Nitrate exceeded the MCL of 10 mg/L in four wells during the FY04 sampling events. The nitrate concentration in one of the wells, TA2-W-19 only slightly exceeded the MCL and only for the nitrate analysis conducted in the field at the time of sampling. Nitrate concentrations are generally stable with a slight decrease over time. All other inorganic analytes were below MCLs, where established.

Canyons Area

Quarterly sampling was conducted on three Canyons Area wells located in Lurance Canyon near the SNL/NM Burn Site facility. The samples were analyzed for VOCs, SVOCs, High Explosives (HE), diesel range organics, gasoline organics, major ions including perchlorate (CYN-MW1D only, per the COOC), NPN, metals, gross alpha-beta, tritium, and radionuclides by gamma spectroscopy.

Organic Analyte Results

Toluene and Bis(2-Ethylhexyl)phthalate were detected in some wells but were all at "J" qualified values. ("J" data qualifier indicates an estimated constituent concentration that was detected but is below the laboratory practical quantitation limit [PQL].) Both toluene and Bis(2-Ethylhexyl)phthalate are common laboratory contaminants and likely are not present in the groundwater. Low levels of diesel range organics were detected. The highest value of 84.8 µg/L was detected in the sample for CYN-MW1D. All analysis for gasoline range organics were negative. No MCLs have been established for both diesel and gasoline range organics.

Inorganic Analyte Results

Fluoride exceeded the MAC of 1.6 mg/L for all samples collect in FY04 from CYN-MW1D. The NPN MCL of 10 mg/L was exceeded in all samples collected from CYN-MW1D and CYN-MW3. No perchlorate above the 4 µg/L action level was detected in the September 2004 sample from the CYN-MW1D well.

NPN (AS NITROGEN) MCL = 10 mg/L		
Well	**Concentration**	**Period**
Shallow Groundwater System Wells		
TA 2-SW1-320	24 mg/L	October/November 2003
TA2-SW1-320	25.0 mg/L	January/February 2004
TA2-SW1-320	24.2 mg/L	April/May 2004
TA2 –SW1-320	24.0 mg/L	July/August 2004
TJA-7	25.0 mg/L	October/November 2003
TJA-7	29.8 mg/L	January/February 2004
TJA-7	17.9 mg/L	April/March 2004
TJA-7	24.3/24.6 mg/L (dup)	July/August 2004
Regional Aquifer Wells		
TJA-4	25.8 mg/L	October/November 2003
TJA-4	27.0 mg/L	January/February 2004
TJA-4	26.4 mg/L	April/May 2004
TJA-4	25.4 mg/L	July/August 2004

NOTE: mg/L = milligrams per liter MCL = maximum contaminant level
dup = duplicate

FLUORIDE MCL = 4.0 mg/L MAC = 1.6 mg/L		
Well	**Concentration**	**Period**
CYN-MW1D	1.88 mg/L	December 2003
CYN-MW1D	1.79/1.78 mg/L (dup)	March 2004
CYN-MW1D	1.92 mg/L	June 2004
CYN-MW1D	1.71 mg/L	September 2004

NOTE: mg/L = milligrams per liter MAC = maximum allowable concentration
dup = duplicate MCL = maximum contaminant level

NPN MCL = 10.0 mg/L		
Well	**Concentration**	**Period**
CYN-MW1D	28 mg/L	December 2003
CYN-MW1D	24.9/25.1mg/L (dup)	March 2004
CYN-MW1D	25 mg/L	June 2004
CYN-MW1D	14 mg/L	September 2004
CYN-MW3	11.2 mg/L	December 2003
CYN-MW3	11.1 mg/L	June 2004
CYN-MW3	14.3 mg/L	September 2004

NOTE: mg/L = milligrams per liter dup = duplicate
MCL = maximum contaminant level

Metals Results
No metal concentrations above MCLs were detected in any of the wells sampled in FY04.

Radiological Results
Groundwater samples were analyzed for gross alpha, gross beta, tritium, and gamma spectroscopy. All radionuclide activities were below MCLs and DOE drinking water guidelines, where established. Gamma spectroscopy analysis did not detect any isotopes above associated MDAs, except for short-lived unsupported daughter products.

All radionuclide activities were below MCL and DOE drinking water guidelines where established.

DSS

Quarterly groundwater sampling of the four DSS wells, CYN-MW5, CTF-MW1, CTF-MW2, and CTF-MW3 was conducted in FY04.

Analytes Sampled

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), alkalinity, and major anions/cations. The sample from CYN-MW5 was analyzed for perchlorate per the COOC.

VOC and SVOC Analyses

No VOCs and SVOCs were detected above MCLs or MACs. In Well CTF-MW3, chloroform and dibromochloromethane were detected quarterly below the PQL and the results were "J" qualified. ("J" data qualifier indicates an estimated constituent concentration that was detected but is below the laboratory PQL.)

HE Compounds

HE compounds were not detected.

Inorganic Chemical Analyses

Fluoride was detected above the MAC of 1.6 mg/L in CTF-MW2 and CTF-MW3. Perchlorate was not detected in CYN-MW5 above the action level of mg/L.

FLUORIDE MCL = 4.0 mg/L MAC = 1.6 mg/L		
Well	**Concentration**	**Period**
CTF-MW2	2.28 mg/L	December 2003
CTF-MW3	1.9 mg/L	March 2004
CTF-MW2	1.77 mg/L	June 2004
CTF-MW3	2.23 mg/L	December 2003
CTF-MW3	2.22 mg/L	March 2004
CTF-MW3	7.72 mg/L	June 2004

NOTE: mg/L = milligrams per liter MAC = maximum allowable concentration
MCL = maximum contaminant level

Total RCRA Metals and Hexavalent Chromium

Arsenic was consistently detected in well CTF-MW2 above the MCL of 10 µg/L. Concentrations of the other seven RCRA metals and hexavalent chromium did not exceed established MCLs in any of the other wells.

ARSENIC MCL = 10 µg/L		
Well	**Concentration**	**Period**
CTF-MW2	73.8 µg/L	December 2003
CTF-MW2	62.6 µg/L	March 2004
CTF-MW2	67.4 /65.7µg/L (dup)	June 2004

mg/L = milligrams per liter MCL = maximum contaminant level
dup = duplicate

Gross Alpha/Beta Activities

Gross alpha/beta samples were collected from the four DSS wells. All results were below the MDA.

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 FY04, data from 142 wells were incorporated into the monitor well water level database. Water levels were measured monthly or quarterly.

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 one foot per year. 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 7-4. Groundwater levels east of the Tijeras fault complex are approximately 100 to 150 feet below the surface. The water table west of the Tijeras fault complex and the Sandia fault are approximately 500 feet or more below the surface. The aquifer system on the east side 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, FY04 is presented in Figure 7-4. The extent of the contoured map area was constructed using July, August, and September 2004 static water level data from 60 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 “U” shaped depression with the top of the “U” pointing north, 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 5,150 feet above sea level (fasl). This elevation corresponds to a depth to water from the surface of approximately 280 feet, where at the same location, the regional water table is a 530 feet below the ground surface. Along the eastern boundary of the SGWS the elevation of first water is at 5,010 fasl. This elevation is approximately the elevation of the regional water table at this location. 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 the *FY04 Annual Groundwater Monitoring Report* (SNL 2004).

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 feet. These units constitute the primary aquifer for the Albuquerque Metropolitan Area. In FY04, KAFB pumped approximately 1.11 billion gallons (3,395 acre-feet) of groundwater from ten water supply wells. In comparison, 1.18 billion gallons (3,604 acre-feet) of water were pumped for the same period of time in FY03.

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 60 wells were used to construct the map.

The amount of decline over the FY03 to FY04 period is approximately 1 feet/year, a decrease from the previous year's average decline of 1.2 feet/year. 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. 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.

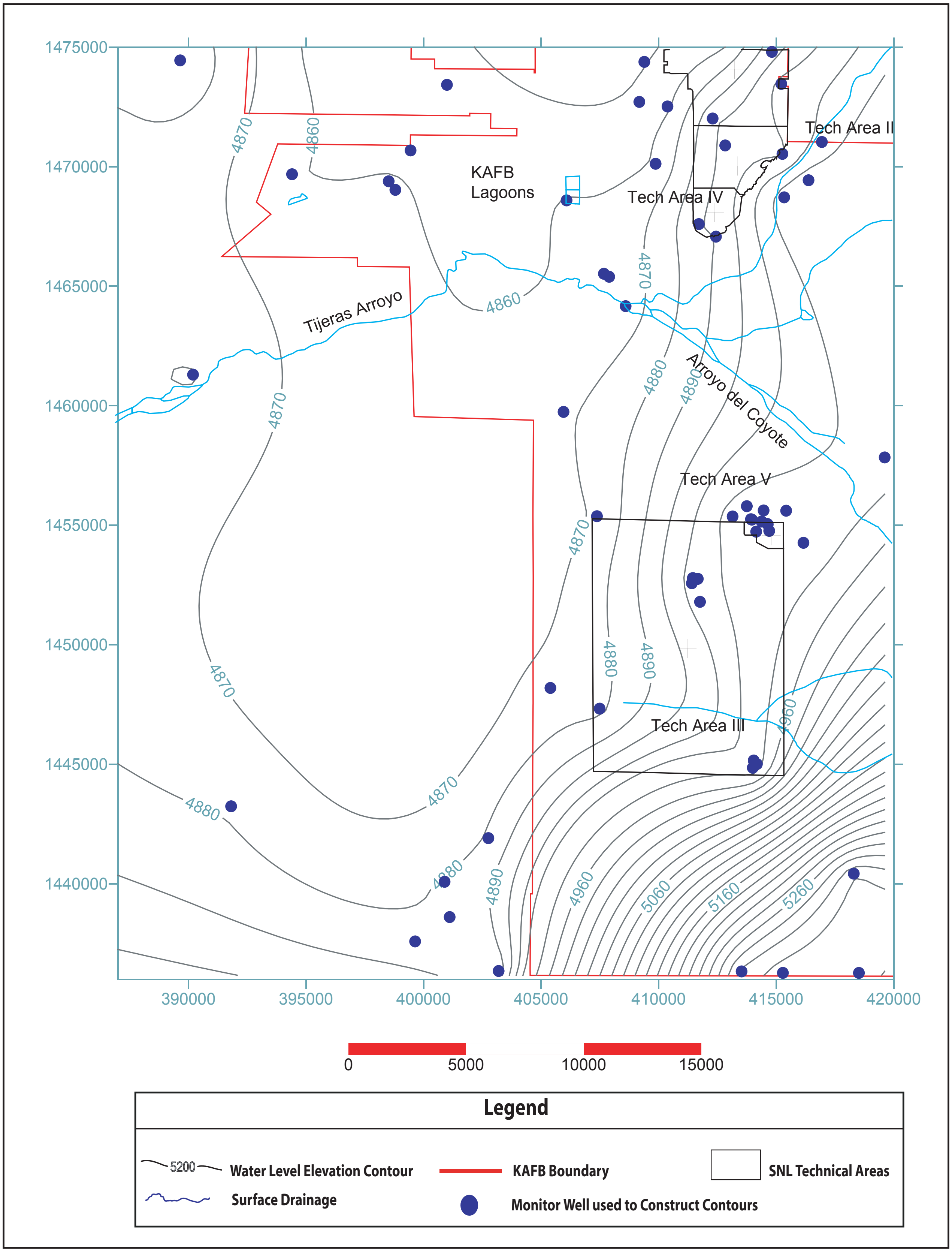

FIGURE 7-4. Regional Groundwater Elevation Map for SNL/KAFB, FY04

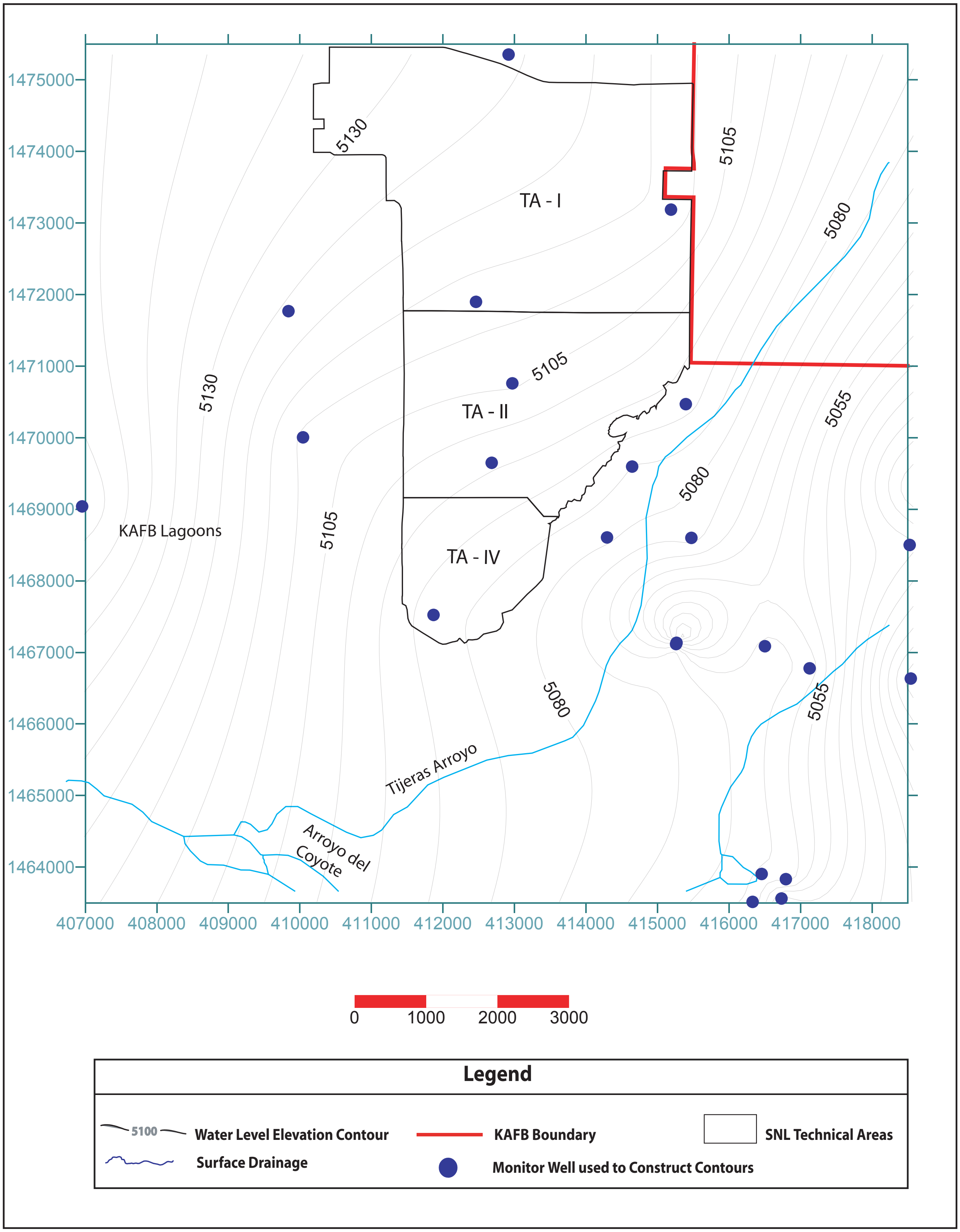

FIGURE 7-5. Shallow Groundwater System Water Elevation Map

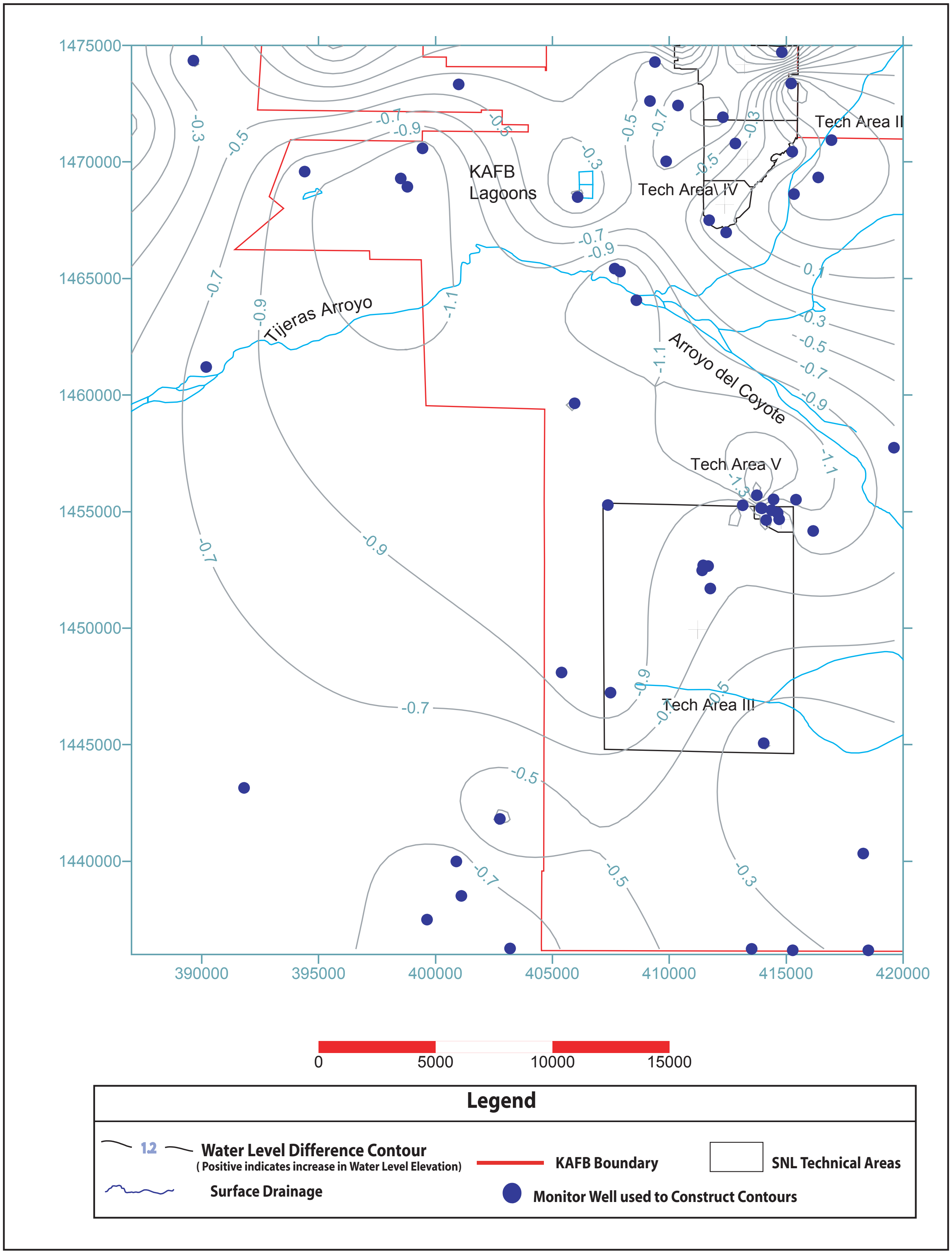

FIGURE 7-6. Annual Water Table Elevation Changes, FY03-FY04

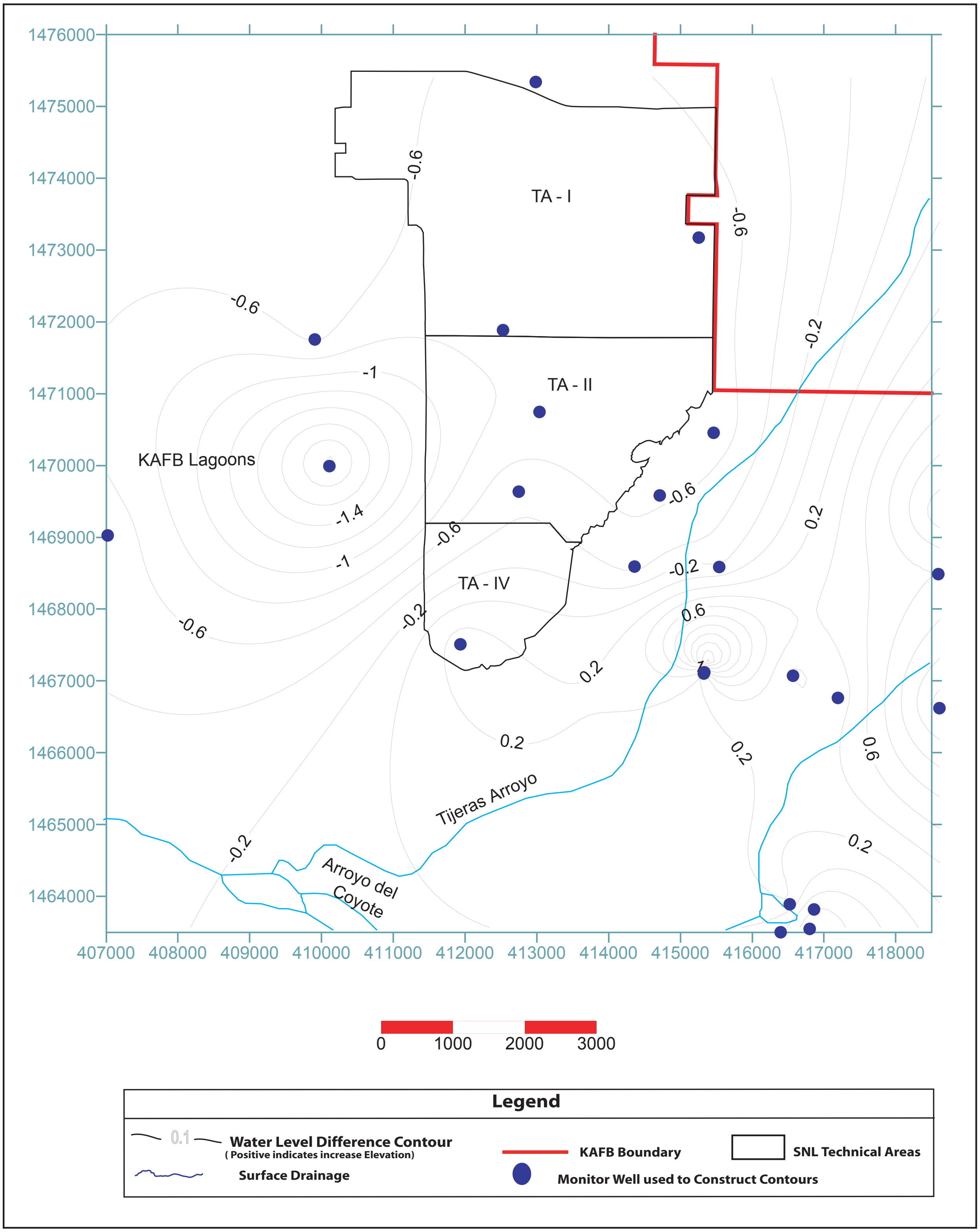

FIGURE 7-7. Shallow Groundwater System Elevation Changes, FY03-FY04

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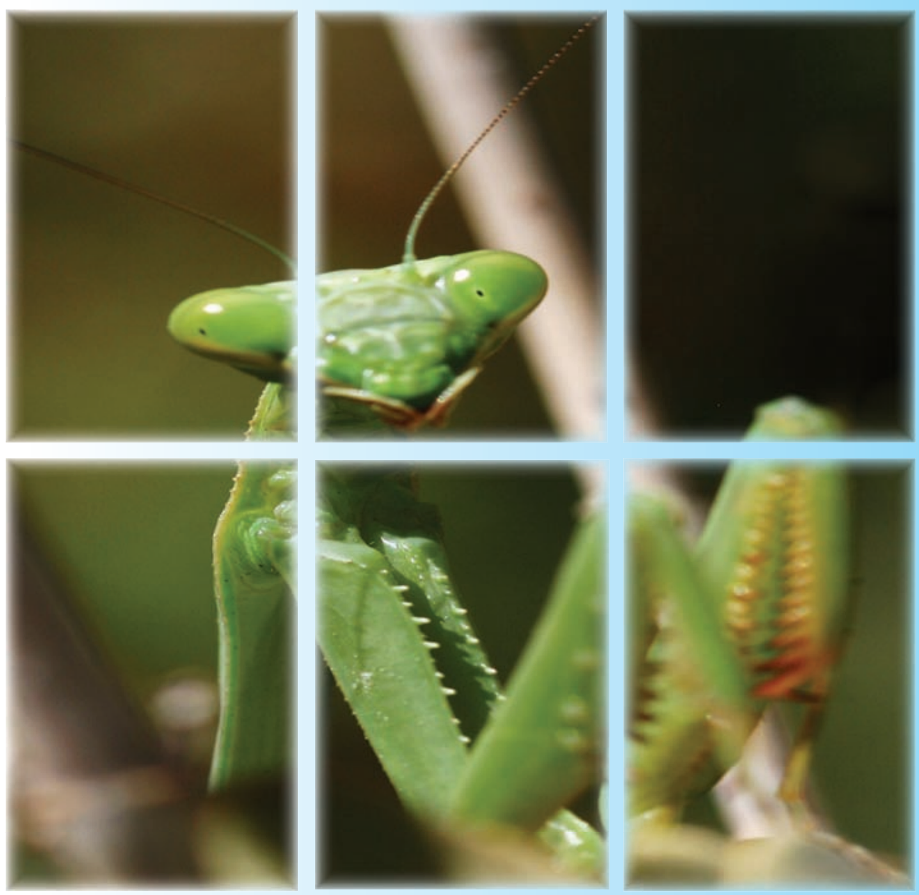
chapter eight

QUALITY ASSURANCE

In This Chapter ...

Environmental Snapshot

In 2004, the Sample Management Office processed a total of 9,738 samples in support of Sandia Corporation projects. Of these, 4,635 were for environmental monitoring and surveillance projects.



Photogenic Praying Mantis at SNL/NM

8.1 CORPORATE LEVEL QUALITY ASSURANCE (QA)

Sandia National Laboratories, New Mexico (SNL/NM) takes a management systems approach to integrate the applicable U.S. Department of Energy (DOE) Orders and other customer requirements, including adherence to Code of Federal Regulations (CFRs). The SNL Integrated Laboratory Management System (ILMS) CPSR 001.3, is the business rule that defines a uniform management system approach for accomplishing this integration activity.

The SNL/NM Corporate Work Process (CWP) CPR 001.3.4, is the business rule that describes the process-level approach for implementing the ILMS management principles and constituent elements.

These two approaches are used to integrate and implement the ten QA criteria contained in the Corporate Quality Assurance Program (QAP) CPR 001.3.2, with the safety requirements contained in CPR 400.1.2, "Integrated Safety Management System (ISMS)."

Corporate Quality Assurance Program

The SNL/NM QAP defines requirements, assigns responsibilities and authorities, and provides criteria for the management, performance, and assessment of work.

QA Criteria

The QA requirements are taken from DOE Order 414.1A "Quality Assurance," and 10 CFR 830.120 Subpart A "Quality Assurance Requirements."

Ten criteria are applied to all scope of work and implemented in accordance with the level of formality using the graded approach.

Management:
Criterion 1 - Program
Criterion 2 - Personnel Training and Qualification
Criterion 3 - Quality Improvement
Criterion 4 - Documents and Records

Performance:
Criterion 5 - Work Processes
Criterion 6 - Design
Criterion 7 - Procurement
Criterion 8 - Inspection and Acceptance Testing

Assessment:
Criterion 9 - Management assessment
Criterion 10 - Independent assessment

ISMS

Sandia is committed to performing work safely and ensuring the protection of members of the workforce, the public, and the environment. ISMS systematically integrates safety into management and work practices at all levels so that missions are accomplished while protecting the worker, the public, and the environment. The Environmental Management System (EMS) is integrated within ISMS as a component of environmental performance and assurances within ISMS.

The ISMS five safety management functions incorporate Environment, Safety, and Health (ES&H) into all activities from planning through performance through continuous improvement. (See illustration on following page.)

ISMS Five Safety Management Functions

Plan work - which involves translating the mission into work, setting expectations, and prioritizing tasks and allocating resources;

Analyze Hazards - identify and analyze hazards associated with the work;

Control Hazards - develop and implement hazard controls, which involves identifying applicable requirements, identifying controls to prevent/mitigate hazards, establishing the safety envelope, and implementing controls;

Perform Work - perform work within controls, which involves confirming operational readiness and performing work safely;

Feedback and Improve - provide feedback on adequacy of controls and continue to improve safety management, which involves gathering feedback information on the adequacy of controls, identifying and implementing opportunities for improving the definition and planning of work, conducting line and independent oversight, and, if necessary, addressing regulatory enforcement actions.

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.

Samples are packaged, shipped, and tracked to off-site laboratories by the Sample Management Office (SMO) as discussed in Section 8.3. Some samples are processed and analyzed for radiological constituents by the SNL/NM Radiation Protection Sample Diagnostics (RPSD) laboratory in accordance with RPSD procedures.

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 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 Quality Check (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 U.S. Environmental Protection Agency (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 Quality Assurance Project Plan (QAPP) for the SMO (SNL 2003f). 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, the SMO is responsible to ensure laboratories are audited annually.

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

Project specified QC samples are submitted to contract laboratories in order to meet project Data Quality Objectives (DQOs) and SAP requirements. Various field QC samples are collected to assess the quality and final usability of the data. Errors that can be introduced into the sampling process include potential sample contamination in the field or during transportation of samples, some of which are unavoidable. Additionally, the variability present at each sample location can also affect sample results.

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 either statistically established control criteria or method prescribed control limits 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 2004 SMO ACTIVITIES

In 2004, the SMO processed a total of 9,738 samples in support of Sandia Corporation projects, including environmental monitoring (air and water), waste characterization, decontamination and demolition (D&D), and Environmental Restoration (ER). Of these, 4,635 were for environmental monitoring and surveillance projects. A total of 1,166 samples were submitted as field and analytical QC samples to assist with data validation and decision-making. Approximately 804 QC samples were for environmental monitoring and surveillance projects.

SMO Sample Processing

The SMO processed the following types of samples in 2004 in support of SNL/NM projects:

- *Radioactive waste*
- *Mixed waste*
- *Hazardous waste*
- *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*

SMO contract laboratories perform work in compliance with the Sandia Corporation SOW for analytical laboratories (Puissant 2003).

Inter-Laboratory Comparisons

SMO contract laboratories are required to participate in the DOE Assessment Programs including 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% 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 Performance Evaluation Provider (PEP). Windows are typically two or three standard deviations around the true value.

Laboratory QA
In 2004, the SMO continued on-site data package assessments and validation at the National Environmental Laboratory Accreditation Program (NELAP) accredited laboratories used by Sandia Corporation. Data packages (including a wide array of analysis methods) are requested at the time on 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 2004, Sandia Corporation employed the following contract laboratories to perform analysis of SNL/NM samples:

General Engineering Laboratories (GEL) – Charleston, South Carolina.

Severn Trent – St. Louis, Missouri; Richland, Washington; Santa Ana, California; Austin, Texas; and Arvada, Colorado.

Hall Laboratory – Albuquerque, New Mexico.

QA Audits
The DOE Consolidated Audit Program (DOECAP), conducted audits in 2004 at the primary SMO contract laboratories using the DOECAP Quality Systems Analytical Services (QSAS) requirements. The audit reports, responses from the labs, and closure letters are all posted and tracked through the DOECAP website. The SMO works closely with the contract laboratories to expeditiously resolve audit findings. Decisions regarding sample distribution to the contract laboratories are based on audit information including outstanding corrective actions. In 2004, 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 makes the final decision regarding usability of data.

In addition, a predetermined percentage of data are validated to detailed method specified requirements and qualified in accordance with the Data Validation Procedure for Chemical and Radiochemical Data (SNL 2003c).

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chapter nine

REFERENCES, DOCUMENTS, PERMITS, LAWS, REGULATIONS, AND STANDARDS FOR ENVIRONMENTAL PROGRAMS

In This Chapter ...

Corrales Bosque in the Fall

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- Superfund Amendments and Reauthorization Act (SARA) of 1986 (see CERCLA)
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Note: U.S.C. = United States Code

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Ambient Air Surveillance Program

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NESHAP Program

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Air Quality Compliance Program

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Water Quality

All Water Quality Programs
- *Water Quality* (SNL 1997c)
- Section 10E, "Chemical Spills," *ES&H Manual* (SNL 2001a)
- *Sandia National Laboratories/New Mexico Emergency Plan* (SNL 2004l)

Wastewater Program
- Section 10H, "Discharges to the Sanitary Sewer System," *ES&H Manual* (SNL 2003l)
- *SNL/NM Wastewater Sampling and Analysis Plan* (SNL 2004v)

Surface Discharge Program
- *Discharge Plan Renewal Application, DP-530, SNL/NM* (SNL 2001c)
- Section 10T, "Surface and Storm Water Discharges," *ES&H Manual* (SNL 2004p)
- Section 10F, "Oils, Greases, and Fuels," *ES&H Manual* (SNL 1999a)

Storm Water Program
- *Storm Water Pollution Prevention Plan (SWP3)* (SNL 2001b)
- Section 10T, "Surface and Storm Water Discharges," *ES&H Manual* (SNL 2004p)
- *Sampling and Analysis Plan for the Storm Water Monitoring Program* (SNL 2003j)

Groundwater Protection Program (GWPP)
- *Annual Groundwater Monitoring Report (Fiscal Year 2003) for Sandia National Laboratories/ New Mexico* (SNL 2004)

NEPA Program

- *The National Environmental Policy Act (NEPA), Cultural Resources and Historic Properties Programs* (PG470110, Issue E) (SNL 2003p)
- *Sandia National Laboratories Final Site-Wide Environmental Impact Statement (SWEIS)* (DOE 1999a)
- *Environmental Assessment (EA) Rapid Reactivation Project* (DOE 1999)
- *Sandia National Laboratories/New Mexico Facilities and Safety Information Document (FSID)* (SNL 2005d) (Official Use Only)
- *Sandia National Laboratories/New Mexico Environmental Information Document (EID) (SNL 2004k) (Official Use Only)*
- Section 10B, *National Environmental Policy Act* (*NEPA*), *Cultural Resources, and Historic Properties*, (SNL 2003k)
- *Quality Assurance Project Plan (QAPjP) for the Preparation of Environmental Assessments at Sandia National Laboratories, New Mexico* (SNL 2004i)
- *SWEIS Annual Review- CY 2002* (SNL 2003o)

Various Other Environmental Programs

Biological Control Activity
- Section 6K, "Hazardous Waste Operations and Emergency Response (HAZWOPER)," *ES&H Manual* (SNL 2004n)
- Section 6D, "Hazard Communication Standard," *ES&H Manual* (SNL 2004m)

Oil Storage and Spill Containment

Oil Storage Programs
- *Final Spill Prevention Controls and Countermeasures (SPCC) Plan* (SNL 2003d)
- Section 10K, "Underground Storage Tanks," *ES&H Manual* (SNL 2003m)
- Section 10F, "Oils, Greases, and Fuels," *ES&H Manual* (SNL 1999a)

Terrestrial Surveillance

- *The Role of Data Analysis in Sampling Design of Environmental Monitoring* (Shyr, Herrera, Haaker 1998)
- *Environmental Monitoring and Surveillance Program* (SNL 2000b)
- *Environmental ALARA Program* (SNL 1996)
- *Quality Assurance Project Plan (QAPjP) for Terrestrial Surveillance at SNL/NM* (SNL 2004j)
- *2004 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2005g)
- *Environmental Monitoring Plan* (SNL 2002b)

Quality Assurance

Sample Management Office (SMO)

- *DOE/NNSA Model Statement of Work* (DOE/NNSA 2004)
- *Quality Assurance Project Plan (QAPP) for the Sample Management Office (SMO)* (SNL 2003f)

Waste Management

All Waste Management Programs

- *Storm Water Pollution Prevention Plan (SWP3)* (SNL 2001b)
- *Programmatic Waste Acceptance Criteria* (SNL 2003e)
- *Waste Management* (SNL 2003q)
- *Waste Characterization Project Overview* (SNL 2004w)

Hazardous Waste Management Program

- *2003 Hazardous Waste Biennial Report for Sandia National Laboratories/New Mexico and Sandia National Laboratories/Tonopah Test Range* (SNL 2004x)
- Section 19A, "Hazardous Waste Management," *ES&H Manual* (SNL 2005e)
- Section 10E, "Chemical Spills," *ES&H Manual* (SNL 2001a)

Solid Waste Program

- Section 19F, "Other Waste," *ES&H Manual* (SNL 2004s)

Radioactive Waste Management Program

- *Site Treatment Plan for Mixed Waste, Sandia National Laboratories/New Mexico,* FY03 Update. (SNL 2004u)
- Section 19B, "Radioactive Waste Management," *ES&H Manual* (SNL 2005f)
- *Radioactive Waste/Nuclear Material Disposition Department (RWNMDD) Waste Management Program* (SNL 2003h)
- *Manzano Nuclear Facilities/Non-Nuclear Storage Bunkers Maintenance Support Program* (SNL 2004h)
- Section 19D, "Radioactive Material Management Areas (RMMAs)," *ES&H Manual* (SNL 2003n)
- Section 19C, "Mixed Waste Management," *ES&H Manual* (SNL 2004r)
- Section 19E, "Treatability Studies for Hazardous and Mixed Waste," *ES&H Manual* (SNL 1997b)

TSCA Waste

- Section 6S, "Toxic Substances Control Act (TSCA)," *ES&H Manual* (SNL 2004o)

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2004

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-6	7/1/03	12/31/07	COA
General	WW006 Station Manhole, at Pennsylvania Ave.	2069 F-6	8/1/03	1/31/08	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-5	2/1/004	7/31/08	COA
General	WW011 Station Manhole, north of TA-III (includes TAs-III and V, and Coyote Test Field sewer lines)	2069 K-5	11/17/04	12/31/08	COA
SURFACE DISCHARGE					
Pulsed Power Development Facilities (Discharge Plan)	TA-IV, Lagoons I and II	DP-530	9/21/01	9/21/06	NMED
UNDERGROUND STORAGE TANKS					
UST (20,000 gallons)	TA-I	1368	8/23/04	6/30/05	NMED
UST (20,000 gallons)	TA-I	1369	8/23/04	6/30/05	NMED
ABOVE GROUND STORAGE TANKS					
AST/ 50,000	TA-I	1370	8/23/04	6/30/05	NMED
AST / 50,000	TA-I	1370	8/23/04	6/30/05	NMED
AST / 10,000	TA-I	1370	8/23/04	6/30/05	NMED
AST / 10,000	TA-I	1370	8/23/04	6/30/05	NMED
AST / 10,000	TA-I	1370	8/23/04	6/30/05	NMED
AST / 1,500	TA-I	1370	8/23/04	6/30/05	NMED
AST / 2,000	TA-I	1370	8/23/04	6/30/05	NMED
AST / 25,000	CTF	1370	8/23/04	6/30/05	NMED

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2004 *(continued)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
STORM WATER					
National Pollution Discharge Elimination System (NPDES) "Multi-sector General" Permit	Storm water discharges from Monitoing Points (MP) 01 through MP 10	NMR05A961	2/01	9/30/05	EPA
NPDES Construction Permits					
CINT CORE Facility Construction Project	Eubank	NMR15DC23	10/21/03	6/30/06	EPA
MESA Microsystems and Engineering Science Applications Facility	TA-I	NM0002376	N/A	7/31/09	EPA
ECIM Exterior Communication Infrastructure Modernization Project	TA-I	NMR15DC79	3/1/04	6/30/06	EPA
Aerial Cable Facilities Renovation	Sol se Mete Canyon	NMR15DD44	3/12/04	5/30/05	EPA
Building 805 Demolition Project	Building 805	NMR15DE25	4/6/04	11/30/04	EPA
Tijeras Arroyo Escarpment Stabilization Project	Tijeras Arroyo	NMR15DH65	6/21/04	10/31/04	EPA
Building 755	Building 755	NMR15DK40	8/9/04	4/15/05	EPA
TA-I Waterline Rehabilitation Project	TA-I	NMR15DR15	9/9/04	10/30/05	EPA
Security MO Installation	N/A	NMR15DS43	9/28/04	12/30/04	EPA
Photovoltaics Parking Lot	Photovoltaics Parking Lot	NMR15DV49	11/05/04	6/30/05	EPA
Building 956 - Lot A	Building 956	NMR15DW01	11/12/04	5/30/05	EPA
TA-II & TA-IV Improvments	TA-II and TA-IV		12/8/04	6/30/05	EPA
Building 729	Building 729	NMR15DY97	1/4/05	7/31/05	EPA
WAIVERS					
Building 702 Construction	Building 702	NMLEW108	11/7/04	6/15/05	EPA
Building 758 Construction	Building 758	NA	12/21/04	7/8/05	EPA
PENDING PROJECTS					
Building 1090	Building 1090	NMR15E170	2/15/04	9/30/05	EPA
COMPLETED PROJECTS					
SSWM Storm Drain System Modernization Project	SSWM Infrastructure	NMR15DC24	10/21/03	10/7/04	EPA
JCEL Joint Computational Engineering Lab	JCEL	NMR15DC26	10/21/03	10/7/04	EPA
Steam Plant AST Removal	Steam Plant	NMLEW97	9/2/04	10/7/04	EPA
Parking Lots - Building 894	Building 894	NMR15DI93	7/12/04	11/24/04	EPA
3 Parking Lots	Parking Lots	MNLEW96	9/17/04	NA	EPA
ECOLOGICAL					
New Mexico Department of Game and Fish for Scientific/Educational Purposes Authorization for Taking of Protected Wildlife	Site-Wide Ecological Monitoring Activity	2931	1/1/04	12/31/04	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	12/31/04	U.S. Fish and Wildlife Service
U.S. Fish and Wildlife Service Special Purpose Relocate Permit	Site-Wide Ecological Monitoring Activity	MB090256-0	6/25/04	12/31/04	U.S Fish and Wildlife Service

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2004 *(continued)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
RCRA *(continued)*					
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 [a] *** (request for renewal submitted 2/6/02, most recent revision submitted 11/29/2004)	NMED
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 [a]*** (request for renewal submitted 2/6/02, most recent revision submitted 11/04)	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[a] *** Class II modification issued 11/25/03. (request for renewal submitted 2/6/02, most recent revision submitted 11/29/04)	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 [a]*** (request for renewal submitted 2/6/02, most recent revision submitted 12/03)	NMED
RCRA Part A Permit Application for Hazardous Waste Management Units for the hazardous component in mixed waste stored and/or treated at ten waste management areas.	RMWMF (storage and treatment); 7 Manzano Bunkers (storage only); Auxiliary Hot Cell Facility (storage and treatment); Bldg. 6596 (storage only)	NM5890110518	Application for interim status first submitted 8/90; most recent revision 11/29/04	Under Review[a] (No expiration date)	NMED
RCRA Part B Permit Application for Hazardous Waste Management Units for the hazardous component in mixed waste stored and/or treated at seven waste management areas.	RMWMF (MW treatment and storage); 5 Manzano Bunkers (storage only); Auxiliary Hot Cell Facility (storage and treatment); Bldg. 6596 (storage only)	NM5890110518	Application first submitted in 1992. Most recent revision submitted 11/29/04	Under Review [a]	NMED

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2004 *(continued)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
TSCA					
Risk-Based Approval Request under 40 CFR 761.61(c); Risk-Based Method for Management of PCB Materials; Chemical Waste Landfill and CAMU	Chemical Waste Landfill and CAMU, co-located in TA-III	N/A	6/26/02	CAMU Closure Report submitted 4/19/04. CWL permit continues until closure; extended storage provision expired 9/30/03.	EPA, Region 6
Open Burn Permits**					
Lurance Burn Site	Igloo Building 9830	#04-001	1/5/04	12/31/04	COA
10,000’ Sled Track	Blast Tube Test Series	#04-002	1/5/04	12/31/04	COA
TTF**	Thermal Treatment	#04-003	1/5/04	12/31/04	COA
Above Ground	Explo/Propel/Therm	#04-004	1/5/04	12/31/04	COA
Above Ground	D Test	#04-008	1/15/04	12/31/04	COA
Lurance Burn Site	Large Pool Fire Tests	#04-009	1/15/04	12/31/04	COA
Burn Site/Sled	Wood Crib Fire Tests	#04-010	1/15/04	12/31/04	COA
Fire Extinguisher	Fier Training	#04-012	6/1/04	12/31/04	COA
Explosives	Thermite Applications	#04-021	6/2/04	12/31/04	COA
5000’ Track Bunker	LNG/LPG Tank Scoping	#04-031	8/17/04	12/31/04	COA
Water Impact Facility	LNG Spill Test on Water	#04-033	9/3/04	12/31/04	COA
Lurance Burn Site	Fuel Fire Accident Scenario	#04-037	9/28/04	12/31/04	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[a] 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 (closed)	Biennial update	COA

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2004 *(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
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
Processing and Environmental Technology Laboratory (PETL)	TA-I	936	5/5/04	Registration	COA
Advanced Manufacturing Prototype Facility (AMPF)	TA-I	1406	11/6/00	Registration	COA
Microelectronics Development Laboratory (MDL)	TA-I	1678	12/23/02	Biennial update	COA
Steam Plant	TA-I	1705	11/10/04	Biennial update	COA
FUGITIVE DUST CONTROL AND DEMOLITION PERMIT FILE** (Permits & Registrations)**					
K Avenue	K Avenue Improvement	Permit # unavailable	3/17/03	8/14/04	COA
Rad & Classified	Landfill Remediation	10-326-2573	6/4/03	5/30/04	COA
MESA MicroFab	MESA Project Phase I	10-328-2600	6/13/03	6/13/04	COA
MESA MicroLab	MESA Project Phase II	Permit # unavailable	11/17/03	5/31/05	COA
14th Street; Systems Modernization	TA-I	Permit # unavailable	3/1/04	2/23/05	COA
Storm Drain; SSWM Improvements	TA-III	10-149-2727	3/18/04	3/18/05	COA
Building 805; 805 Demolition Project	TA-I	10-210-2751	4/13/04	4/13/05	COA
Infrastructure Mod.; Exterior Communicate	F & Wyoming	10-390-2819	5/27/04	5/27/05	COA
MESA MicroFab 2; MESA Project Phase	TA-I	10-360-2841	6/10/04	6/10/05	COA
New Buiding 518; CINT Core Facility	Eubank Blvd.	10-237-2844	6/17/04	6/17/05	COA
SWMU 91; VCA 2004	TA-III	10-411-2903	7/30/04	7/30/05	COA
Soil Stockpile; CINT Core Facility	TA-I	10-237-2916	8/11/04	8/11/05	COA
MESA's WIF; Weapons Integration	TA-I	10-237-2918	8/10/04	8/10/05	COA
Cell No. 1; Borrow Site	TA-III	10-348-2925	8/18/04	8/18/05	COA
Four Stage Tanks; Tank Site Demolition	TA-I	10-210-2944	9/8/04	9/8/05	COA
Water Pipe Bursting; Waterline Rehabilitaion	TA-I	10-10-2998	11/22/04	11/22/05	COA
Building 6636; Radiography Upgrade	TA-III	Permit # unavailable	1/12/04	10/1/04	COA

NOTE: † Registration = Certificate, no permit required
††Approval = EPA does not issue a permit.to NMED on 02/06/2002
[a]Combined with application for permit renewal submitted
N/A = not applicable
PCB = polychlorinated biphenyl
*Permanent application submitted to COA on 2/28/05
**Open Burn Permits are issued by the City of Albuquerque for no more than a year at any one time.
***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.
****Permits are obtained by general contractors directly from City of Albuquerque
AST = Aboveground Storage Tank
COA= City of Albuquerque
JCEL = Joint Computational Engineering Laboratory
MESA = Microsystems and Engineering Sciences Applications
NMED = New Mexico Environment Department
NESHAP = National Emission Standards for Hazardous Air Pollutants
EPA = U.S. Environmental Protection Agency
RCRA = Resource Conservation and Recovery Act
SCA/CUB = Scientific Computing Annex/Central Utility Building
SCF = Scientific Computing Facility
SMERF = Smoke Emission Reduction Facility
TA= technical area
TTF = Thermal Treatment Facility
UST Bur. = Underground Storage Tank

APPLICABLE LAWS AND 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 Surface Waters"

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 Decisionmaking"
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
The National Environmental Policy Act (NEPA), Cultural Resources and Historic Properties Programs (PG470110, Issue E)
Sandia National Laboratories Final Site-Wide Environmental Impact Statement (SWEIS) (DOE 1999a)
Sandia National Laboratories/New Mexico Facilities and Safety Information Document (FSID) (SNL 2005b) (Official Use Only)
Sandia National Laboratories/New Mexico Environmental Information Document (EID) (SNL 2004l) (Official Use Only)

Section 10B, National Environmental Policy Act (NEPA), Cultural Resources, and Historic Properties, (SNL 2003l)
SNL/NM Air Quality and NEPA Quality Assurance Program Plan (2005)

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"
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 9-23)

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, "Petroleum Storage Tanks"

Waste Management

ER Project

Resource Conservation and Recovery Act (RCRA) of 1976, as amended
Toxic Substances Control Act (TSCA) of 1976
Pollution Prevention Act of 1990
40 CFR 261, "Identification and Listing of Hazardous Waste" (20.4.1.200 NMAC)
40 CFR 262, "Standards Applicable to the Generators of Hazardous Wastes" (20.4.1.300 NMAC)
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" (20.4.1.500 NMAC)
40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (20.4.1.600 NMAC)
40 CFR 268, "Land Disposal Restrictions" (20.4.1.800 NMAC)
40 CFR 270, "EPA-Administered Permit Programs: The Hazardous Waste Permit Program"(20.4.1.900 NMAC)
40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions"

Hazardous Waste Management Program

Resource Conservation and Recovery Act (RCRA) of 1976, as amended
Toxic Substances Control Act (TSCA) of 1976
Pollution Prevention Act of 1990
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" (20.4.1.200 NMAC)
40 CFR 262, "Standards Applicable to Generators of Hazardous Waste" (20.4.1.300 NMAC)
40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste" (20.4.1.400 NMAC)
40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities", (20.4.1.500 NMAC)
40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"(20.4.1.600 NMAC)
40 CFR 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities" (20.4.1.700 NMAC)
40 CFR 268, "Land Disposal Restrictions" (20.4.1.800 NMAC)
40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program" (20.4.1.900 NMAC)
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"
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 4.3, "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	Fugitive Dust Control
		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) Subpart H – Radionuclides Subpart M – 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

Notes: CAA = Clean Air Act
NMAC = New Mexico Administrative Code

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 the STP
Sep 1996	First MW Shipment	First MW shipment made to Perma-Fix/DSSI
Oct 1996	FFCO Amendment No. 1	FFCO amended
Dec 1996	Revisions to Proposed Treatment Methods	DOE and Sandia re-submitted Part A and B permit application, to reflect revisions to proposed on-site treatment methods
May 1997	FFCO Amendment No. 2	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.
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.

See notes at end of table.

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

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 No. 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.
Feb 2002	Revisions to Permit Application	DOE and Sandia submitted updated Part A and B permit application, to reflect revisions to on-site waste management operations. Permit application for mixed waste management units is combined with permit renewal request for hazardous waste management units at SNL.NM.
2003	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 2002 activities, and changes to proposed treatment technologies. NMED approved Revision 7 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
2004	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 2003 activities, and changes to proposed treatment technologies. NMED approved Revision 8 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
2004	FFCO Amendment No. 4	FFCO amended

Notes: 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.
FY = fiscal year
DOE = Department of Energy
HDRV = Historical Disposal Requests Validation
STP = Site Treatment Plan
FFCO = Federal Facility Compliance Order
MW = Mixed Waste

TABLE 9-4. Mixed Waste Treatment and Disposal Status

Waste Category	Volume (m^3)	Preferred Treatment Technology	Description	Status and Plans
TG 1	0.2	Deactivation	Inorganic Debris with Explosive Component	Utilizing on-site treatment and investigating off-site treatment and disposal options.[a]
TG 2	0	Deactivation	Inorganic Debris with a Water Reactive Component	No waste currently in inventory.
TG 3	0.01	Deactivation	Reactive Metals	Utilizing on-site treatment and investigating off-site treatment and disposal options.
TG 4	0.05	Macro-encapsulation	Elemental Lead	Utilizing off-site treatment and disposal options. [a]
TG 5	0	Neutralization followed by Stabilization	Aqueous Liquids (Corrosive)	No waste currently in inventory.
TG 6	0	Amalgamation	Elemental Mercury	No waste currently in inventory.
TG 7	0	Incineration	Organic Liquids I	No waste currently in inventory.
TG 8	3.6	Thermal Desorption	Organic Debris with Organic Contaminants	Utilizing off-site treatment and disposal options. [a]
TG 9	17.6	Macro-encapsulation	Inorganic Debris with TCLP Metals	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities. [a]
TG 10	0.7	Sort followed by Reclassification	Heterogeneous Debris	Sort waste as needed to determine more suitable treatability groups.
TG 11	0.01	Hydrothermal Processing	Organic Liquids II	Utilizing off-site treatment and disposal options. [a]
TG 12	1.15	Macro-encapsulation	Organic Debris with TCLP Metals	Utilizing off-site treatment and disposal options. [a]
TG 13	0.0.3	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	0.09	Stabilization	Soils <50% Debris & Particulates with TCLP Metals	Utilizing on-site treatment 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	Investigating on-site treatment and off-site treatment and disposal options. [a]
TG 18	0	Incineration	Particulates with Organic Contaminants	No waste currently in inventory.
TG 19	0.004	Stabilization	Liquids with Metals	Utilizing on-site treatment and off-site treatment and disposal options. [a]
TG 20	0.36	Deactivation followed by Stabilization	Propellant with TCLP Metals	Investigating on-site treatment and off-site treatment and disposal options. [a]
TG 21	1.0	Off-Site Shipment / Macro-encapsulation	Sealed Sources with TCLP Metals	Investigating on-site treatment and off-site treatment and disposal options. [a]
TG 22	0	Not Applicable	Reserved	Not Applicable
TG 23	0	Off-Site Shipment / Size Reduction followed by Stabilization	Thermal Batteries	No waste currently in inventory.
TG 24	2.3	Off-Site Shipment / Macro-encapsulation	Spark Gap Tubes with TCLP Metals	Utilizing on-site treatment and off-site treatment options, and investigating off-site disposal options. [a]
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	0.6	Off-Site Shipment / Macro-encapsulation	Debris Items with Reactive Compounds & TCLP Metals	Investigating on-site treatment and off-site treatment and disposal options. [a]
TG 27	0.14	Stabilization	High Mercury Solids & Liquids	Investigating off-site treatment and disposal options.
TRU/MW	0.83	To be determined	TRU/MW	Investigating off-site treatment and disposal options.

Notes: [a] Treatment and/or disposal at one or more permitted off-site mixed waste management facilities.
Treatments are detailed in the *Site Treatment Plan for Mixed Waste, Sandia National Laboratories, New Mexico* (SNL 2004t) and the *Site Treatment Plan for MW, FY03 Update* (SNL 2004u).
TCLP = toxicity characteristic leaching procedure m^3 = cubic meters
TRU/MW = transuranic/mixed waste

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, *Radiation Protection of the Public and the Environment* (DOE 1993a). Environmental monitoring requirements for DOE operations are given in DOE Order 450.1, *Environmental Protection Program* (DOE 2005). 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 9-5 lists the DCGs pertinent to activities at SNL/NM and to this report.

TABLE 9-5. 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 absorp

** F_1 value is the gastrointestinal absorption factor.

Listed DCG's for U_{tot} are based on U_{nat} listing in

Conversion from microcuries per milliliter (µCi/ml) to micrograms per liter (µg/L) may be made using:

$$\mu g/L = X \mu Ci/ml \; \frac{1.48 \times 10^9 \mu g/L}{[\mu Ci/ml]}$$

- *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 9-6 summarizes the public radiation protection standards that are applicable to DOE facilities.

WATER QUALITY MONITORING PARAMETERS

Resource Conservation and Recovery Act (RCRA)

Table 9-7 lists the 40 CFR 265, Subpart F, parameters required for groundwater monitoring analysis, implemented under RCRA. Table 9-8 gives the EPA interim primary drinking water standards (40 CFR 265, Appendix III) for the groundwater monitoring parameters. Table 9-9 gives EPA secondary drinking water standards. At SNL/NM, this regulation applies to Environmental Restoration (ER) sites. Table 9-10 gives New Mexico Water Quality Control Commission (NMWQCC) Standards for groundwater.

TABLE 9-6. 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 DOE = Department of Energy

TABLE 9-7. Groundwater Monitoring Parameters Required by 40 CFR 265, Subpart F*

Contamination Indicator	Groundwater Quality	Appendix III† Drinking Water Supply
pH	Chloride	Arsenic
Specific Conductivity	Iron	Barium
Total Organic Halogen (TOX)	Manganese	Cadmium
Total Organic Carbon (TOC)	Phenol	Chromium
	Sodium	Fluoride
	Sulfate	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.
pH = potential of hydrogen (acidity)

TABLE 9-8. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards

Inorganic Chemicals	MCL	Units
Antimony	0.006	mg/L
Arsenic	0.010	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]	0.2	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 9-8. 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
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 9-9. 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 9-10. 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	0.75	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 9-10. 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

2004 WASTEWATER AND STORM WATER MONITORING RESULTS

Employee Conducting Wastewater Monitoring

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CONTENTS

TABLES

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TABLE A-1. Permitted Sanitary Outfalls, March 2004

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

Permit Number:	**2069-A**		**2069F-4**		**2069G-2**		**2069I-3**		**2069-K**		**Regulatory**
Station:	**WW001**		**WW006**		**WW007**		**WW008**		**WW011**		**Limit**
Date Collected:	**3/2/2004**		**3/2/2004**		**3/2/2004**		**3/2/2004**		**3/2/2004**		**COA**
Sample ID:	**064037**		**064038**		**064039**		**064040**		**064041**		**(mg/L)**
Analyte											
Aluminum	0.0581	J	0.287	J	0.00497	U	0.121		0.094	J	900
Arsenic	0.0101		0.00445	J	0.00238	U	0.0102		0.0139		0.051
Boron	0.105		0.159		0.0112	J	0.0883		0.352		NE
Cadmium	0.000592	BJ	0.000432	BJ	0.000386	BU	0.000386	BU	0.000386	BU	0.5
Chromium	0.00119	J	0.00211	J	0.00082	J	0.00269	J	0.00409	J	4.1
Copper	0.0561		0.0311		0.00877		0.0196		0.0431		5.3
Fluoride	0.822		0.69		2.34		2.35		0.464		36
Lead	0.00266	U	0.00266	U	0.00266	U	0.00266	U	0.00266	U	1
Molybdenum	0.17		0.0648		0.0106		0.0579		0.0255		2
Nickel	0.00236	J	0.00538		0.00148	U	0.00148	U	0.003	J	2
Selenium	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.46
Silver	0.00118	U	0.0121		0.00118	U	0.00118	U	0.00118	U	5
Zinc	0.0837		0.0627		0.00209	U	0.0322		0.113		2.2

Permit Number:	**2069-A**		**2069F-4**		**2069G-2**		**2069I-3**		**2069-K**		**Regulatory**
Station:	**WW001**		**WW006**		**WW007**		**WW008**		**WW011**		**Limit**
Date Collected:	**3/3/2004**		**3/3/2004**		**3/3/2004**		**3/3/2004**		**3/3/2004**		**COA**
Sample ID:	**064042**		**064043**		**064044**		**064045**		**064046**		**(mg/L)**
Analyte											
Aluminum	0.219		0.278	J	0.384		0.104		0.523		900
Arsenic	0.0171		0.0118		0.0044	J	0.0102		0.0166		0.051
Boron	0.142		0.226		0.0232	J	0.231		0.135		NE
Cadmium	0.00182	BJ	0.000638	BJ	0.000386	BU	0.00095	BJ	0.000547	BJ	0.5
Chromium	0.00279	J	0.00143	J	0.00139	J	0.00443	J	0.00278	J	4.1
Copper	0.162		0.0308		0.00745		0.0409		0.0236		5.3
Fluoride	0.749		0.649		5.11		4		0.55		36
Lead	0.00266	U	0.00266	U	0.00266	U	0.00266	U	0.00375	J	1
Molybdenum	0.175		0.0707		0.0115		0.0118		0.0675		2
Nickel	0.0047	J	0.00479	J	0.00148	U	0.00475	J	0.00151	J	2
Selenium	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.46
Silver	0.00118	U	0.02		0.00118	U	0.00118	U	0.00118	U	5
Zinc	0.147		0.0998		0.00248	J	0.162		0.0457		2.2

See notes at end of table.

TABLE A-1. Permitted Sanitary Outfalls, March 2004 (concluded)

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

Permit Number:	**2069-A**	**2069F-4**		**2069G-2**		**2069I-3**		**2069-K**	**Regulatory**
Station:	**WW001**	**WW006**		**WW007**		**WW008**		**WW011**	**Limit**
Date Collected:	**--**	**3/2/2004**		**3/2/2004**		**3/2/2004**		**--**	**COA**
Sample ID:	**--**	**064047**		**064048**		**064049**		**--**	**(mg/L)**
Analyte									
Cyanide,Total	--	0.00834		0.00172	U	0.00372	J	--	0.45
Cyanide,Total	--	0.0168		0.00172	U	0.0423		--	0.45
Cyanide,Total	--	0.018		0.00172	U	0.00469	J	--	0.45
Cyanide,Total	--	0.00172		0.0217		0.00564		--	0.45

NOTES: COA = City of Albuquerque

"—" -= not applicable

J = Estimated value, the analyte concentration fell above the effective (MDL) minimum detection limit and below the effective (PQL) practical quantitation 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 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.

TABLE A-2. Summary of Sanitary Outfalls of Radiological Analyses, March 2004

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

Permit Number:	2069-A		2069F-4		2069I-3		2069-K		Regulatory
Station:	WW001		WW006		WW008		WW011		Sewer
Date Collected:	3/2/2004		3/2/2004		3/2/2004		3/2/2004		Release
Sample ID:	064037		064038		064040		064041		Limits [a]
									(Monthly Average)
Analyte	**Activity**	**MDA**	**Activity**	**MDA**	**Activity**	**MDA**	**Activity**	**MDA**	
Actinium-228	3.57 ± 21.3 U	10.4	7.73 ± 13.1 UX	7.55	1.11 ± 10.3 U	5.76	17.5 ± 8.81 X	8	300,000
Americium-241	6.86 ± 10.7 U	8.14	10.4 ± 9.74 UX	8.11	-7.71 ± 11.5 U	9	0.463 ± 2.63 U	2.22	200
Antimony-124	-1.36 ± 3.01 U	2.4	1.87 ± 2.08 UX	1.81	-0.997 ± 1.91 U	1.37	0.941 ± 2.11 U	1.86	70,000
Antimony-125	1.77 ± 7.16 U	6.06	-4.43 ± 4.83 U	3.96	1.58 ± 4.66 U	3.82	-1.28 ± 5.02 U	4.11	300,000
Barium-133	-2.51 ± 3.33 U	2.71	1.98 ± 2.54 U	2.14	-0.393 ± 2.13 U	1.73	1.22 ± 2.25 U	1.93	200,000
Beryllium-7	-11.1 ± 22.2 U	18	-15.3 ± 15.7 U	12.6	-4.14 ± 13.7 U	11.6	-1.28 ± 18.4 U	15	6,000,000
Bismuth-211	23 ± 20.1 UX	13.1	20.6 ± 12.3 UX	10.7	7.7 ± 19.2 U	8.35	1.05 ± 18.5 U	9.06	NE
Bismuth-212	17.9 ± 21.3 U	19.2	2.25 ± 15.2 U	12.8	10.9 ± 12.5 U	11	3.3 ± 16.8 U	14.5	70,000
Bismuth-214	4 ± 11.1 U	5.41	7.14 ± 8.06 UX	3.97	1.17 ± 8.71 U	3.55	5 ± 4.3 UX	3.87	3,000,000
Cadmium-109	57.8 ± 57.4 UX	48.5	-11.6 ± 37.2 U	32.1	-10.2 ± 40.7 U	32	-0.943 ± 24.3 U	20.1	60,000
Cerium-139	-1.9 ± 2.21 U	1.73	-0.983 ± 1.62 U	1.34	-0.667 ± 1.44 U	1.21	-0.169 ± 1.51 U	1.1	700,000
Cerium-141	0.356 ± 4.27 U	3.48	0.872 ± 5.36 U	2.54	2.46 ± 4.98 UX	2.25	-2.52 ± 2.8 U	2.17	300,000
Cerium-144	-13.6 ± 15.8 U	12.4	15.6 ± 18.4 UX	9.54	9.1 ± 10.4 UX	9.08	-1.04 ± 8.81 U	7.08	30,000
Cesium-134	5.16 ± 2.82 UX	2.53	2.37 ± 2.1 UX	1.88	0.073 ± 1.62 U	1.35	1.31 ± 2.47 U	2.15	9,000
Cesium-137	33 ± 5.7 X	4.74	0.71 ± 2.11 U	1.81	1.89 ± 1.74 UX	1.55	1.72 ± 2.18 U	1.94	10,000
Chromium-51	6.45 ± 23.6 U	20.2	4.99 ± 18.4 U	15.2	-11.9 ± 15.8 U	12.6	-16 ± 18.1 U	14.7	5,000,000
Cobalt-57	-0.0443 ± U	1.64	0.0493 ± 1.43 U	1.23	0.0415 ± 1.28 U	1.11	0.849 ± 1.09 U	0.905	600,000
Cobalt-60	2.46 ± 3.22 U	2.85	0.371 ± 2.05 U	1.75	-0.719 ± 1.68 U	1.36	-0.263 ± 2.3 U	1.95	30,000
Europium-152	-4.47 ± 8.55 U	6.15	0.502 ± 5.73 U	4.69	0.912 ± 5.05 U	4.17	0.189 ± 5.05 U	4.25	100,000
Europium-154	2.27 ± 7.42 U	6.37	-2.1 ± 5.58 U	4.53	0.46 ± 5.36 U	4.57	-1.88 ± 7.21 U	5.25	70,000
Gross Alpha	1.81 ± 1.49 U	1.08	2.81 ± 1.85	1.09	2.14 ± 1.14	0.751	1.73 ± 0.798	0.495	NE
Gross Beta	23.2 ± 1.72	0.768	34.3 ± 3.06	1.44	6.83 ± 1.06	0.609	2.12 ± 0.676	0.457	NE
Iron-59	-0.787 ± 5.65 U	4.69	-1.9 ± 4.06 U	3.34	-1.62 ± 3.16 U	2.6	3.81 ± 5.04 U	4.37	100,000
Lead-211	-65.3 ± 92.2 U	58	34.6 ± 53.2 U	43.7	-6.46 ± 45.6 U	36.5	-12.6 ± 48 U	39	2,000,000
Lead-212	2.62 ± 9.72 U	4.68	3.02 ± 6.68 U	2.56	11.8 ± 3.49 X	3.06	0.888 ± 5.52 U	2.81	20,000
Lead-214	7.99 ± 7.02 UX	4.71	2.67 ± 4.31 U	3.61	2.68 ± 6.69 U	3.34	0.367 ± 6.42 U	3.57	1,000,000
Manganese-54	-1.77 ± 2.57 U	2.08	-0.724 ± 1.95 U	1.56	-0.536 ± 1.67 U	1.35	0.247 ± 2.18 U	1.85	300,000
Mercury-203	1.06 ± 2.64 U	2.28	2.57 ± 2.07 UX	1.79	-0.011 ± 1.79 U	1.48	0.00683 ± 1.86 U	1.59	300,000
Neptunium-237	-2.13 ± 17.3 U	14.2	8.24 ± 21 U	9.36	4.05 ± 12.7 U	10.2	3.93 ± 7.8 U	6.03	300,000
Neptunium-239	-1.47 ± 15.5 U	12.7	6.85 ± 11.1 U	9.72	-2.47 ± 9.72 U	8.37	-0.221 ± 8.3 U	6.74	300,000
Niobium-95	3.48 ± 6.21 UX	2.41	-0.521 ± 2.06 U	1.68	1.19 ± 1.84 U	1.6	1.39 ± 2.57 U	2.24	300,000
Potassium-40	86.3 ± 77.8	20.3	82.9 ± 50.6	15.8	19.4 ± 38.5 U	13.1	6.78 ± 43.4 U	18.2	40,000
Protactinium-231	-35.8 ± 115 U	96.4	27.4 ± 88 U	73.5	44.7 ± 77 U	65	38.8 ± 75 U	65	60
Protactinium-233	1.84 ± 7.19 U	4.08	-0.359 ± 3.7 U	3.02	-0.596 ± 3.24 U	2.65	2.41 ± 3.14 U	2.74	200,000
Protactinium-234	-2.46 ± 20 U	16.7	-18.4 ± 16.9 U	12.1	4.41 ± 12.9 U	10.9	-6.08 ± 18.1 U	14.7	300,000
Radium-223	-8.71 ± 48.8 U	41.1	-26.4 ± 40.3 U	31.6	4.58 ± 32.8 U	27.1	-17.1 ± 37.3 U	27.5	1,000
Radium-224	93.6 ± 54.5 X	43.7	30.3 ± 41.1 U	31.6	9.06 ± 54.6 U	38.4	32.3 ± 31.5 UX	25.5	2,000
Radium-226	4 ± 11.1 U	4.91	7.14 ± 8.06 UX	3.97	1.17 ± 8.71 U	2.79	5 ± 4.3 UX	3.87	600

See notes at end of table.

TABLE A-2. Summary of Sanitary Outfalls of Radiological Analyses, March 2004 (concluded)

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

Permit Number:	2069-A		2069F-4		2069I-3		2069-K		Regulatory
Station:	WW001		WW006		WW008		WW011		Sewer
Date Collected:	3/2/2004		3/2/2004		3/2/2004		3/2/2004		Release
Sample ID:	064037		064038		064040		064041		Limits [a]
									(Monthly Average)
Analyte	Activity	MDA	Activity	MDA	Activity	MDA	Activity	MDA	
Radium-228	3.57 ± 21.3 U	10.4	7.73 ± 13.1 UX	7.55	1.11 ± 10.3 U	5.76	17.5 ± 8.81 X	8	600
Radon-219	27.8 ± 32.3 U	28	-8.51 ± 21.3 U	18.1	10.4 ± 19.6 U	16.3	11.7 ± 21.3 U	18.1	NE
Rhodium-106	18.1 ± 25.7 U	21.9	3.58 ± 16.1 U	13.8	-1.16 ± 14.4 U	12.1	-14.8 ± 17.6 U	14.5	1,000,000
Ruthenium-103	-1.75 ± 2.99 U	2.4	0.0517 ± 1.96 U	1.68	-0.0348 ± U	1.37	-0.617 ± 2.29U	1.85	300,000
Ruthenium-106	9.1 ± 25.8 U	21.6	5.71 ± 16.3 U	14.1	4.81 ± 14.2 U	12.3	-11.9 ± 17.4 U	14.5	30,000
Selenium-75	-0.393 ± 3.21U	2.73	1.44 ± 2.43 U	2.06	1.38 ± 2.12 U	1.81	-1.42 ± 2.01 U	1.68	70,000
Sodium-22	-0.0782 ± U	2.27	-0.545 ± 1.97 U	1.62	0.177 ± 1.91 U	1.63	-0.666 ± 2.58U	1.88	20,000
Strontium-85	-14.3 ± 4.36 U	3.08	-14.5 ± 3.25 U	2.17	-17 ± 2.75 U	1.67	-19.1 ± 3.44 U	1.98	400,000
Thallium-208	9.44 ± 3.45 X	3.12	1.01 ± 3.74 U	1.92	5.62 ± 1.93 X	1.81	5.21 ± 2.38 X	2.1	NE
Thorium-227	-16.2 ± 27.4 U	22.9	-18.4 ± 22.3 U	17.5	2.81 ± 19.1 U	16	-6.01 ± 18.2 U	15.4	20,000
Thorium-231	6.06 ± 13.4 U	11.6	-1.92 ± 10.6 U	8.7	2.42 ± 8.95 U	7.51	-3.84 ± 8.36 U	7.03	500,000
Thorium-232	2.6 ± 9.64 U	3.43	2.99 ± 6.63 U	2.54	11.7 ± 3.47 X	3.04	0.876 ± 5.46 U	2.77	300
Thorium-234	5.28 ± 172 U	69.6	207 ± 92.3 X	73.8	224 ± 103 X	82.6	1.89 ± 62.9 U	20.9	50,000
Tin-113	-1.03 ± 3.41 U	2.83	0.191 ± 2.57 U	2.08	0.0871 ± 2.15 U	1.75	-0.129 ± 2.28U	1.89	300,000
Tritium	63.6 ± 95.2 U	77	0 ± 86.6 U	72.7	61.8 ± 92.5 U	74.8	64.2 ± 96.1 U	77.7	10,000,000
Uranium-235	27.3 ± 17.1 UX	14	3.4 ± 20.9 U	10.8	9.57 ± 19.4 UX	9.47	21.5 ± 10.4 X	8.34	3,000
Uranium-238	5.28 ± 172 U	69.6	207 ± 92.3 X	73.8	224 ± 103 X	82.6	1.89 ± 62.9 U	20.9	3,000
Yttrium-88	1.99 ± 3.36 U	3.04	1.27 ± 2.13 U	1.89	-0.246 ± 1.96 U	1.58	-0.662 ± 2.2 U	1.76	100,000
Zinc-65	1.33 ± 5.86 U	4.39	1.33 ± 4.83 U	3.7	-2.32 ± 3.46 U	2.81	2.99 ± 6.75 U	3.78	50,000
Zirconium-95	-2.53 ± 5.52 U	3.94	2.25 ± 3.56 U	3.09	0.834 ± 2.98 U	2.53	1.24 ± 4.04 U	3.5	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 analyte is not present.

NE = not established.

MDA = minimum detectable activity.

CFR = Code of Federal Regulations

[a] The monthly average concentration values for release to sanitary sewerage were derived by taking the most restrictive occupational stochastic oral ingestion annual limits on intake (ALI) for a Reference Man.

TABLE A-3. Permitted Sanitary Outfalls, September 2004

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

Permit Number:	2069-A		2069F-4		2069G-2		2069I-3		2069-K		Regulatory
Station:	WW001		WW006		WW007		WW008		WW011		Limit
Date Collected:	9/8/2004		9/8/2004		9/8/2004		9/8/2004		9/8/2004		COA
Sample ID:	065453		065454		065455		065456		065457		(mg/L)
Analyte											
Aluminum	0.192		0.104		0.169		0.125		0.194		900
Arsenic	0.02		0.0205		0.0036	J	0.0142		0.013		0.051
Boron	0.19		0.181		0.0304	J	0.123		0.133		NE
Cadmium	0.000386	U	0.00054	J	0.000386	U	0.000386	U	0.000586	J	0.5
Chromium	0.00287	BJ	0.00105	BJ	0.000938	BJ	0.00212	BJ	0.00289	BJ	4.1
Copper	0.00974		0.00458	J	0.00267	J	0.0152		0.0262		5.3
Fluoride	1.07		0.72		2.07		2.04		0.55		36
Lead	0.00266	U	0.00266	U	0.00266	U	0.00266	U	0.00266	U	1
Molybdenum	0.191		0.15		0.0425		0.0901		0.035		2
Nickel	0.00506		0.00381	J	0.0024	J	0.0101		0.00371	J	2
Selenium	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.46
Silver	0.00118	U	0.00118	U	0.00118	U	0.00118	U	0.00118	U	5
Zinc	0.173		0.0446		0.00282	J	0.0414		0.102		2.2

Permit Number:	2069-A		2069F-4		2069G-2		2069I-3		2069-K		Regulatory
Station:	WW001		WW006		WW007		WW008		WW011		Limit
Date Collected:	9/9/2004		9/9/2004		9/9/2004		9/9/2004		9/9/2004		COA
Sample ID:	065458		065459		065460		065461		065462		(mg/L)
Analyte											
Aluminum	0.201		0.222		0.168		0.14		0.0375	J	900
Arsenic	0.0209		0.0135		0.00521		0.0176		0.00987		0.051
Boron	0.189		0.198		0.0341	J	0.13		0.129		NE
Cadmium	0.000386	U	0.000512	J	0.000386	U	0.000386	U	0.000386	U	0.5
Chromium	0.0026	BJ	0.00232	BJ	0.00127	BJ	0.00247	BJ	0.00155	BJ	4.1
Copper	0.038		0.00593		0.00199	J	0.0115		0.0185		5.3
Fluoride	0.434		0.711		2.23		2.03		0.533		36
Lead	0.00266	U	0.00266	U	0.00266	U	0.00266	U	0.00266	U	1
Molybdenum	0.265		0.0774		0.0114		0.0737		0.0306		2
Nickel	0.00343	J	0.00315	J	0.00148	U	0.00683		0.00407	J	2
Selenium	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.00338	U	0.46
Silver	0.00118	U	0.00161	J	0.00118	U	0.00118	U	0.00118	U	5
Zinc	0.18		0.089		0.00209	U	0.0493		0.0495		2.2

See notes at end of table.

TABLE A-3. Permitted Sanitary Outfalls, September 2004 (concluded)

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

Permit Number:	2069-A	2069F-4		2069G-2		2069I-3		2069-K	Regulatory
Station:	**WW001**	**WW006**		**WW007**		**WW008**		**WW011**	**Limit**
Date Collected:	**--**	**9/8/2004**		**9/8/2004**		**9/7/2004**		**--**	**COA**
Sample ID:	**--**	**065463**		**065464**		**065465**		**--**	**(mg/L)**
Analyte									
Cyanide, Total	--	0.00213	BJ	0.00172	BU	0.00172	BJ	--	0.45
Cyanide, Total	--	0.00172	BU	0.053	B	0.00652	B	--	0.45
Cyanide, Total	--	0.00172	BU	0.00172	BU	0.00435	BJ	--	0.45
Cyanide, Total	--	0.0019	BJ	0.00587	B	0.00319	BJ	--	0.45

NOTES: COA = City of Albuquerque

"—" -= not applicable

J = Estimated value, the analyte concentration fell above the effective (MDL) minimum detection limit and below the effective (PQL) practical quantitation 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 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.

TABLE A-4. Summary of Sanitary Outfalls of Radiological Analyses, September 2004

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

Permit Number:	**2069-A**		**2069F-4**		**2069I-3**		**2069-K**		**Regulatory**
Station:	**WW001**		**WW006**		**WW008**		**WW011**		**Sewer**
Date Collected:	**9/8/2004**		**9/8/2004**		**9/8/2004**		**9/8/2004**		**Release**
Sample ID:	**065453**		**065454**		**065456**		**065457**		**Limits [a]**
									(Monthly Average)
Analyte	**Activity**	**MDA**	**Activity**	**MDA**	**Activity**	**MDA**	**Activity**	**MDA**	
Actinium-228	9.96 ± 6.94 U	5.67	11.1 ± 9.85 U	6.06	17.6 ± 8.23 X	7.37	3.3 ± 12.9 U	5.64	300,000
Americium-241	8.18 ± 11.7 U	9.66	-0.893 ± 9.78 U	7.13	4.22 ± 11 U	8.95	-6.36 ± 10.5 U	8.82	200
Antimony-124	1.76 ± 2.09 U	1.84	-1.42 ± 2.14 U	1.73	-0.306 ± U	1.93	-0.831 ± 2.03 U	1.67	70,000
Antimony-125	2.15 ± 4.54 U	3.75	-0.184 ± 4.63 U	3.48	-3.58 ± 6 U	4.72	1.9 ± 4.28 U	3.71	300,000
Barium-133	1.73 ± 2.1 U	1.78	1.57 ± 2.19 U	1.73	-2.54 ± 2.78 U	2.18	-2.25 ± 1.89 U	1.53	200,000
Beryllium-7	-5.17 ± 16.2 U	13.7	4.25 ± 16.6 U	14.3	5.62 ± 20.3 U	17.7	-12.4 ± 15.6 U	12.6	6,000,000
Bismuth-211	6.71 ± 25 U	7.95	18.5 ± 20.5 X	7.57	22.1 ± 13.8 U	11.7	12.2 ± 9.77 U	8.73	NE
Bismuth-212	2.18 ± 26.4 U	10.4	4.23 ± 13.8 U	11.6	13.5 ± 16.1 U	14	9.66 ± 13.1 U	11.3	70,000
Bismuth-214	1.94 ± 8.45 U	2.66	3.58 ± 6.93 U	2.98	0.05 ± 10 U	3.1	12 ± 7.84 X	3.39	3,000,000
Cadmium-109	1.92 ± 42.5 U	33.7	12.7 ± 34.1 U	29.9	-2.82 ± 49 U	35.7	2.51 ± 40.6 U	31	60,000
Cerium-139	-0.67 ± 1.56 U	1.32	0.993 ± 1.37 U	1.18	-2.5 ± 1.96 U	1.62	-1.94 ± 1.48 U	1.17	700,000
Cerium-141	-3.21 ± 3.53 U	2.96	3.85 ± 4.86 U	2.57	-0.65 ± 4.4 U	3.77	0.031 ± 3.33 U	2.78	300,000
Cerium-144	-3.09 ± 10.6 U	9.04	-1.61 ± 9.52 U	8.08	-1.39 ± 12.7 U	11	-4.09 ± 9.81 U	8.08	30,000
Cesium-134	-0.478 ± 1.86 U	1.52	-0.568 ± 1.94 U	1.55	-0.932 ± U	1.74	2.42 ± 1.81 U	1.61	9,000
Cesium-137	0.604 ± 1.58 U	1.36	2.74 ± 2.85 U	1.39	0.868 ± 2.25 U	1.69	1.15 ± 2.07 U	1.37	10,000
Chromium-51	-9.26 ± 22.5 U	18.2	-17.2 ± 20.9 U	16.3	21.6 ± 27.6 U	23.3	-4.67 ± 20 U	17.1	5,000,000
Cobalt-57	-0.155 ± 1.33 U	1.14	0.96 ± 1.17 U	1.02	0.013 ± 1.59 U	1.37	1.01 ± 1.24 U	1.07	600,000
Cobalt-60	0.45 ± 1.81 U	1.56	-0.0348 ± U	1.62	-0.672 ± 2 U	1.65	0.284 ± 1.99 U	1.69	30,000
Europium-152	-3.28 ± 4.81 U	3.81	1.55 ± 4.74 U	3.88	1.37 ± 6.12 U	5.07	-2.53 ± 4.29 U	3.61	100,000
Europium-154	0.321 ± 4.76 U	4.06	1.53 ± 5.1 U	4.36	3.08 ± 6.28 U	4.89	0.192 ± 4.66 U	3.93	70,000
Gross Alpha	4.6 ± 3.08 U	2.31	3.67 ± 1.93	1.26	4.78 ± 2.11	1.25	2.9 ± 1.98 U	1.43	NE
Gross Beta	18.3 ± 2.24	1.17	14.3 ± 2.1	1.21	7.47 ± 1.69	1.07	15 ± 2.19	1.3	NE
Iron-59	-0.348 ± 4.17 U	3.55	-3.59 ± 4.5 U	3.56	-0.0203 ± U	4.12	3.24 ± 4.07 U	3.65	100,000
Lead-211	26.6 ± 46 U	38.3	4.86 ± 44.4 U	38.2	32.3 ± 59.7 U	46.9	3.74 ± 47.1 U	35.6	2,000,000
Lead-212	11.5 ± 3.24 X	2.97	12.4 ± 3.22 X	2.81	11.7 ± 4.2 X	3.49	4.92 ± 2.94 U	2.5	20,000
Lead-214	2.33 ± 8.71 U	3.32	6.43 ± 7.15 U	3.23	11.8 ± 4.99 X	4.2	5.23 ± 3.4 U	3.05	1,000,000
Manganese-54	0.0147 ± 1.89 U	1.37	-0.986 ± 1.8 U	1.4	1.23 ± 1.9 U	1.64	0.191 ± 1.66 U	1.37	300,000
Mercury-203	0.251 ± 2.16 U	1.8	-0.676 ± 2.06 U	1.67	1.42 ± 2.78 U	2.34	1.5 ± 2.05 U	1.71	300,000
Neptunium-237	-2.26 ± 12.8 U	10.1	8.99 ± 18.7 U	8.63	41.9 ± 37.2 X	10.4	1.28 ± 10.8 U	9.23	300,000
Neptunium-239	4.74 ± 9.79 U	8.6	-0.405 ± 8.72 U	7.47	0.324 ± 11.7 U	10.1	8.67 ± 9.35 U	8.05	300,000
Niobium-95	3.71 ± 4.53 U	1.83	0.664 ± 2.53 U	2.11	0.365 ± 2.81 U	2.37	0.835 ± 2.4 U	2.02	300,000
Potassium-40	20.1 ± 45.4 U	14.4	58.9 ± 22.6 X	21.8	77.5 ± 64.6	16.4	103 ± 32.7	12.2	40,000
Protactinium-231	0.464 ± 75.5 U	62.6	68.6 ± 70.7 U	59.6	21.6 ± 94.5 U	79	71.5 ± 75.5 U	62.8	60
Protactinium-233	1.62 ± 3.29 U	2.76	0.441 ± 3.47 U	2.52	-0.913 ± U	3.47	-1.38 ± 2.96 U	2.52	200,000
Protactinium-234	9.91 ± 12.4 U	10.8	8.44 ± 14 U	12.3	-7.15 ± 16.5 U	13.1	-2.98 ± 12.9 U	10.9	300,000
Radium-223	14.4 ± 33.8 U	28.3	-0.891 ± 32.1 U	26	-23.7 ± 42.2 U	33.9	24.9 ± 30 U	26.4	1,000
Radium-224	-95.8 ± 36 U	27.5	-93.1 ± 35.3 U	26.2	-132 ± 47.1 U	33.7	-51.2 ± 33 U	25.3	2,000
Radium-226	1.94 ± 8.45 U	2.66	3.58 ± 6.93 U	2.98	0.05 ± 10 U	4.39	12 ± 7.84 X	3.39	600
Radium-228	9.96 ± 6.94 U	5.67	11.1 ± 9.85 U	6.06	17.6 ± 8.23 X	7.37	3.3 ± 12.9 U	5.64	600

See notes at end of table.

TABLE A-4. Summary of Sanitary Outfalls of Radiological Analyses, September 2004 (concluded)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number:	2069-A		2069F-4		2069I-3		2069-K		Regulatory
Station:	WW001		WW006		WW008		WW011		Sewer
Date Collected:	9/8/2004		9/8/2004		9/8/2004		9/8/2004		Release
Sample ID:	065453		065454		065456		065457		Limits [a] (Monthly Average)
Analyte	Activity	MDA	Activity	MDA	Activity	MDA	Activity	MDA	
Radon-219	-11.5 ± 20.3 U	15.9	0.0683 ± 19.3 U	16.6	13.7 ± 24.7 U	20.5	15.5 ± 19.9 U	15.7	NE
Rhodium-106	4.44 ± 14.3 U	12.3	-2.35 ± 15.6 U	12.9	-9.23 ± 18.2 U	15.1	-1.62 ± 14.3 U	11.9	1,000,000
Ruthenium-103	-1.95 ± 2.06 U	1.69	1.25 ± 2.53 U	1.94	-0.107 ± U	2.26	-1.66 ± 2.12 U	1.71	300,000
Ruthenium-106	6.94 ± 14.2 U	12.3	-0.293 ± 15.5 U	12.9	-7.15 ± 18.1 U	15.1	-2.49 ± 14.1 U	11.7	30,000
Selenium-75	0.906 ± 2.24 U	1.89	0.557 ± 2.09 U	1.73	-0.607 ± U	2.46	-0.831 ± 2.14 U	1.71	70,000
Sodium-22	0.138 ± 1.71 U	1.46	0.11 ± 1.87 U	1.56	1.11 ± 2.26 U	1.76	0.0504 ± 1.67 U	1.41	20,000
Strontium-85	4.07 ± 1.9 X	1.77	-14.8 ± 3.04 U	2.01	-21.1 ± 3.8 U	2.3	-21 ± 3.32 U	2.01	400,000
Thallium-208	4.25 ± 1.86 X	1.74	0.372 ± 4.81 U	1.78	2.84 ± 4.44 U	2.17	1.54 ± 1.71 U	1.49	NE
Thorium-227	2.58 ± 19.1 U	16	-0.468 ± 17.6 U	14.5	-5.47 ± 24.7 U	20.5	-6.92 ± 19.4 U	15.6	20,000
Thorium-231	5.62 ± 9.18 U	7.8	1.78 ± 8.37 U	6.92	3.82 ± 11.7 U	9.82	3.73 ± 8.7 U	7.17	500,000
Thorium-232	11.3 ± 3.17 X	2.91	12.2 ± 3.15 X	2.76	11.5 ± 4.11 X	3.41	4.81 ± 2.88 U	2.44	300
Thorium-234	257 ± 92.8 X	81.4	190 ± 89.6 X	65.8	18.4 ± 185 U	77.8	252 ± 102 X	81.8	50,000
Tin-113	-0.349 ± 2.34 U	1.88	-0.0297 ± U	1.79	0.399 ± 2.85 U	2.34	-1.87 ± 2.06 U	1.69	300,000
Tritium	-33.3 ± 89.1 U	76.1	-118 ± 89.1 U	79.7	-65.2 ± 98.3 U	85.2	-4.7 ± 102 U	86.1	10,000,000
Uranium-235	8.65 ± 10.7 U	9.38	14.9 ± 13.5 U	8.23	0.14 ± 13 U	11.2	16.1 ± 10.3 U	8.65	3,000
Uranium-238	257 ± 92.8 X	81.4	190 ± 89.6 X	65.8	18.4 ± 185 U	68.2	252 ± 102 X	81.8	3,000
Yttrium-88	-0.481 ± 1.97 U	1.56	-1.29 ± 2.01 U	1.57	0.853 ± 2.49 U	2.12	0.0335 ± 1.97 U	1.69	100,000
Zinc-65	-1.21 ± 4.23 U	3.05	0.757 ± 4.62 U	3.43	1.68 ± 4.86 U	3.75	2.69 ± 2.74 U	3.51	50,000
Zirconium-95	2.05 ± 3.3 U	2.87	0.558 ± 3.66 U	3.03	2.69 ± 3.95 U	3.43	2.65 ± 3.32 U	2.87	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 analyte is not present.
NE = not established.
MDA = minimum detectable activity.
CFR = Code of Federal Regulations
[a] The monthly average concentration values for release to sanitary sewerage were derived by taking the most restrictive occupational stochastic oral ingestion annual limits on intake (ALI) for a Reference Man.

TABLE A-5. Summary of Sanitary Outfalls of Semi-Volatile Organic Compounds, September 2004
(All Results in micrograms per liter [ug/L] unless otherwise noted.)

Permit Number:	2069-A		2069F-4		2069I-3		2069-K	
Station:	WW001		WW006		WW008		WW011	
Date Collected:	9/8/2004		9/8/2004		9/8/2004		9/8/2004	
Sample ID:	065453		065454		065456		065457	
Analyte								
1,2,4-Trichlorobenzene	0.657	U	0.689	U	0.689	U	0.71	U
2,4,6-Trichlorophenol	0.361	U	0.379	U	0.379	U	0.39	U
2,4-Dichlorophenol	0.435	U	0.456	U	0.456	U	0.47	U
2,4-Dimethylphenol	0.435	U	0.456	U	0.456	U	6.7	J
2,4-Dinitrophenol	4.63	U	4.85	U	4.85	U	5	U
2,4-Dinitrotoluene	0.648	U	0.68	U	0.68	U	0.7	U
2,6-Dinitrotoluene	0.463	U	0.485	U	0.485	U	0.5	U
2-Chloronaphthalene	0.37	U	0.388	U	0.388	U	0.4	U
2-Chlorophenol	0.38	U	0.398	U	0.398	U	0.41	U
2-Methyl-4,6-	0.926	U	0.971	U	0.971	U	1	U
2-Nitrophenol	0.546	U	0.573	U	0.573	U	0.59	U
4-Chloro-3-methylphenol	0.639	U	0.67	U	0.67	U	0.69	U
4-Nitrophenol	4.63	U	4.85	U	4.85	U	5	U
Acenaphthene	0.463	U	0.485	U	0.485	U	0.5	U
Acenaphthylene	0.463	U	0.485	U	0.485	U	0.5	U
Anthracene	0.463	U	0.485	U	0.485	U	0.5	U
Benzo(a)anthracene	0.463	U	0.485	U	0.485	U	0.5	U
Benzo(a)pyrene	0.463	U	0.485	U	0.485	U	0.5	U
Benzo(b)fluoranthene	0.463	U	0.485	U	0.485	U	0.5	U
Benzo(ghi)perylene	0.463	U	0.485	U	0.485	U	0.5	U
Benzo(k)fluoranthene	0.463	U	0.485	U	0.485	U	0.5	U
bis(2-Chloroethoxy)methane	0.444	U	0.466	U	0.466	U	0.48	U
bis(2-Chloroethyl) ether	1.27	U	1.33	U	1.33	U	1.37	U
bis(2-Chloroisopropyl)ether	0.741	U	0.777	U	0.777	U	0.8	U
bis(2-Ethylhexyl)phthalate	1.2	U	4.23	J	1.87	J	1.3	U
Chrysene	0.463	U	0.485	U	0.485	U	0.5	U
Dibenzo(a,h)anthracene	0.463	U	0.485	U	0.485	U	0.5	U
Dibenzofuran	0.389	U	0.408	U	0.408	U	0.42	U
Diethylphthalate	0.984	J	1.74	J	0.864	U	0.89	U
Di-n-butylphthalate	0.926	BU	1.21	BJ	1.18	BJ	1.14	BJ
Di-n-octylphthalate	0.806	U	0.845	U	0.845	U	0.87	U
Fluoranthene	0.463	U	0.485	U	0.485	U	0.5	U
Fluorene	0.463	U	0.485	U	0.485	U	0.5	U
Hexachlorobenzene	0.602	U	0.631	U	0.631	U	0.65	U
Hexachlorobutadiene	0.296	U	0.311	U	0.311	U	0.32	U
Hexachlorocyclopentadie	0.926	U	0.971	U	0.971	U	1	U

See notes at end of table.

TABLE A-5. Summary of Sanitary Outfalls of Semi-Volatile Organic Compounds, September 2004 (concluded) *(All Results in micrograms per liter [ug/L] unless otherwise noted.)*

Permit Number:	**2069-A**		**2069F-4**		**2069I-3**		**2069-K**	
Station:	**WW001**		**WW006**		**WW008**		**WW011**	
Date Collected:	**9/8/2004**		**9/8/2004**		**9/8/2004**		**9/8/2004**	
Sample ID:	**065453**		**065454**		**065456**		**065457**	
Analyte								
Hexachloroethane	0.398	U	0.417	U	0.417	U	0.43	U
Indeno(1,2,3-cd)pyrene	0.463	U	0.485	U	0.485	U	0.5	U
Isophorone	0.546	U	0.573	U	0.573	U	0.59	U
Naphthalene	0.102	U	0.107	U	0.107	U	0.11	U
Nitrobenzene	0.583	U	0.612	U	0.612	U	0.63	U
N-Nitrosodipropylamine	0.694	U	0.728	U	0.728	U	0.75	U
Pentachlorophenol	4.63	U	4.85	U	4.85	U	5	U
Phenanthrene	0.463	U	0.485	U	0.485	U	0.5	U
Phenol	0.278	U	0.291	U	0.291	U	0.3	U
Pyrene	0.463	U	0.485	U	0.485	U	0.5	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.

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TABLE A-6. Summary of Sanitary Outfalls of Volatile Organic Compounds, September 2004

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

Permit Number:	2069-A		2069F-4		2069I-3		2069-K	
Station:	WW001		WW006		WW008		WW011	
Date Collected:	9/8/2004		9/8/2004		9/8/2004		9/8/2004	
Sample ID:	065453		065454		065456		065457	
Analyte								
1,1,1-Trichloroethane	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
1,1,2-Trichloroethane	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
1,1-Dichloroethylene	0.41	U	0.41	U	0.41	U	0.41	U
1,2-Dichlorobenzene	0.38	U	0.398	U	0.398	U	0.41	U
1,2-Dichloroethane	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
1,3-Dichlorobenzene	0.38	U	0.398	U	0.398	U	0.41	U
1,4-Dichlorobenzene	0.287	U	0.301	U	0.301	U	0.31	U
2,4,5-Trichlorophenol	0.898	U	0.942	U	0.942	U	0.97	U
2-Butanone	2.31	U	2.31	U	2.31	U	22.6	0
2-Hexanone	1.45	U	1.45	U	1.45	U	1.45	U
2-Methylnaphthalene	0.463	U	0.485	U	0.485	U	0.5	U
3,3'-Dichlorobenzidine	0.472	U	0.495	U	0.495	U	0.51	U
4-Bromophenylphenylether	1.13	U	1.18	U	1.18	U	1.22	U
4-Chloroaniline	1.02	U	1.07	U	1.07	U	1.1	U
4-Chlorophenylphenylether	0.778	U	0.816	U	0.816	U	0.84	U
4-Methyl-2-pentanone	1.78	U	1.78	U	1.78	U	1.78	U
Acetone	67.8		43.8		554		113	
Benzene	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
Bromofluorobenzene	49.8		47.4		48.1		47.3	
Bromoform	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
Butylbenzylphthalate	0.63	U	1.03	J	22.2		0.68	U
Carbazole	0.463	U	0.485	U	0.485	U	0.5	U
Carbon disulfide	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
Chlorobenzene	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
Chloroform	0.36	U	0.36	U	0.36	U	0.394	J
Chloromethane	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
cis-1,3-Dichloropropylene	0.3	U	0.3	U	0.3	U	0.3	U
Dibromochloromethane	0.29	U	0.29	U	0.29	U	0.29	U
Dibromofluoromethane	54.4		54.4		54.4		52.5	
Dimethylphthalate	0.491	U	0.515	U	0.515	U	0.53	U
Diphenylamine	0.731	U	0.767	U	0.767	U	0.79	U

See notes at end of table.

TABLE A-6. Summary of Sanitary Outfalls of Volatile Organic Compounds, September 2004 (concluded) *(All Results in micrograms per liter [ug/L] unless otherwise noted.)*

Permit Number:	**2069-A**		**2069F-4**		**2069I-3**		**2069-K**	
Station:	**WW001**		**WW006**		**WW008**		**WW011**	
Date Collected:	**9/8/2004**		**9/8/2004**		**9/8/2004**		**9/8/2004**	
Sample ID:	**065453**		**065454**		**065456**		**065457**	
Analyte								
Ethylbenzene	0.21	U	0.21	U	0.21	U	0.21	U
Methylene chloride	3.3	U	3.3	U	3.3	U	3.3	U
m-Nitroaniline	0.926	U	0.971	U	0.971	U	1	U
o-Cresol	1.2	J	0.437	U	0.437	U	0.835	J
o-Nitroaniline	0.593	U	0.621	U	0.621	U	0.64	U
p-Nitroaniline	0.62	U	0.65	U	0.65	U	0.67	U
Styrene	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
Toluene	0.39	U	0.39	U	0.39	U	0.81	J
Toluene-d8	50.7		51.4		51.6		58.1	
trans-1,2- Dichloroethylene	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
Trichloroethylene	0.36	U	0.36	U	0.36	U	0.36	U
Vinyl acetate	1.32	U	1.32	U	1.32	U	1.32	U
Vinyl chloride	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

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.

TABLE A-7. Permitted Sanitary Outfalls, April and November 2004

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

Permit Number:	**SNL**		**SNL**		**SNL**		**Regulatory**
Station:	**Lagoon #1**		**Lagoon #1**		**Lagoon #2**		**Limit**
Date Collected:	**4/8/2004**		**4/8/2004**		**11/16/2004**		**COA**
Sample ID:	**064668**		**064673**		**066281**		**(mg/L)**
Analyte							
Beryllium			0.000611	J	0.00007	U	NE
Calcium	34.5	B			36.2		NE
Magnesium	2.86				6.5		NE
Potassium	6.37				4.7865		NE
Sodium	41.2				247.39	B	NE

NOTES: COA = City of Albuquerque

"—" -= not applicable

J = Estimated value, the analyte concentration fell above the effective (MDL) minimum detection limit and below the effective (PQL) practical quantitation 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 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-8. Permitted Sanitary Outfalls of Non-radiological Analyses, CY 2004
(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
2069-A	WW001	Aluminum	4	0.168	0.074	0.0581	0.219	900
		Arsenic	4	0.017	0.005	0.0101	0.0209	0.051
		Boron	4	0.157	0.041	0.105	0.19	NE
		Cadmium	4	0.001	0.001	0.000386	0.00182	0.5
		Chromium	4	0.002	0.001	0.00119	0.00287	4.1
		Copper	4	0.066	0.066	0.00974	0.162	5.3
		Fluoride	4	0.769	0.262	0.434	1.07	36
		Lead	4	0.003	0.000	0.00266	0.00266	1
		Molybdenum	4	0.200	0.044	0.17	0.265	2
		Nickel	4	0.004	0.001	0.00236	0.00506	2
		Selenium	4	0.003	0.000	0.00338	0.00338	0.46
		Silver	4	0.001	0.000	0.00118	0.00118	5
		Zinc	4	0.146	0.044	0.0837	0.18	2.2
2069F-4	WW006	Aluminum	4	0.223	0.084	0.104	0.287	900
		Arsenic	4	0.013	0.007	0.00445	0.0205	0.051
		Boron	4	0.191	0.028	0.159	0.226	NE
		Cadmium	4	0.001	0.000	0.000432	0.000638	0.5
		Chromium	4	0.002	0.001	0.00105	0.00232	4.1
		Copper	4	0.018	0.015	0.00458	0.0311	5.3
		Cyanide, Total	8	0.007	0.007	0.00172	0.018	0.45
		Fluoride	4	0.693	0.032	0.649	0.72	36
		Lead	4	0.003	0.000	0.00266	0.00266	1
		Molybdenum	4	0.091	0.040	0.0648	0.15	2
		Nickel	4	0.004	0.001	0.00315	0.00538	2
		Selenium	4	0.003	0.000	0.00338	0.00338	0.46
		Silver	4	0.009	0.009	0.00118	0.02	5
		Zinc	4	0.074	0.025	0.0446	0.0998	2.2
2069G-2	WW007	Aluminum	4	0.181	0.155	0.00497	0.384	900
		Arsenic	4	0.004	0.001	0.00238	0.00521	0.051
		Boron	4	0.025	0.010	0.0112	0.0341	NE
		Cadmium	4	0.000	0.000	0.000386	0.000386	0.5
		Chromium	4	0.001	0.000	0.00082	0.00139	4.1
		Copper	4	0.005	0.003	0.00199	0.00877	5.3
		Cyanide, Total	8	0.011	0.018	0.00172	0.053	0.45
		Fluoride	4	2.938	1.453	2.07	5.11	36
		Lead	4	0.003	0.000	0.00266	0.00266	1
		Molybdenum	4	0.019	0.016	0.0106	0.0425	2
		Nickel	4	0.002	0.000	0.00148	0.0024	2
		Selenium	4	0.003	0.000	0.00338	0.00338	0.46
		Silver	4	0.001	0.000	0.00118	0.00118	5
		Zinc	4	0.002	0.000	0.00209	0.00282	2.2

See notes at end of table.

TABLE A-8. Permitted Sanitary Outfalls of Non-radiological Analyses, CY 2004 (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	0.123	0.015	0.104	0.14	900
		Arsenic	4	0.013	0.004	0.0102	0.0176	0.051
		Boron	4	0.143	0.061	0.0883	0.231	NE
		Cadmium	4	0.001	0.000	0.000386	0.00095	0.5
		Chromium	4	0.003	0.001	0.00212	0.00443	4.1
		Copper	4	0.022	0.013	0.0115	0.0409	5.3
		Cyanide, Total	8	0.009	0.014	0.00172	0.0423	0.45
		Fluoride	4	2.605	0.942	2.03	4	36
		Lead	4	0.003	0.000	0.00266	0.00266	1
		Molybdenum	4	0.058	0.034	0.0118	0.0901	2
		Nickel	4	0.006	0.004	0.00148	0.0101	2
		Selenium	4	0.003	0.000	0.00338	0.00338	0.46
		Silver	4	0.001	0.000	0.00118	0.00118	5
		Zinc	4	0.071	0.061	0.0322	0.162	2.2
2069-K	WW011	Aluminum	4	0.212	0.217	0.0375	0.523	900
		Arsenic	4	0.013	0.003	0.00987	0.0166	0.051
		Boron	4	0.187	0.110	0.129	0.352	NE
		Cadmium	4	0.000	0.000	0.000386	0.000586	0.5
		Chromium	4	0.003	0.001	0.00155	0.00409	4.1
		Copper	4	0.028	0.011	0.0185	0.0431	5.3
		Fluoride	4	0.524	0.041	0.464	0.55	36
		Lead	4	0.003	0.001	0.00266	0.00375	1
		Molybdenum	4	0.040	0.019	0.0255	0.0675	2
		Nickel	4	0.003	0.001	0.00151	0.00407	2
		Selenium	4	0.003	0.000	0.00338	0.00338	0.46
		Silver	4	0.001	0.000	0.00118	0.00118	5
		Zinc	4	0.078	0.035	0.0457	0.113	2.2

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

TABLE A-9. Permitted Sanitary Outfalls of Radiological Analyses, CY 2004
(All Results in picocuries per liter [pci/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit COA
2069-A	WW001	Actinium-228	2	6.765	4.518	3.57	9.96	300,000
		Americium-241	2	7.520	0.933	6.86	8.18	200
		Antimony-124	2	0.200	2.206	-1.36	1.76	NE
		Antimony-125	2	1.960	0.269	1.77	2.15	NE
		Barium-133	2	-0.390	2.998	-2.51	1.73	NE
		Beryllium-7	2	-8.135	4.193	-11.1	-5.17	NE
		Bismuth-211	2	14.855	11.519	6.71	23	NE
		Bismuth-212	2	10.040	11.116	2.18	17.9	NE
		Bismuth-214	2	2.970	1.457	1.94	4	NE
		Cadmium-109	2	29.860	39.513	1.92	57.8	NE
		Cerium-139	2	-1.285	0.870	-1.9	-0.67	NE
		Cerium-141	2	-1.427	2.522	-3.21	0.356	NE
		Cerium-144	2	-8.345	7.432	-13.6	-3.09	30,000
		Cesium-134	2	2.341	3.987	-0.478	5.16	9,000
		Cesium-137	2	16.802	22.907	0.604	33	10,000
		Chromium-51	2	-1.405	11.109	-9.26	6.45	5,000,000
		Cobalt-57	2	-0.100	0.078	-0.155	-0.0443	NE
		Cobalt-60	2	1.455	1.421	0.45	2.46	30,000
		Europium-152	2	-3.875	0.841	-4.47	-3.28	NE
		Europium-154	2	1.296	1.378	0.321	2.27	NE
		Gross Alpha	2	3.205	1.973	1.81	4.6	NE
		Gross Beta	2	20.750	3.465	18.3	23.2	NE
		Iron-59	2	-0.568	0.310	-0.787	-0.348	100,000
		Lead-211	2	-19.350	64.983	-65.3	26.6	NE
		Lead-212	2	7.060	6.279	2.62	11.5	20,000
		Lead-214	2	5.160	4.002	2.33	7.99	1,000,000
		Manganese-54	2	-0.878	1.262	-1.77	0.0147	NE
		Mercury-203	2	0.656	0.572	0.251	1.06	NE
		Neptunium-237	2	-2.195	0.092	-2.26	-2.13	NE
		Neptunium-239	2	1.635	4.391	-1.47	4.74	NE
		Niobium-95	2	3.595	0.163	3.48	3.71	NE
		Potassium-40	2	53.200	46.810	20.1	86.3	40,000
		Protactinium-231	2	-17.668	25.643	-35.8	0.464	NE
		Protactinium-233	2	1.730	0.156	1.62	1.84	NE
		Protactinium-234	2	3.725	8.747	-2.46	9.91	NE
		Radium-223	2	2.845	16.341	-8.71	14.4	NE
		Radium-224	2	-1.100	133.926	-95.8	93.6	NE
		Radium-226	2	2.970	1.457	1.94	4	600
		Radium-228	2	6.765	4.518	3.57	9.96	600
		Radon-219	2	8.150	27.789	-11.5	27.8	NE
		Rhodium-106	2	11.270	9.659	4.44	18.1	NE

See notes at end of table.

TABLE A-9. Permitted Sanitary Outfalls of Rradiological Analyses, CY 2004 (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 COA
2069-A	WW001	Ruthenium-103	2	-1.850	0.141	-1.95	-1.75	300,000
(concluded)		Ruthenium-106	2	8.020	1.527	6.94	9.1	30,000
		Selenium-75	2	0.257	0.919	-0.393	0.906	NE
		Sodium-22	2	0.030	0.153	-0.0782	0.138	NE
		Strontium-85	2	-5.115	12.990	-14.3	4.07	NE
		Thallium-208	2	6.845	3.670	4.25	9.44	NE
		Thorium-227	2	-6.810	13.279	-16.2	2.58	NE
		Thorium-231	2	5.840	0.311	5.62	6.06	300
		Thorium-232	2	6.950	6.152	2.6	11.3	500,000
		Thorium-234	2	131.140	177.993	5.28	257	50,000
		Tin-113	2	-0.690	0.482	-1.03	-0.349	NE
		Tritium	2	15.150	68.519	-33.3	63.6	10,000,000
		Uranium-235	2	17.975	13.188	8.65	27.3	3,000
		Uranium-238	2	131.140	177.993	5.28	257	3,000
		Yttrium-88	2	0.755	1.747	-0.481	1.99	100,000
		Zinc-65	2	0.060	1.796	-1.21	1.33	NE
		Zirconium-95	2	-0.240	3.239	-2.53	2.05	200,000

Notes: COA = City of Albuquerque
NE = Not established
Std Dev = Standard deviation

TABLE A-10. Summary of Sanitary Outfalls of Semi-Volatile Organic Compounds, April and November 2004 *(All Results in micrograms per liter [ug/L] unless otherwise noted.)*

Permit Number:	**SNL**		**SNL**	
Station:	**Lagoon #1**		**Lagoon #1**	
Date Collected:	**4/8/2004**		**11/16/2004**	
Sample ID:	**064671**		**066281**	
Analyte				
1,2,4-Trichlorobenzene	0.78	U	0.686	U
2,4,6-Trichlorophenol	0.429	U	0.377	U
2,4-Dichlorophenol	0.516	U	0.454	U
2,4-Dimethylphenol	0.516	U	0.454	U
2,4-Dinitrophenol	5.49	U	4.83	U
2,4-Dinitrotoluene	0.769	U	0.6765	U
2,6-Dinitrotoluene	0.549	U	0.483	U
2-Chloronaphthalene	0.44	U	0.3865	U
2-Chlorophenol	0.451	U	0.396	U
2-Methyl-4,6- dinitrophenol	1.1	U	0.9665	U
2-Nitrophenol	0.648	U	0.57	U
4-Chloro-3-methylphenol	0.758	U	0.6665	U
4-Nitrophenol	5.49	U	4.83	U
Acenaphthene	0.549	U	0.483	U
Acenaphthylene	0.549	U	0.483	U
Anthracene	0.549	U	0.483	U
Benzo(a)anthracene	0.549	U	0.483	U
Benzo(a)pyrene	0.549	U	0.483	U
Benzo(b)fluoranthene	0.549	U	0.483	U
Benzo(ghi)perylene	0.549	U	0.483	U
Benzo(k)fluoranthene	0.549	U	0.483	U
bis(2- Chloroethoxy)methane	0.527	U	0.464	U
bis(2-Chloroethyl) ether	1.51	U	1.325	U
bis(2-Chloroisopropyl)ether	0.879	U	0.773	U
bis(2-Ethylhexyl)phthalate	1.43	U	1.655	U
Chrysene	0.549	U	0.483	U
Dibenzo(a,h)anthracene	0.549	U	0.483	U
Dibenzofuran	0.462	U	0.406	U
Diethylphthalate	0.978	U	0.86	U
Di-n-butylphthalate	1.1	U	0.9665	U
Di-n-octylphthalate	0.956	U	0.841	U
Fluoranthene	0.549	U	0.483	U
Fluorene	0.549	U	0.483	U
Hexachlorobenzene	0.714	U	0.628	U
Hexachlorobutadiene	0.352	U	0.3095	U
Hexachlorocyclopentadiene	1.1	U	0.9665	U
Hexachloroethane	0.473	U	0.415	U
Indeno(1,2,3-cd)pyrene	0.549	U	0.483	U

See notes at end of table.

TABLE A-10. Summary of Sanitary Outfalls of Semi-Volatile Organic Compounds, April and November 2004 (concluded) *(All Results in micrograms per liter [ug/L] unless otherwise noted.)*

Permit Number:	**SNL**		**SNL**	
Station:	**Lagoon #1**		**Lagoon #1**	
Date Collected:	**4/8/2004**		**11/16/2004**	
Sample ID:	**064671**		**066281**	
Analyte				
Isophorone	0.648	U	0.57	U
Naphthalene	0.121	U	0.1065	U
Nitrobenzene	0.692	U	0.609	U
N-Nitrosodipropylamine	0.824	U	0.7245	U
Pentachlorophenol	5.49	U	4.83	U
Phenanthrene	0.549	U	0.483	U
Phenol	0.33	U	0.2895	U
Pyrene	0.549	U	0.483	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.

TABLE A-11. Summary of Sanitary Outfalls of Volatile Organic Compounds, April and November 2004
(All Results in micrograms per liter [ug/L] unless otherwise noted.)

Permit Number:	**SNL**		**SNL**	
Station:	**Lagoon #1**		**Lagoon #1**	
Date Collected:	**4/8/2004**		**11/16/2004**	
Sample ID:	**064670**		**066281**	
Analyte				
1,1,1-Trichloroethane	0.34	U	0.34	U
1,1,2,2-Tetrachloroethane	0.49	U	0.49	U
1,1,2-Trichloroethane	0.44	U	0.44	U
1,1-Dichloroethane	0.41	U	0.41	U
1,1-Dichloroethylene	0.41	U	0.41	U
1,2-Dichlorobenzene	0.451	U	0.396	U
1,2-Dichloroethane	0.29	U	0.29	U
1,2-Dichloropropane	0.25	U	0.25	U
1,3-Dichlorobenzene	0.451	U	0.396	U
1,4-Dichlorobenzene	0.341	U	0.2995	U
2,4,5-Trichlorophenol	1.07	U	0.9375	U
2-Butanone	2.31	U	2.31	U
2-Hexanone	1.45	U	1.45	U
2-Methylnaphthalene	0.549	U	0.483	U
3,3'-Dichlorobenzidine	0.56	U	0.4925	U
4-Bromophenylphenylether	1.34	U	1.175	U
4-Chloroaniline	1.21	U	1.065	U
4-Chlorophenylphenylether	0.923	U	0.812	U
4-Methyl-2-pentanone	1.78	U	1.78	U
Acetone	8.7		5.745	
Benzene	0.33	U	0.33	U
Bromodichloromethane	0.38	U	0.38	U
Bromofluorobenzene	46.4			
Bromoform	0.5	U	0.5	U
Bromomethane	0.5	U	0.5	U
Butylbenzylphthalate	0.747	U	1.297	U
Carbazole	0.549	U	0.483	U
Carbon disulfide	1.91	U	1.91	U
Carbon tetrachloride	0.29	U	0.29	U
Chlorobenzene	0.32	U	0.32	U
Chloroethane	0.5	U	0.5	U
Chloroform	0.36	U	0.36	U
Chloromethane	0.5	U	0.5	U
cis-1,2-Dichloroethylene	0.3	U	0.3	U
cis-1,3-Dichloropropylene	0.3	U	0.3	U
Dibromochloromethane	0.29	U	0.29	U
Dibromofluoromethane	41.6			
Dimethylphthalate	0.582	U	0.5125	U

See notes at end of table.

TABLE A-11. Summary of Sanitary Outfalls of Volatile Organic Compounds, April and November 2004 (concluded) *(All Results in micrograms per liter [ug/L] unless otherwise noted.)*

Permit Number:	**SNL**		**SNL**	
Station:	**Lagoon #1**		**Lagoon #1**	
Date Collected:	**4/8/2004**		**11/16/2004**	
Sample ID:	**064670**		**066281**	
Analyte				
Diphenylamine	0.868	U	0.7635	U
Ethylbenzene	0.21	U	0.21	U
Methylene chloride	3.3	U	3.3	U
m-Nitroaniline	1.1	U	0.9665	U
o-Cresol	0.495	U	0.435	U
o-Nitroaniline	0.703	U	0.618	U
p-Nitroaniline	0.736	U	0.647	U
Styrene	0.25	U	0.25	U
Tetrachloroethylene	0.33	U	0.33	U
Toluene	0.39	U	0.39	BU
Toluene-d8	48.2			
trans-1,2- Dichloroethylene	0.37	U	0.37	U
trans-1,3- Dichloropropylene	0.29	U	0.29	U
Trichloroethylene	0.36	U	0.36	U
Vinyl acetate	1.32	U	1.32	U
Vinyl chloride	0.55	U	0.55	U
Xylenes (total)	0.25	U	0.25	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).

TABLE A-12. 2004 Storm Water Sampling Results

First Quarter				
Monitoring Point	**MP-01**	**MP-02**	**MP-04**	
DATE OF SAMPLING	**11/12/2003**	**11/12/2003**	**10/9/2003**	
COC Number	**606878**	**606878**	**606877**	
RAINFALL	**0.39**	**0.39**	**0.35**	**Benchmark**
Parameter	measurements in mg/l unless noted			
Aluminum	0.158	J 0.0814	2.84	0.7500
Arsenic	0.00567	0.011	U ND	0.1685
Barium	0.0731	0.12	0.101	4.0000
Cadmium	0.00769	U ND	J 0.000632	0.0159
Chromium	J 0.0015	J 0.000869	J 0.00323	0.5000
Copper	0.0429	J 0.00312	0.00809	0.0636
Iron	0.15	J 0.0731	1.79	1.0000
Lead	0.00782	U ND	0.00701	0.0816
Magnesium	5.36	5.13	2.31	0.0636
Manganese	0.0782	0.0546	0.0427	1.0000
Mercury (total)	J 0.000061	U ND	J 0.000096	0.0024
Nickel	0.00871	U ND	BJ 0.00323	1.4170
Selenium	U ND	U ND	U ND	0.2385
Silver	U ND	U ND	U ND	0.0318
Zinc	0.119	0.0496	0.0369	0.1170
Ammonia	1.86	0.11	0.19	19.0000
Cyanide (total)	0.00801	J 0.00346	U ND	0.0636
pH				6-9 S.U.
PCBs	U ND	U ND		
Gross Alpha/Beta (pCi/L)			19.5/37.8	
Nitrate + Nitrite	0.49	0.57	0.64	0.0680
Total Kjeldahl Nitrogen		0.7	1.12	
Oil & Grease	J 3.85	U ND	5.74	100.0000
Chemical Oxygen Demand	141	U ND	67.7	120.0000
Total Suspended Solids	64.5		181	100.0000

See notes at end of table.

TABLE A-12. 2004 Storm Water Sampling Results (continued)

Second Quarter				
Monitoring Point	**MP-02**	**MP-04**	**MP-05**	
DATE OF SAMPLING	**4/5/2004**	**3/9/2004**	**2/26/2004**	
COC Number	**607467**	**607353**	**607248**	
RAINFALL	**1.92**	**0.55**	**0.9**	**Benchmark**
Parameter	measurements in mg/l unless noted			
Aluminum	0.427	B 7.33	B 2.01	0.7500
Arsenic	U ND	0.00663		0.1685
Barium	0.0275	B 0.0964	0.058	4.0000
Cadmium	U ND	J 0.00376	ND	0.0159
Chromium	J 0.000755	B 0.0101	BJ 0.00472	0.5000
Copper	B 0.00632	0.0265	0.0118	0.0636
Iron	0.272	5.35	1.39	1.0000
Lead	U ND	B 0.0191	0.00874	0.0816
Magnesium	0.382	B 2.99	B 1.85	0.0636
Manganese	0.0102	0.12	0.0379	1.0000
Mercury (total)	U ND	ND	ND	0.0024
Nickel	J 0.00156	0.00679	J 0.00355	1.4170
Selenium	U ND	U ND	ND	0.2385
Silver	U ND	BJ 0.00205	J 0.00118	0.0318
Zinc	B 0.0471	0.122	B 0.0577	0.1170
Ammonia	0.162			19.0000
Cyanide (total)	U ND	U ND	J 0.00205	0.0636
pH				6-9 S.U.
PCBs	U ND	ND		
Gross Alpha/Beta (pCi/L)	U1.79/3.33	1.93/18.3	57.9/91.6	
Nitrate + Nitrite	J 0.100	0.06	0.92	0.0680
Total Kjeldahl Nitrogen	1	0.0159	3.36	
Oil & Grease	U ND	J 3.88	4.53	100.0000
Chemical Oxygen Demand	B 20.7	47.4	B 152	120.0000
Total Suspended Solids	55.2	54.6	223	100.0000

See notes at end of table.

TABLE A-12. 2004 Storm Water Sampling Results (continued)

Third Quarter			
Monitoring Point	**MP-04**	**MP-06**	
DATE OF SAMPLING	**4/5/2004**	**4/5/2004**	
COC Number	**607467**	**607467**	
RAINFALL	**1.92**	**1.92**	**Benchmark**
Parameter	measurements in mg/l unless noted		
Aluminum	3.58	31.2	0.7500
Arsenic	J 0.00486	0.0106	0.1685
Barium	0.198	0.314	4.0000
Cadmium	J 0.00217	U ND	0.0159
Chromium	J 0.00194	0.022	0.5000
Copper	B 0.0166	B 0.0162	0.0636
Iron	1.36	19.6	1.0000
Lead	0.0196	0.0141	0.0816
Magnesium	3.42	10.8	0.0636
Manganese	0.181	0.348	1.0000
Mercury (total)	U ND	U ND	0.0024
Nickel	0.00517	0.0154	1.4170
Selenium	0.00651	U ND	0.2385
Silver	U ND	U ND	0.0318
Zinc	B 0.0889	B 0.0653	0.1170
Ammonia	0.277	0.146	19.0000
Cyanide (total)	J 0.00172	U ND	0.0636
pH			6-9 S.U.
PCBs	U ND	U ND	
Gross Alpha/Beta (pCi/L)	10.8/13.2	U1.61/2.58	
Nitrate + Nitrite	0.46	0.11	0.0680
Total Kjeldahl Nitrogen	1.16	1.56	
Oil & Grease	U ND	U ND	100.0000
Chemical Oxygen Demand	B 69.8	B 69.8	120.0000
Total Suspended Solids	460	108	100.0000

See notes at end of table.

TABLE A-12. 2004 Storm Water Sampling Results (concluded)

Fourth Quarter **Monitoring Point** **DATE OF SAMPLING** **COC Number** **RAINFALL**	**MP 02** **8/3/2004** **607756**	**MP 04** **7/26/2004** **607748**	**MP 05** **7/26/2004** **607748**	**MP 06** **7/21/2004** **607743**	**MP 07** **7/28/2004** **607754**	**MP 09** **8/5/2004** **607757**	**MP10** **7/26/2004** **607748**
Parameter	measurements in mg/l unless noted						
Aluminum	B 0.451	0.807	3.08	B 26.8	21.6	B 50.2	34.8
Arsenic	J 0.00288	B 0.0055	BJ 0.00258	0.00844	0.00628	0.0131	B 0.0113
Barium	B 0.0468	0.0947	0.0763	0.449	0.304	0.451	0.328
Cadmium	B U ND	U ND	U ND	BJ 0.00177	J 0.000648	J 0.00153	U ND
Chromium	J 0.00184	BJ 0.00154	BJ 0.00372	0.0198	0.0225	0.0477	B 0.0329
Copper	0.00565	J 0.0042	0.00539	0.0164	0.0127	0.0326	0.0192
Iron	B 0.284	B 0.509	B 1.74	16.9	13.1	34.6	B 22.8
Lead	U ND	U ND	0.0164	0.0143	0.0124	0.033	0.00939
Magnesium	B 1.36	2.26	2.42	B 11.1	B 7.75	11.8	15.1
Manganese	0.0338	0.0213	0.0248	0.432	0.238	0.674	0.405
Mercury (total)	B U ND	U ND	U ND	U ND	U ND	U ND	U ND
Nickel	J 0.0018	BJ 0.0021	B 0.00602	0.0162	B 0.016	0.0288	B 0.0234
Selenium	U ND	U ND	U ND	U ND	U ND	0.0101	U ND
Silver	U ND	U ND	U ND	U ND	U ND	U ND	U ND
Zinc	B 0.0448	J 0.00574	J 0.00988	0.0744	0.0444	0.147	0.0852
Ammonia	0.378	B 1.03	0.203	0.159			
Cyanide (total)	U ND	U ND	U ND	U ND	U ND	U ND	U ND
pH							
PCBs	U ND	U ND		U ND	U ND		
Gross Alpha/Beta (pCi/L)	12.6/20.6	3.24/6.90	3.36/8.39	164/62.9	326/340		
Nitrate + Nitrite	0.73	0.81	0.4	U ND	1.8		
Total Kjeldahl Nitrogen		0.123	B 0.556	1.12	0.154		
Oil & Grease	J 2.32	J 4.24	J 1.70	U ND	U ND	J 3.82	
Chemical Oxygen Demand	B 102	B92	82.2	B 66.4	B 131		
Total Suspended Solids	296	1920	57.2		1440		

NOTES: 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 = the analyte was analyzed for, but not detected, below this concentration
COC = contaminant of concern
mg/L = milligrams per liter
S.U. = standard unit

APPENDIX B
2004 GROUNDWATER CONTAMINANT CONCENTRATION TRENDS

Employees Checking Water Levels at SNL/NM

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CONTENTS

FIGURES

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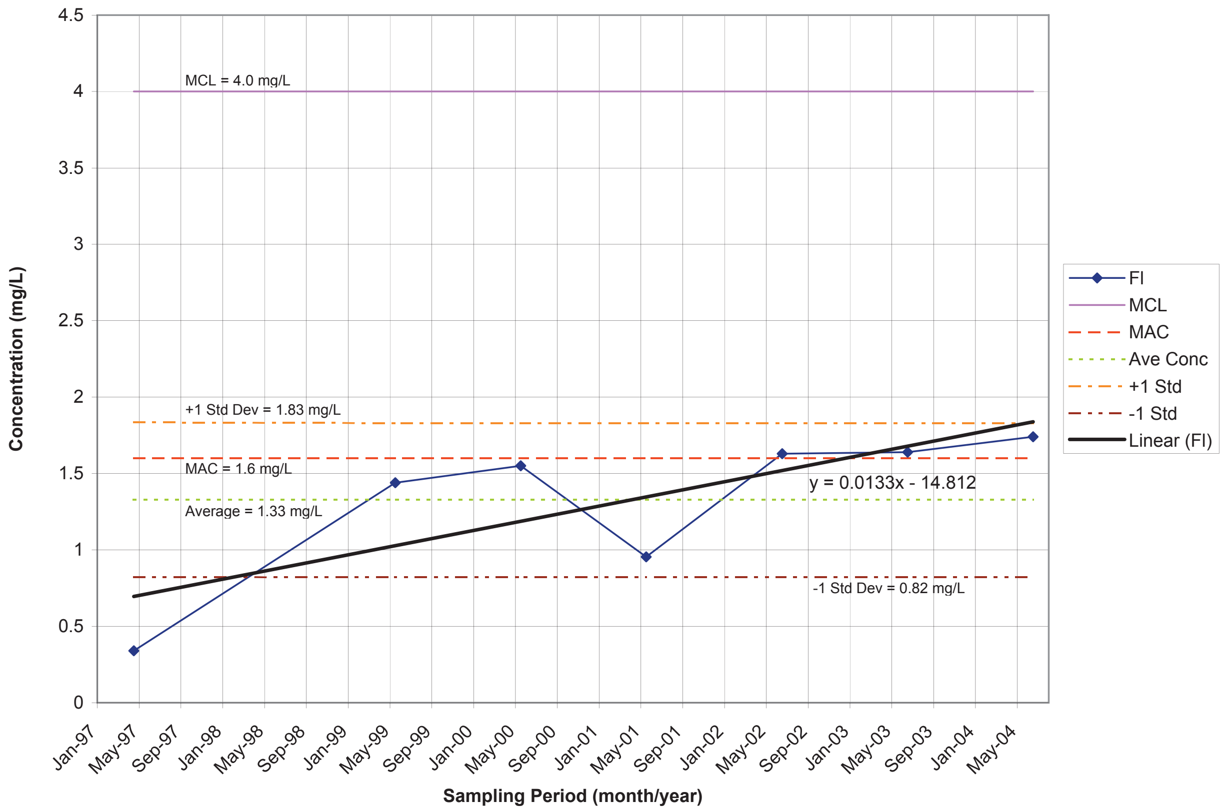

FIGURE B-1. Fluoride Concentrations, Coyote Springs

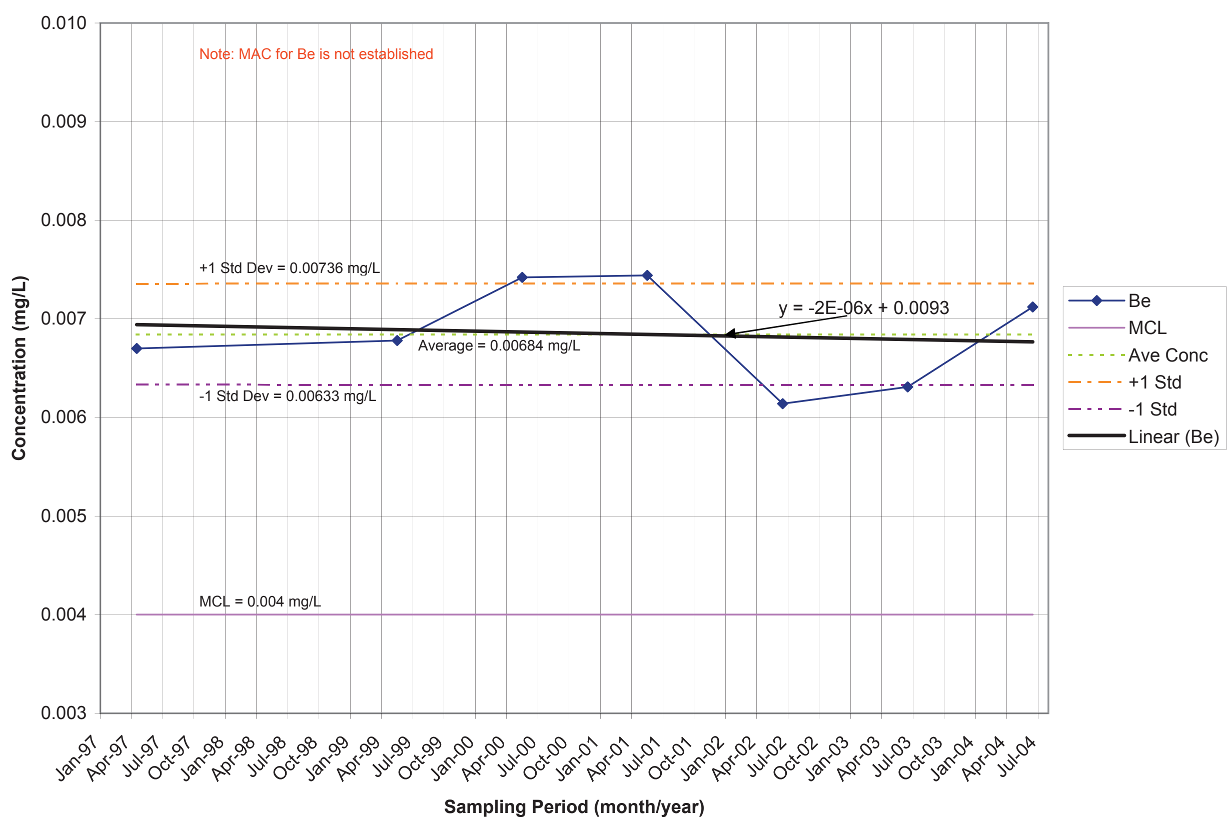

FIGURE B-2. Beryllium Concentrations, Coyote Springs

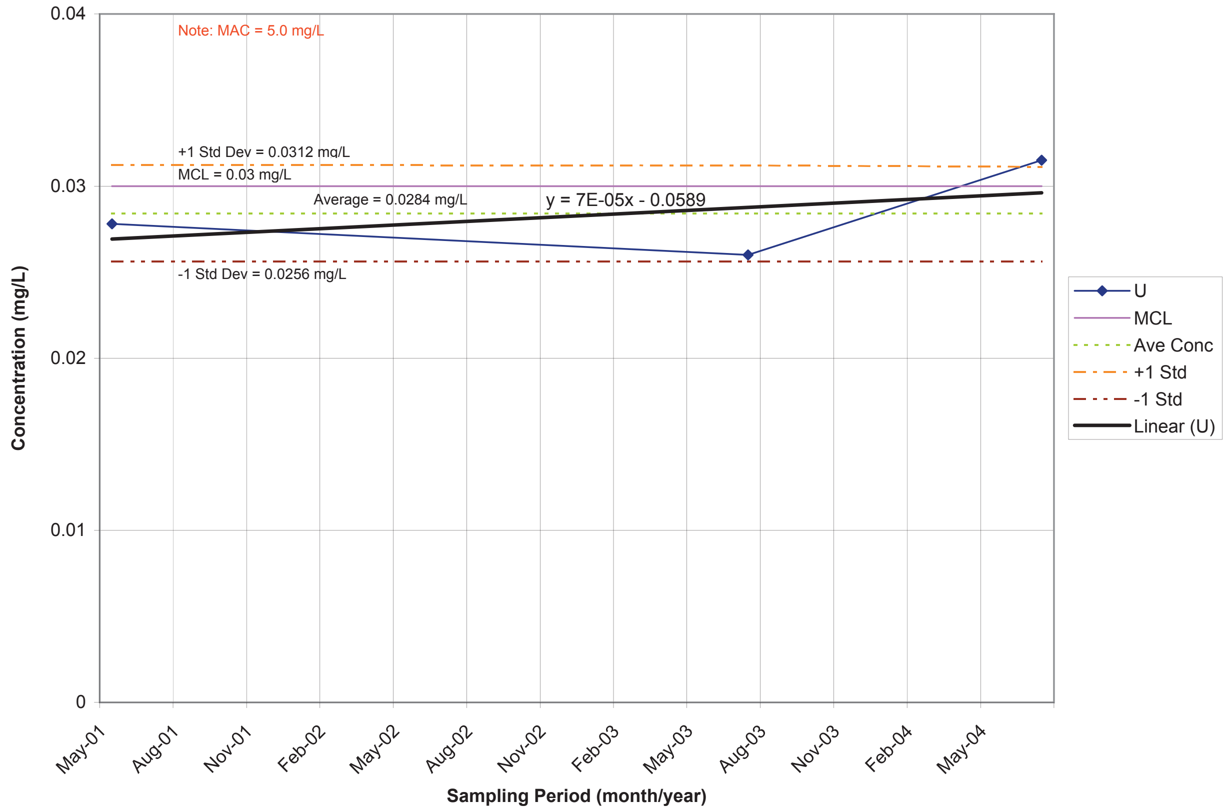

FIGURE B-3. Uranium Concentrations, EOD Hill

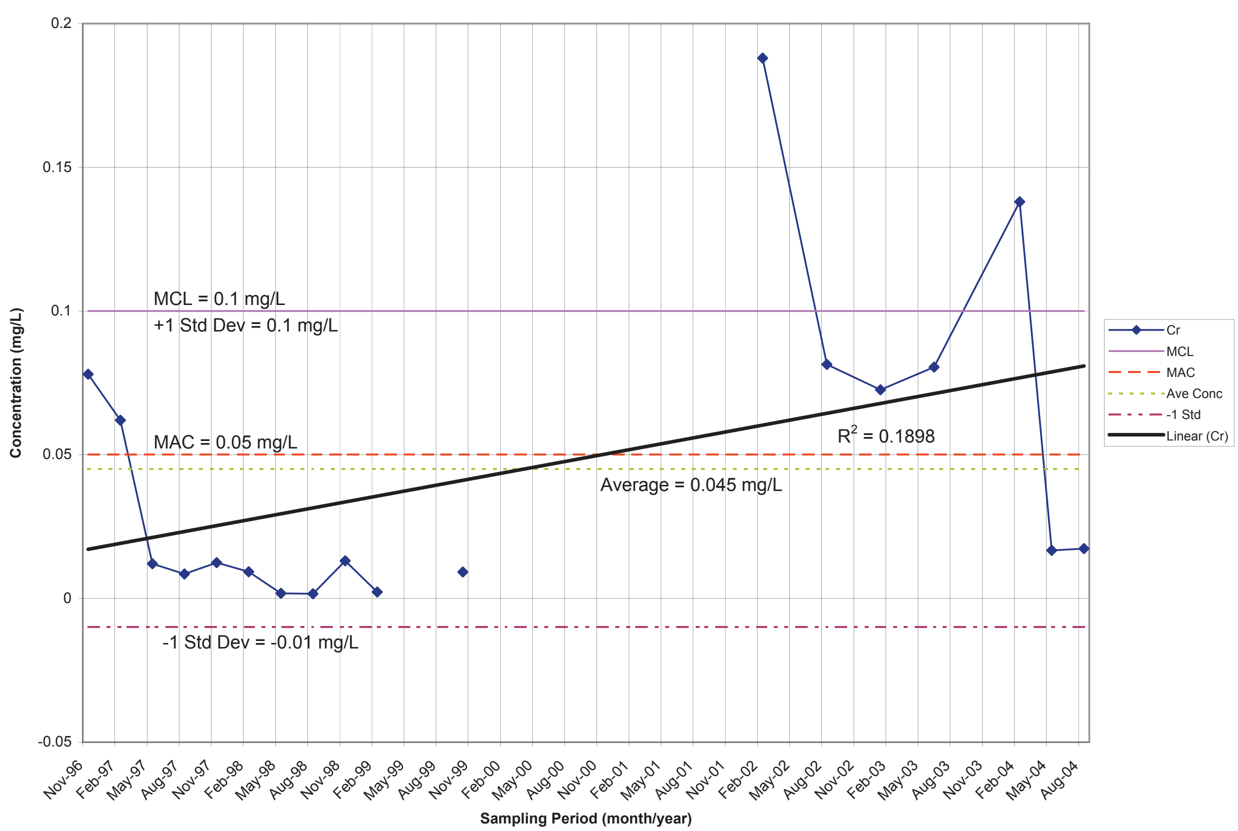

FIGURE B-4. Chromium Concentrations, CWL-BW3

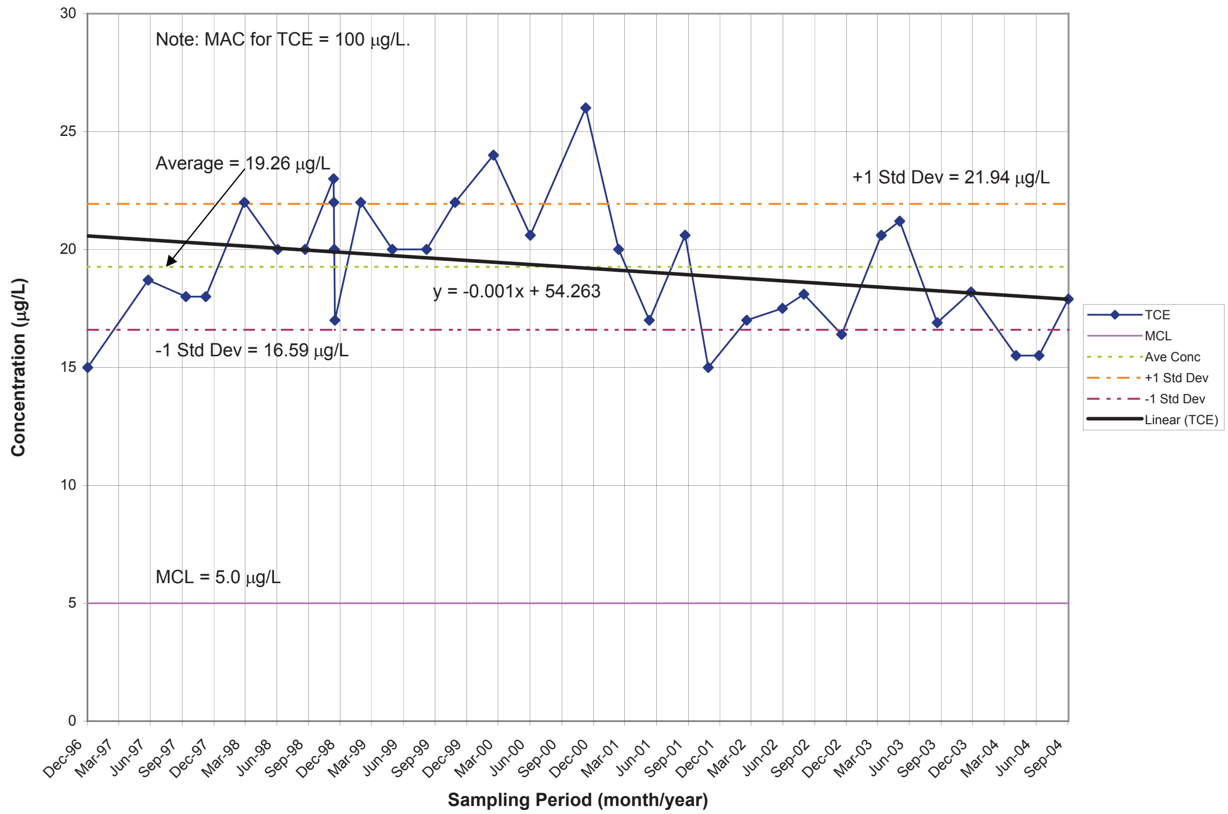

FIGURE B-5. Trichloroethene Concentrations, LWDS-MW1

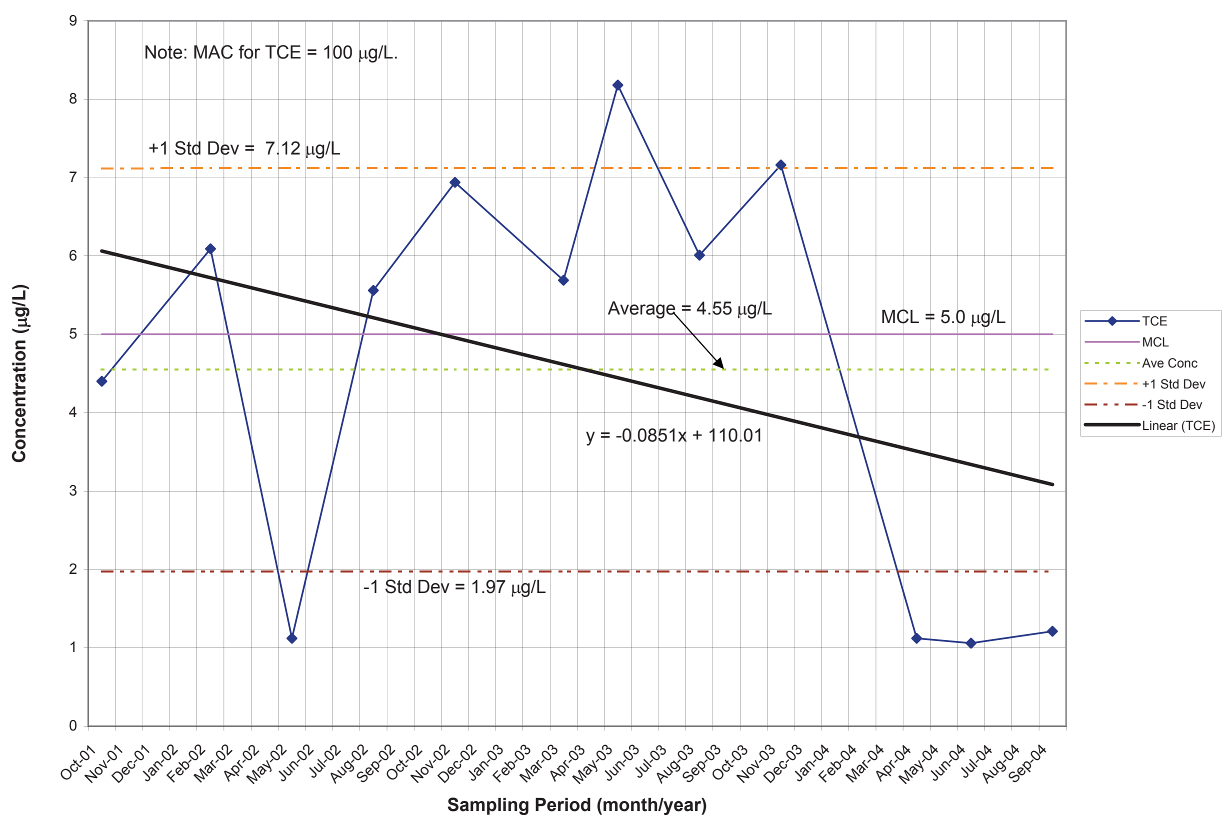

FIGURE B-6. Trichlororethene Concentrations, TAV-MW8

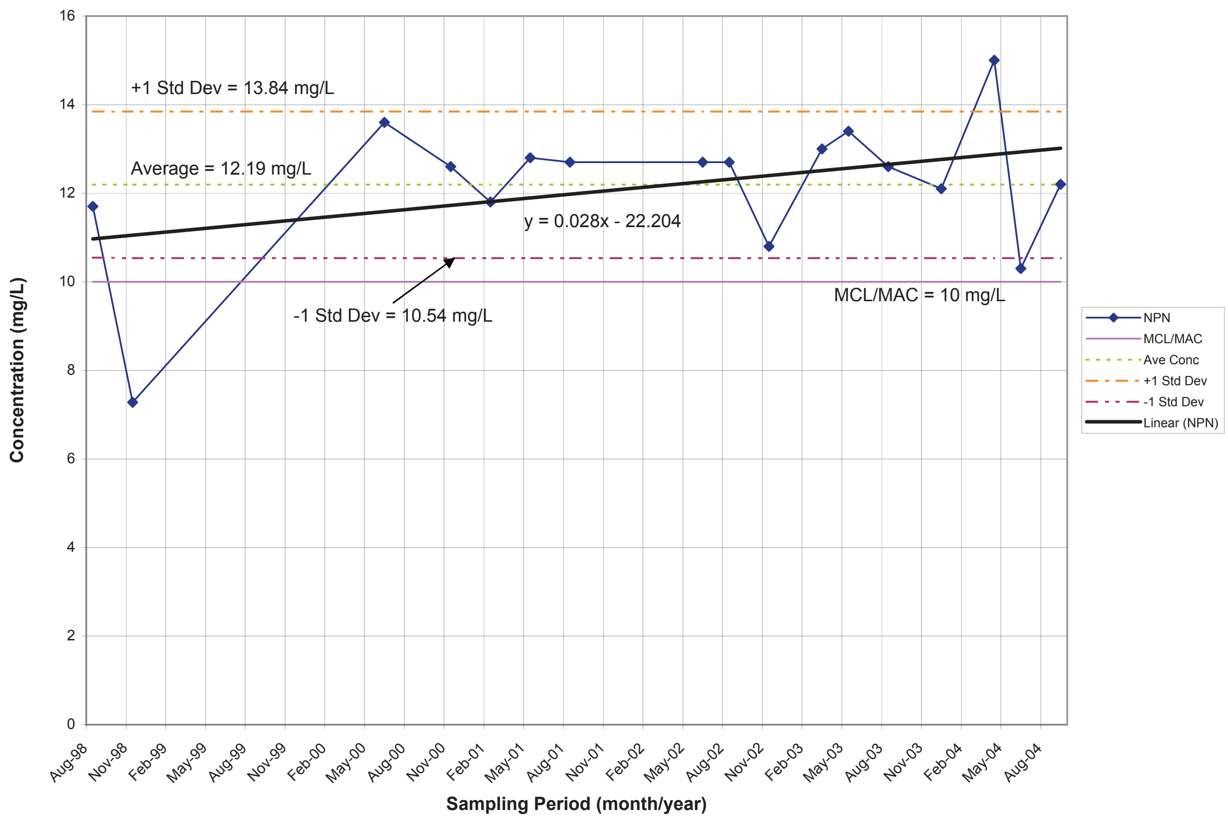

FIGURE B-7. Nitrate plus Nitrite Concentrations, LWDS-MW1

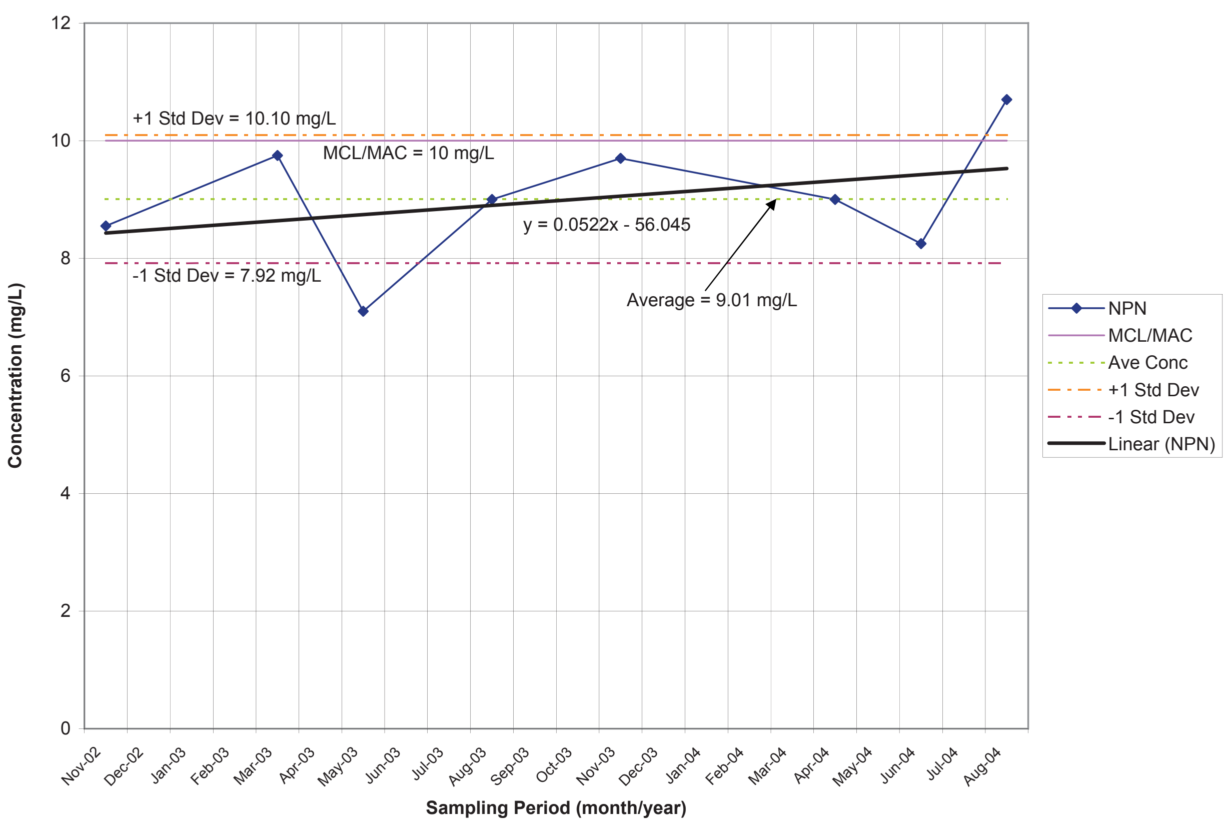

FIGURE B-8. Nitrate plus Nitrite Concentrations, AVN-2

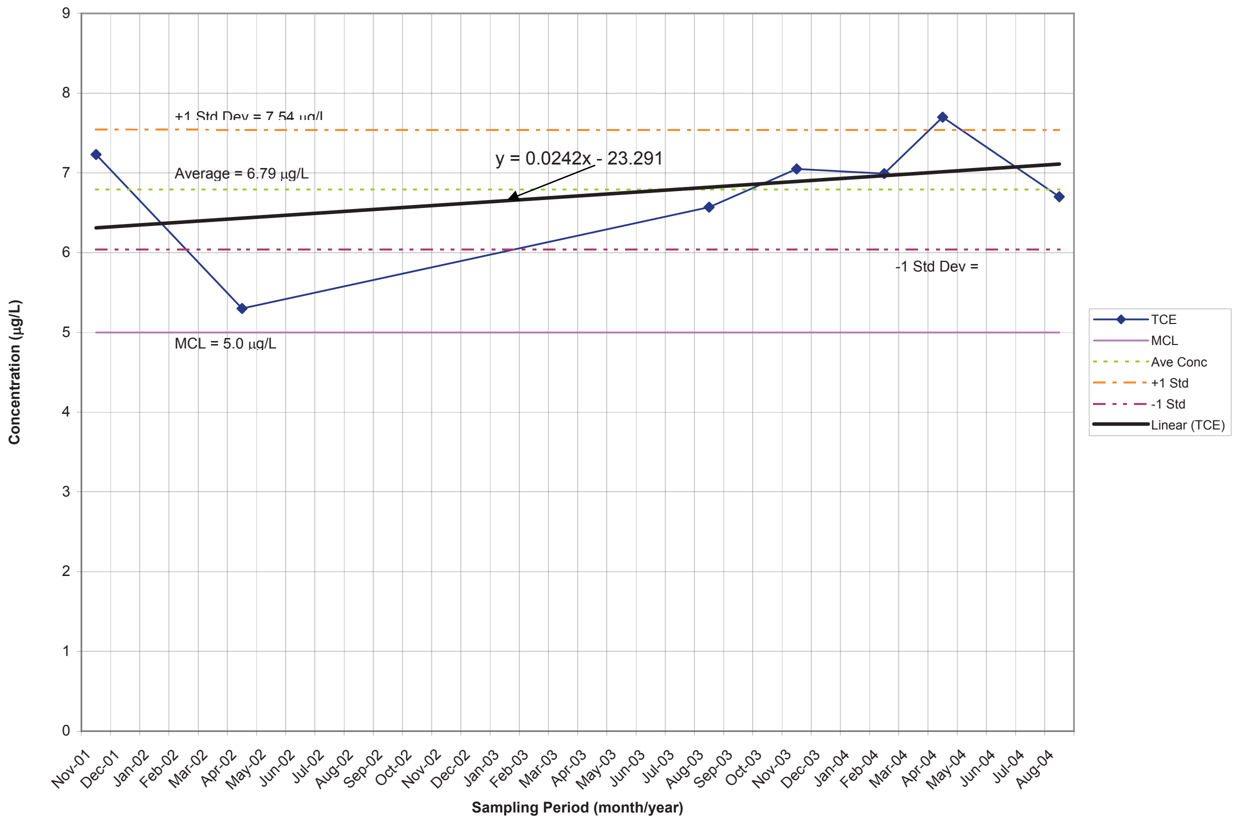

FIGURE B-9. Trichloroethene Concentrations, WYO-4

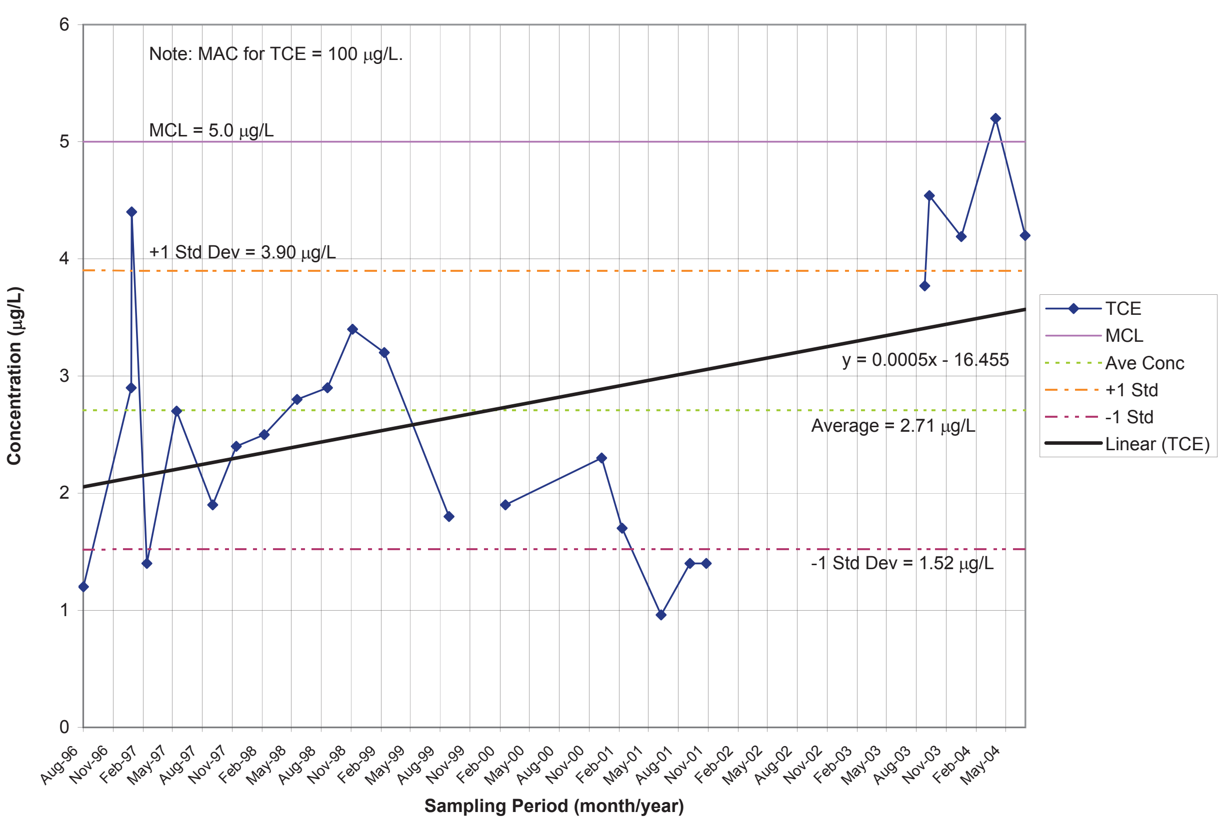

FIGURE B-10. Trichloroethene Concentrations, TA2-W-19

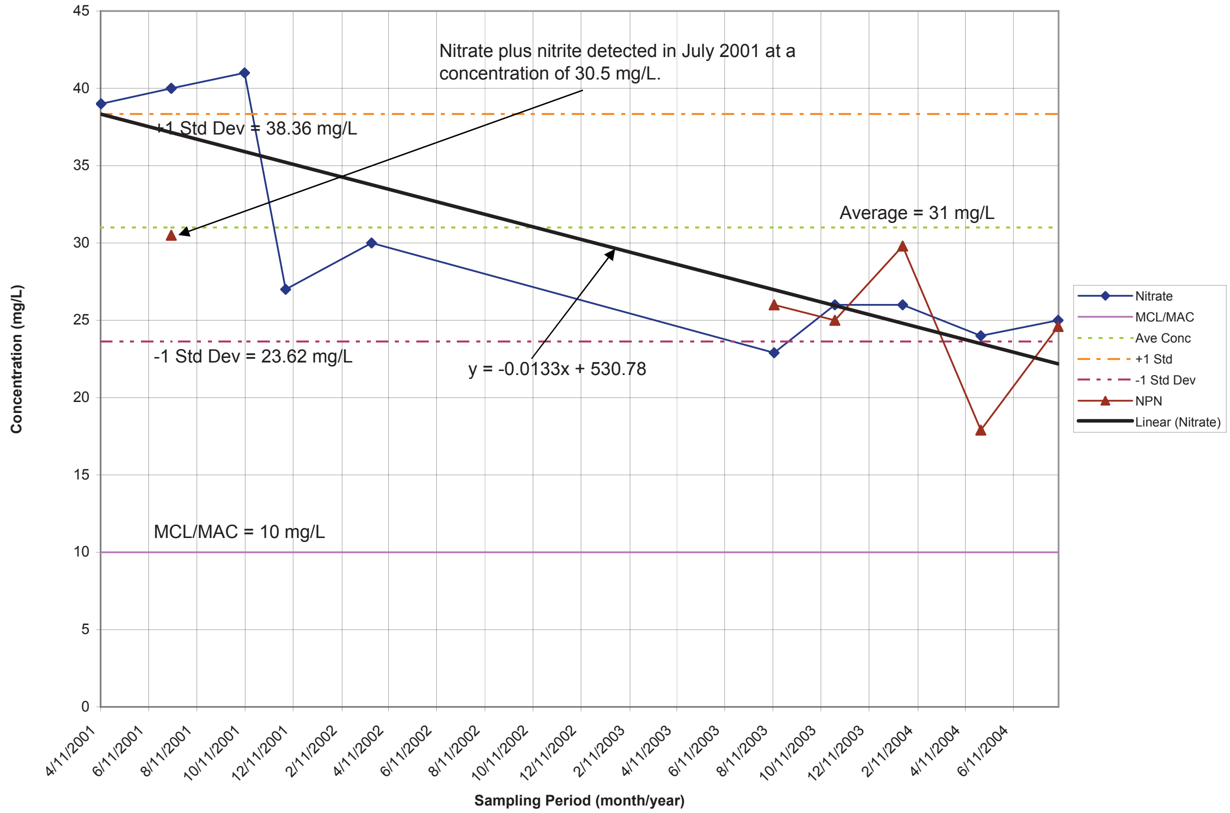

FIGURE B-11. Nitrate Concentrations, TJA-7

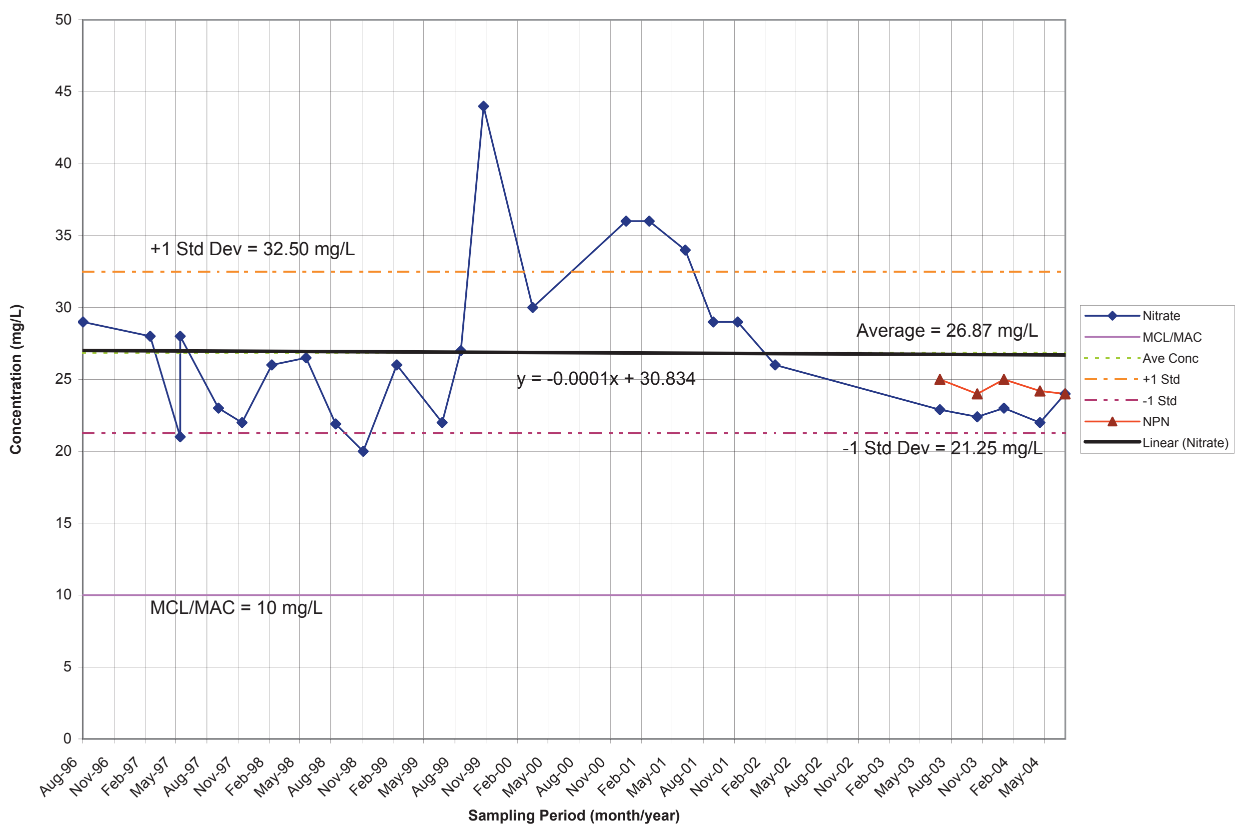

FIGURE B-12. Nitrate Concentrations, TA2-SW1-320

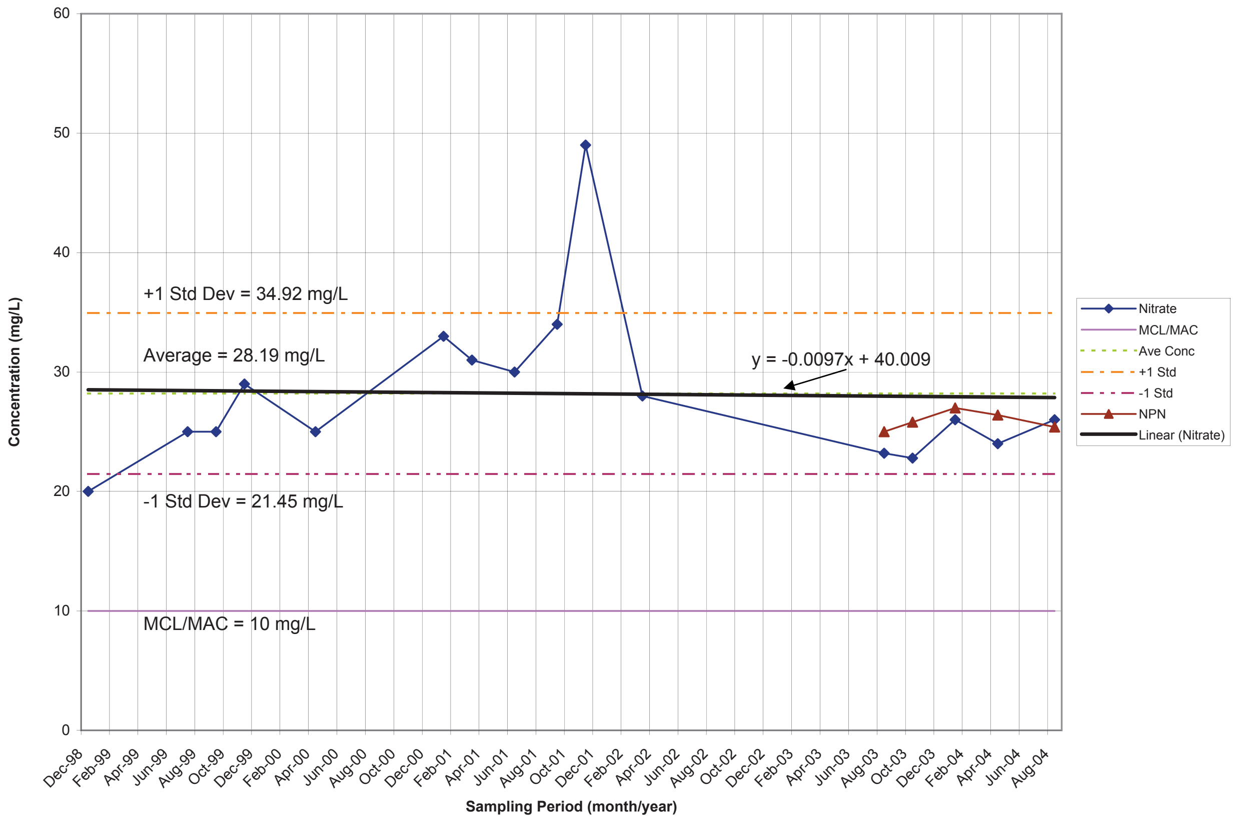

FIGURE B-13. Nitrate Concentrations, TJA-4

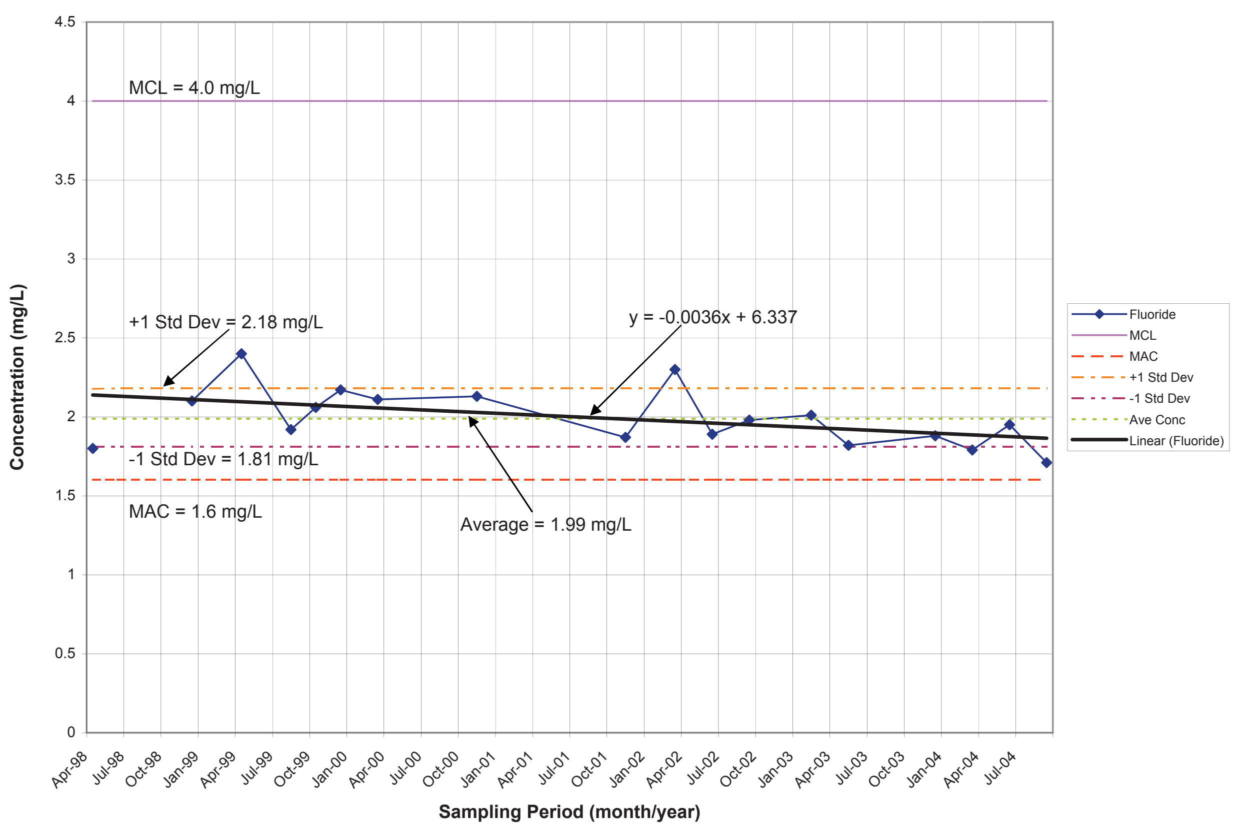

FIGURE B-14. Fluoride Concentrations, CYN-MW1D

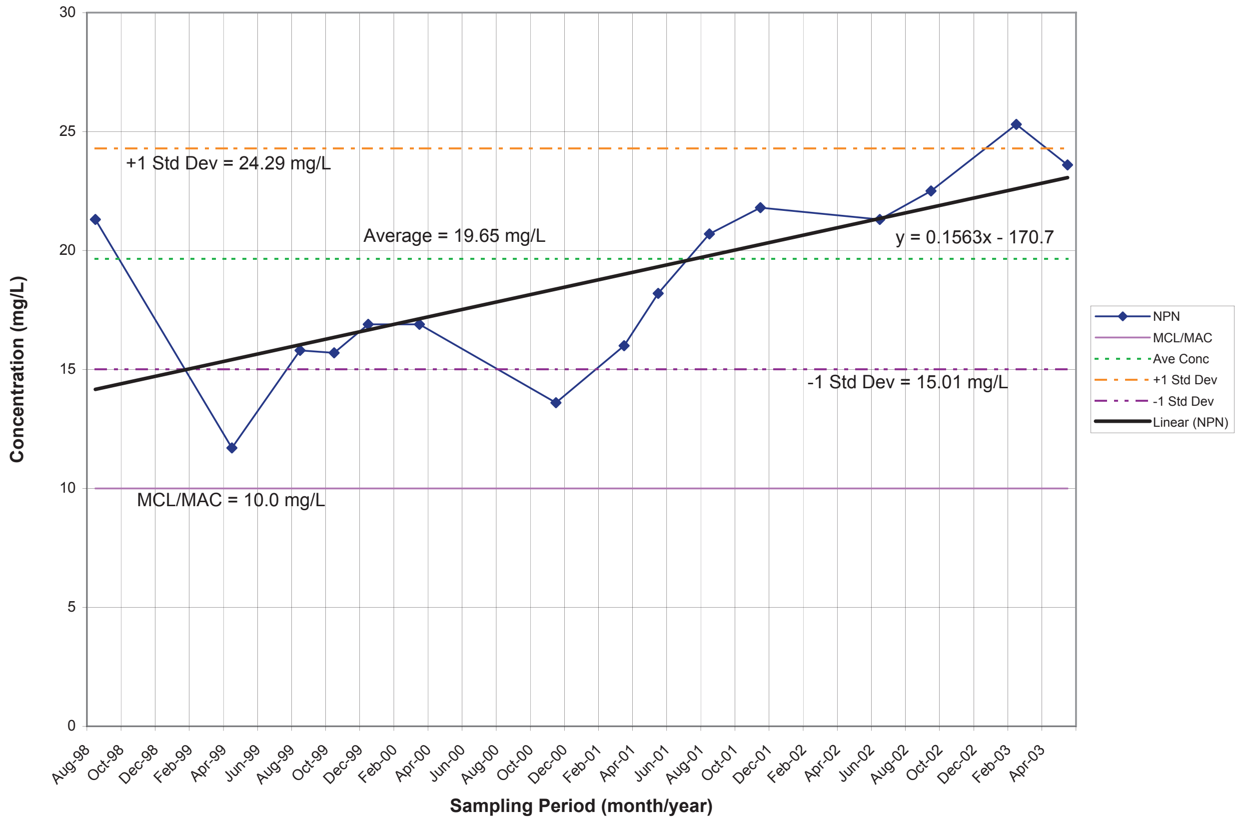

FIGURE B-15. Off-Site Nitrate plus Nitrite Concentrations, CYN-MW1D

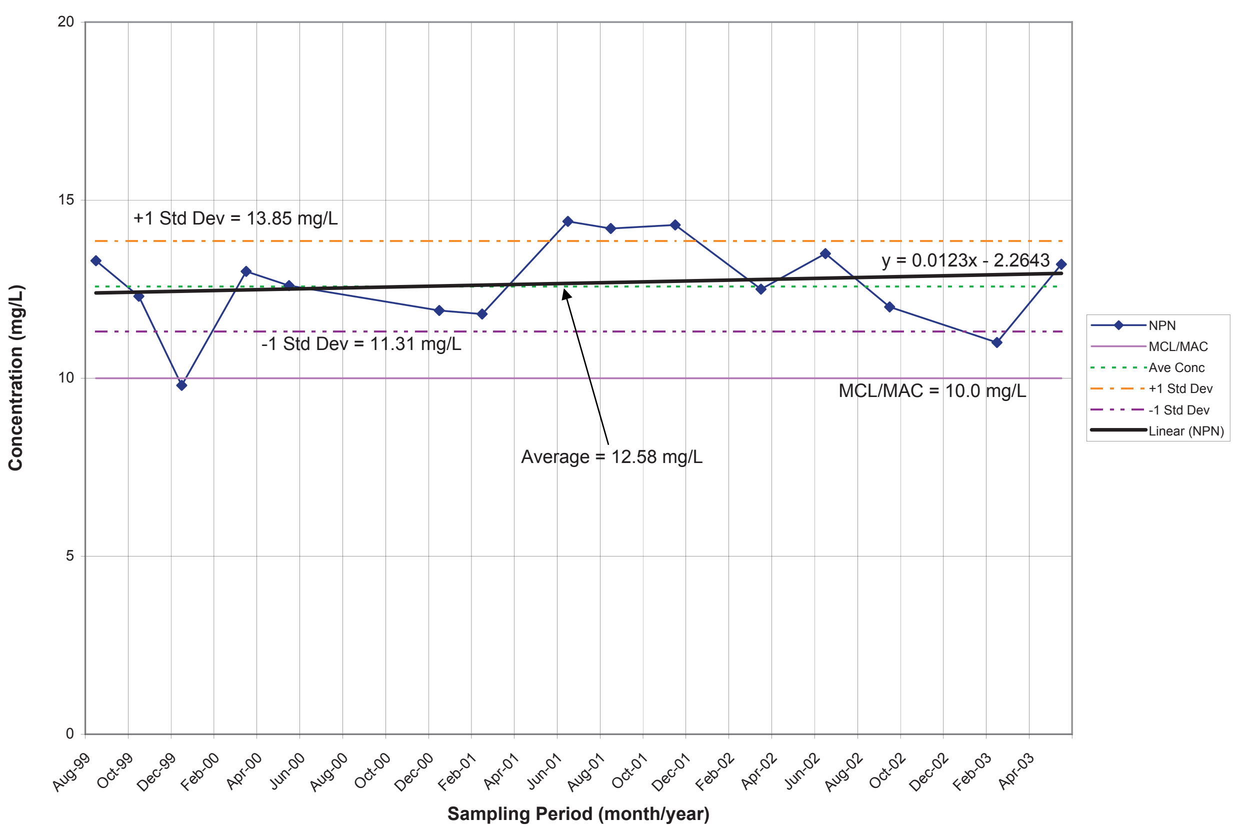

FIGURE B-16. Off-Site Nitrate plus Nitrite Concentrations, CYN-MW3

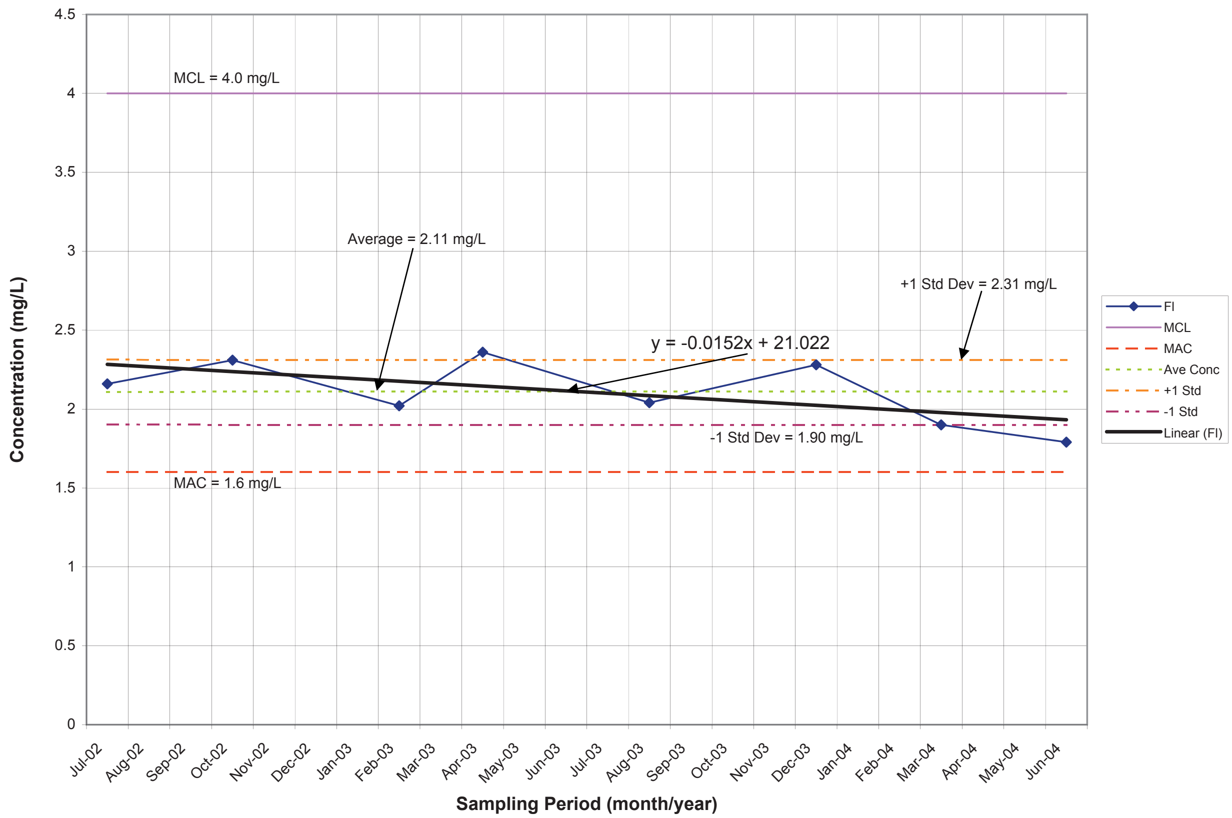

FIGURE B-17. Fluoride Concentrations, CTF-MW2

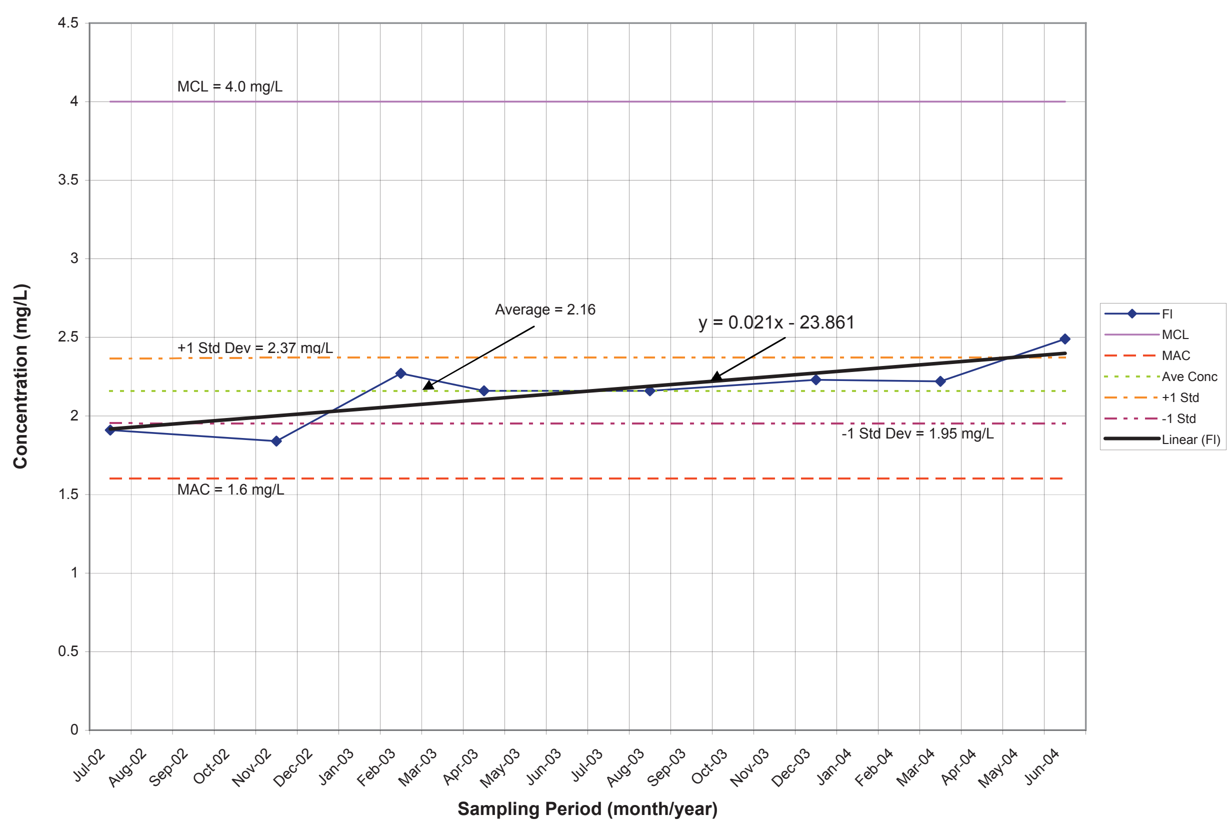

FIGURE B-18. Fluoride Concentrations, CTF-MW3

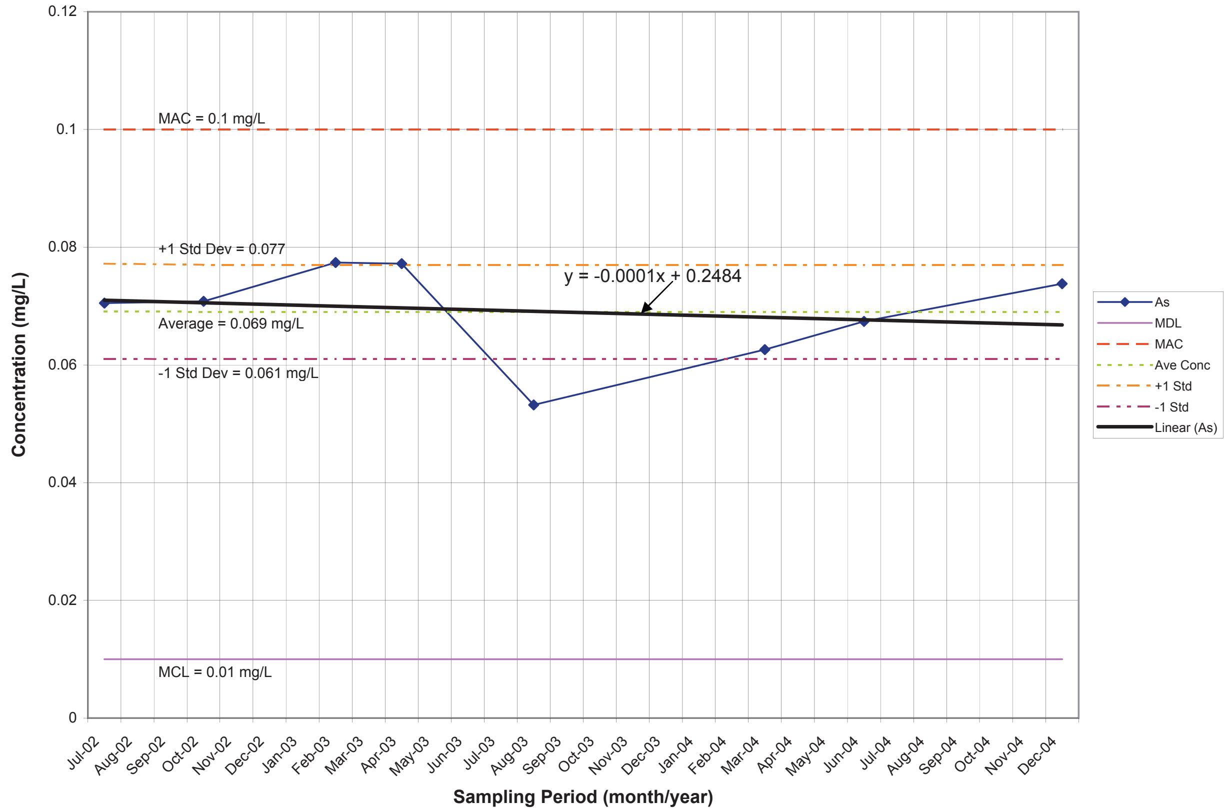

FIGURE B-19. Total Arsenic Concentrations, CTF-MW2

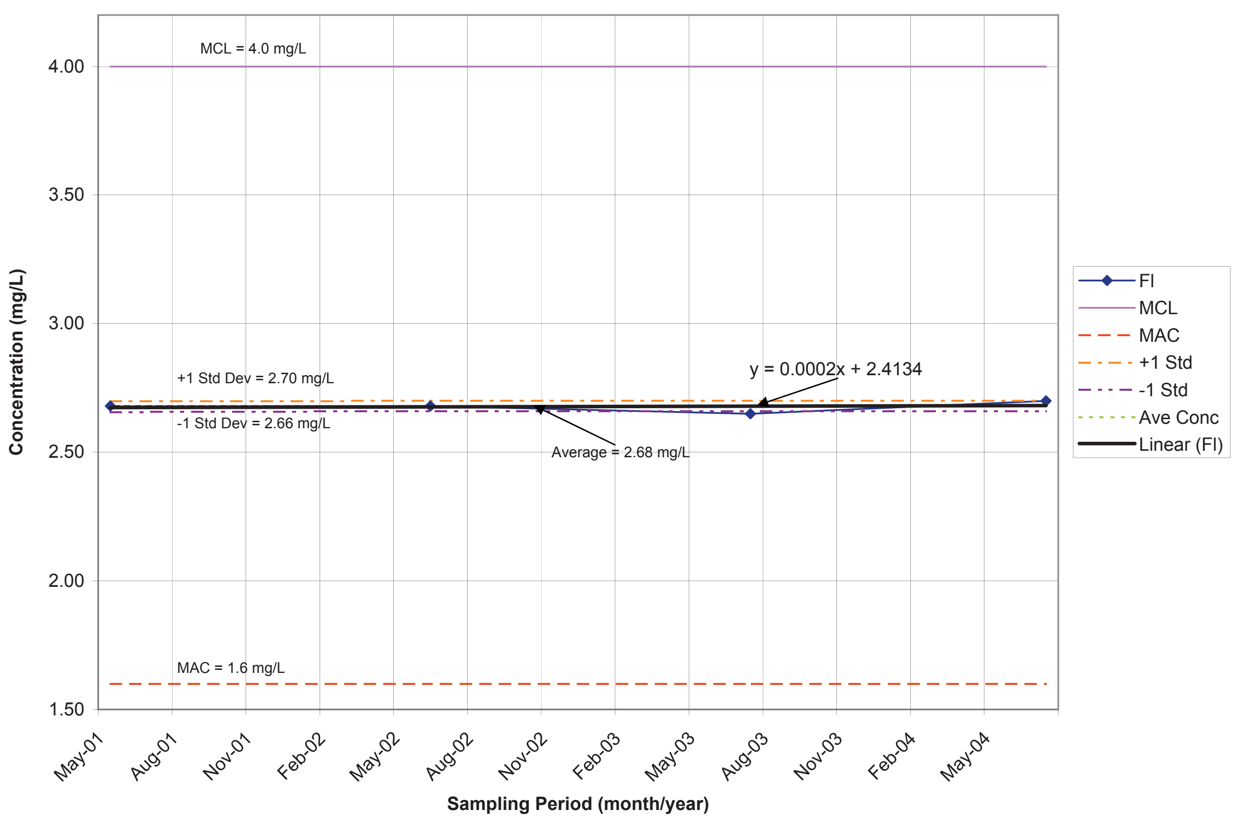

FIGURE B-20. Fluoride Concentrations, SRF-4T

APPENDIX C
2004 TERRESTRIAL SURVEILLANCE RESULTS

Employees Performing Terrestrial Surveillance at an Off-Site Location for SNL/NM

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CONTENTS

TABLES

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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).

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.

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 2004, Soil

Location Type	Analyte	Units	Location	Activity (± 2 σ) And/or concentration		Decision Level	Detection Limit
Off-Site	Cesium-137	pCi/g	8	0.0156 ± 0.00984		0.00699	0.0143
			9	0.51 ± 0.0548		0.00828	0.017
			10	0.259 ± 0.0336		0.00948	0.0195
			11	0.07 ± 0.0133		0.00719	0.0148
			25	0.0121 ± 0.0112		0.00526	0.0108
			62	1.98 ± 0.188		0.0135	0.0279
	Uranium	µg/g	8	0.5		0.00593	0.0395
			9	0.44		0.00599	0.0399
			10	0.584		0.00588	0.0392
			11	0.522		0.00589	0.0393
			25	0.503		0.00599	0.0399
			62	0.863		0.00596	0.0398
Perimeter	Cesium-137	pCi/g	4	0.146 ± 0.0168		0.00706	0.0145
			5	0.275 ± 0.0373		0.0085	0.0175
			12	0.963 ± 0.0979		0.00559	0.0114
			16	0.128 ± 0.0186		0.0076	0.0156
			19	0.704 ± 0.0707		0.0124	0.0253
			58	0.144 ± 0.0177		0.00829	0.017
			59	0.146 ± 0.0186		0.0073	0.015
			60	0.0119 ± 0.0298	UX	0.0117	0.024
			61	0.0199 ± 0.0132		0.00743	0.0153
			63	0.205 ± 0.03		0.0101	0.0208
			64	0.47 ± 0.0392		0.00765	0.0157
			65E	0.118 ± 0.0154		0.00693	0.0141
			80	0.475 ± 0.0421		0.0086	0.0178
			81	0.62 ± 0.0488		0.00773	0.0159
			82	0.016 ± 0.0114		0.00714	0.0147
	Uranium	µg/g	4	0.41		0.00593	0.0395
			5	0.363		0.00595	0.0397
			12	0.4		0.00585	0.039
			16	0.843		0.00588	0.0392
			19	0.377		0.00596	0.0398
			58	1.77		0.00584	0.0389
			59	0.728		0.00588	0.0392
			60	0.622		0.00594	0.0396
			61	0.507		0.006	0.04
			63	0.534		0.00586	0.0391
			64	1.05		0.00589	0.0393

See notes at end of table.

TABLE C-1. Radiological Results by Location for Calendar Year 2004, Soil (continued)

Location Type	Analyte	Units	Location	Activity (± 2 σ) And/or concentration		Decision Level	Detection Limit
Perimeter (concluded)	Uranium	µg/g	65E	1.46		0.00594	0.0396
			80	0.676		0.00588	0.0392
			81	0.352		0.00595	0.0397
			82	0.727		0.00585	0.039
On-Site	Cesium-137	pCi/g	1	0.199 ± 0.0288		0.0106	0.0216
			2NE	0.17 ± 0.0136		0.00594	0.0121
			2NW	0.0635 ± 0.0242		0.0102	0.021
			2SE	0.118 ± 0.0178		0.0069	0.0143
			2SW	0.0631 ± 0.0169		0.00759	0.0156
			3	0.22 ± 0.0258		0.00551	0.0112
			6	0.243 ± 0.0254		0.0081	0.0167
			7	0.405 ± 0.0442		0.00704	0.0144
			20	0.352 ± 0.0367		0.00704	0.0144
			32S	0.0566 ± 0.0172		0.00705	0.0145
			33	0.0969 ± 0.0163		0.00879	0.0181
			34	0.0645 ± 0.0149		0.0075	0.0154
			35	0.204 ± 0.022		0.00668	0.0137
			41	0.27 ± 0.0265		0.00605	0.0124
			42	0.0858 ± 0.037		0.0107	0.022
			43	0.0501 ± 0.0113		0.00798	0.0164
			45	0.0721 ± 0.0141		0.00688	0.0142
			46	0.2 ± 0.0292		0.00941	0.0194
			49	0.201 ± 0.0196		0.00923	0.0191
			51	0.0474 ± 0.0114		0.00656	0.0135
			52	0.0228 ± 0.0135		0.00798	0.0165
			53	0.182 ± 0.0248		0.00762	0.0157
			54	0.0126 ± 0.00859	U	0.00744	0.0153
			55	0.419 ± 0.0328		0.00744	0.0152
			56	0.0138 ± 0.0101	U	0.00698	0.0144
			57	0.0134 ± 0.0141	UX	0.00778	0.0159
			66	0.131 ± 0.0177		0.00626	0.0128
			76	0.0652 ± 0.0155		0.00703	0.0145
			77	0.124 ± 0.021		0.00879	0.0181
			78	0.255 ± 0.0191		0.00814	0.0167

See notes at end of table.

TABLE C-1. Radiological Results by Location for Calendar Year 2004, Soil (concluded)

Location Type	Analyte	Units	Location	Activity (± 2 σ) And/or concentration		Decision Level	Detection Limit
On-Site	Uranium	µg/g	1	0.681		0.00588	0.0392
			2NW	0.295		0.00596	0.0398
			2SE	0.285		0.00591	0.0394
			2SW	0.356		0.00598	0.0398
			3	0.367		0.00584	0.0389
			6	0.386		0.00599	0.0399
			7	0.422		0.00596	0.0398
			20	0.569		0.00596	0.0398
			32S	0.555		0.00587	0.0391
			33	1.18		0.00592	0.0394
			34	0.497		0.00592	0.0394
			35	0.331		0.00592	0.0394
			41	0.335		0.00588	0.0392
			42	0.359		0.00594	0.0396
			43	0.347		0.006	0.04
			45	0.44		0.00592	0.0394
			46	0.552		0.00585	0.039
			49	0.595		0.00591	0.0394
			51	0.438		0.00589	0.0393
			52	0.39		0.00591	0.0394
			53	0.342		0.00583	0.0388
			54	0.369		0.00585	0.039
			55	0.447		0.00596	0.0398
			57	1.21		0.00594	0.0396
			66	0.441		0.00595	0.0397
			76	0.406		0.00592	0.0394
			77	0.503		0.006	0.04
			78	0.34		0.0058	0.0387

NOTES: pCi/g = picocurie per gram
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.
X = Presumptive evidence that analyte is not present.

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TABLE C-2. Radiological Results by Location for Calendar Year 2004, Sediment

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
Off-Site	Cesium-137	pCi/g	8	0.0682 ± 0.0135		0.00556	0.0114
		pCi/g	11	0.0388 ± 0.0117		0.00576	0.0117
		pCi/g	68	0.0153 ± 0.0144		0.0069	0.0143
	Uranium	μg/g	8	0.921		0.00588	0.0392
		μg/g	11	0.493		0.00589	0.0393
		μg/g	68	0.859		0.00599	0.0399
Perimeter	Cesium-137	pCi/g	60	0.00529 ± 0.0132	U	0.00706	0.0145
		pCi/g	65E	0.0103 ± 0.00868	UX	0.00749	0.0154
		pCi/g	73	0.0185 ± 0.0131		0.00709	0.0146
	Uranium	μg/g	60	0.7		0.00598	0.0398
		μg/g	65E	0.703		0.00583	0.0388
		μg/g	73	0.732		0.00598	0.0398
On-Site	Cesium-137	pCi/g	72	0.0344 ± 0.0162		0.00721	0.0149
		pCi/g	74	0.198 ± 0.0232		0.00601	0.0123
		pCi/g	75	0.0562 ± 0.0126		0.00663	0.0136
		pCi/g	79	0.0831 ± 0.0126		0.00516	0.0106
		pCi/g	83	0.253 ± 0.0273		0.00903	0.0186
		pCi/g	84	0.182 ± 0.0132		0.00624	0.0128
		pCi/g	85	0.0336 ± 0.00979		0.00534	0.0109
	Uranium	μg/g	72	0.779		0.00594	0.0396
		μg/g	74	0.788		0.00594	0.0396
		μg/g	75	0.776		0.00581	0.0388
		μg/g	79	1.36		0.00595	0.0397

NOTES: pCi/g = picocurie per gram
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. Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.
X = Presumptive evidence that analyte is not present.

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TABLE C-3. Radiological Results by Location for Calendar Year 2004, Vegetation

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
Off-Site	Cesium-137	pCi/g	8	-0.00209 ± 0.047	U	0.0374	0.078
		pCi/g	9	0.48 ± 0.11		0.0305	0.063
		pCi/g	11	-0.036 ± 0.0577	U	0.043	0.09
		pCi/g	25	0.0251 ± 0.0463	U	0.0377	0.079
		pCi/g	62	0.0201 ± 0.0334	U	0.023	0.048
	Uranium	μg/g	8	0.00591	U	0.0059	0.039
		μg/g	9	0.0087	J	0.0059	0.04
		μg/g	11	0.00589	U	0.0059	0.039
		μg/g	25	0.00594	U	0.0059	0.04
		μg/g	62	0.00581	U	0.0058	0.039
Perimeter	Cesium-137	pCi/g	4	0.042 ± 0.0288	UX	0.0249	0.052
		pCi/g	5	-0.011 ± 0.0169	U	0.0133	0.028
		pCi/g	19	-0.000886 ± 0.025	U	0.0196	0.041
		pCi/g	60	0.101 ± 0.0596		0.0197	0.041
		pCi/g	63	-0.0039 ± 0.0207	U	0.0165	0.034
		pCi/g	64	0.00494 ± 0.0141	U	0.0114	0.024
		pCi/g	82	0.423 ± 0.0665	X	0.0505	0.103
	Tritium	pCi/mL	82	0 ± 0.112	U	0.0942	0.196
	Uranium	μg/g	4	0.00694	J	0.006	0.04
		μg/g	5	0.00589	U	0.0059	0.039
		μg/g	19	0.00994	J	0.006	0.04
		μg/g	60	0.00591	U	0.0059	0.039
		μg/g	63	0.00599	U	0.006	0.04
		μg/g	64	0.00589	U	0.0059	0.039
		μg/g	82	0.00886	J	0.0059	0.039
On-Site	Cesium-137	pCi/g	2NE	0.0393 ± 0.024	U	0.0205	0.0425
		pCi/g	2NW	0.0608 ± 0.0315		0.0188	0.039
		pCi/g	6	0.0192 ± 0.0177	UX	0.0148	0.03
		pCi/g	20	0.0483 ± 0.04	UX	0.0341	0.071
		pCi/g	33	0.00055 ± 0.062	U	0.049	0.101
		pCi/g	34	0.0146 ± 0.0236	U	0.0196	0.041
		pCi/g	35	0.0021 ± 0.0196	U	0.0158	0.033
		pCi/g	43	0.00355 ± 0.0176	U	0.0141	0.03
		pCi/g	45	0.00802 ± 0.0173	U	0.0142	0.029
		pCi/g	46	0.000844 ± 0.022	U	0.0178	0.037
		pCi/g	51	0.00305 ± 0.0264	U	0.0127	0.027
		pCi/g	52	0.034 ± 0.0192	UX	0.0165	0.034
		pCi/g	55	0.0427 ± 0.0399	UX	0.0321	0.066

See notes at end of table.

TABLE C-3. Radiological Results by Location for Calendar Year 2004, Vegetation (concluded)

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
On-Site (concluded)	Tritium	pCi/mL	46	0 ± 0.115	U	0.0967	0.201
	Uranium	µg/g	2NE	0.006	U	0.006	0.04
		µg/g	2NW	0.00586	J	0.0059	0.039
		µg/g	6	0.00599	U	0.006	0.04
		µg/g	20	0.00581	J	0.0058	0.039
		µg/g	33	0.00592	U	0.0059	0.039
		µg/g	34	0.00599	U	0.006	0.04
		µg/g	35	0.0208	J	0.006	0.04
		µg/g	43	0.00596	U	0.006	0.04
		µg/g	45	0.00809	J	0.0059	0.039
		µg/g	46	0.00585	U	0.0059	0.039
		µg/g	51	0.00588	U	0.0059	0.039
		µg/g	52	0.0098	J	0.0059	0.039
		µg/g	55	0.00585	U	0.0059	0.039

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.
X = Presumptive evidence that analyte is not present.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

TABLE C-4. Non-radiological Results for Off-Site by Location for Calendar Year 2004, Soil

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site	8	Aluminum	9100		0.775	9.77
		Antimony	0.335	BU	0.335	0.977
		Arsenic	2.89		0.202	0.488
		Barium	162		0.0651	0.488
		Beryllium	0.441	J	0.0488	0.488
		Cadmium	0.132	J	0.0467	0.488
		Calcium	16700		1.27	9.77
		Chromium	9		0.157	0.488
		Cobalt	3.8		0.0779	0.488
		Copper	13.4		0.198	0.488
		Iron	10300		1.53	9.77
		Lead	11.5		0.277	0.488
		Magnesium	3490		0.571	9.77
		Manganese	252		0.128	0.977
		Mercury	0.00572	J	0.00097	0.00987
		Nickel	7.25	B	0.0834	0.488
		Potassium	2150	B	3.49	9.77
		Selenium	0.342	J	0.158	0.488
		Silver	0.0881	U	0.0881	0.488
		Sodium	207		3.55	9.77
		Thallium	0.977	U	0.977	1.95
		Vanadium	22.9		0.0887	0.488
		Zinc	75.2		0.164	0.488
	9	Aluminum	14900		0.779	9.82
		Antimony	0.374	BJ	0.337	0.982
		Arsenic	4.24		0.203	0.491
		Barium	153		0.0655	0.491
		Beryllium	0.642		0.0491	0.491
		Cadmium	0.189	J	0.047	0.491
		Calcium	27300		1.28	9.82
		Chromium	16.3		0.158	0.491
		Cobalt	5.37		0.0784	0.491
		Copper	12.1		0.199	0.491
		Iron	14600		1.54	9.82
		Lead	17.7		0.279	0.491
		Magnesium	4320		0.574	9.82
		Manganese	292		0.128	0.982
		Mercury	0.0143		0.00098	0.00997
		Nickel	11.7	B	0.0839	0.491
		Potassium	2300	B	3.51	9.82
		Selenium	0.253	J	0.159	0.491
		Silver	0.0886	U	0.0886	0.491

See notes at end of table.

TABLE C-4. Non-radiological Results for Off-Site by Location for Calendar Year 2004, Soil (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site (continued)	9	Sodium	55.7		3.57	9.82
		Thallium	0.982	U	0.982	1.96
		Vanadium	31.5		0.0892	0.491
		Zinc	41.7		0.165	0.491
	10	Aluminum	15900		0.778	9.8
		Antimony	0.34	J	0.337	0.98
		Arsenic	2.86		0.202	0.49
		Barium	105		0.0654	0.49
		Beryllium	0.696		0.049	0.49
		Cadmium	0.153	J	0.0469	0.49
		Calcium	27300	B	1.28	9.8
		Chromium	17.1		0.158	0.49
		Cobalt	5.31		0.0782	0.49
		Copper	8.95		0.199	0.49
		Iron	15600		1.54	9.8
		Lead	9		0.278	0.49
		Magnesium	3280		0.573	9.8
		Manganese	447		0.128	0.98
		Mercury	0.0123		0.000942	0.00958
		Nickel	11.3		0.0837	0.49
		Potassium	2580		3.51	9.8
		Selenium	0.945		0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	55.4		3.56	9.8
		Thallium	0.98	U	0.98	1.96
		Vanadium	31.8		0.089	0.49
		Zinc	33.3	B	0.165	0.49
	11	Aluminum	4960		0.788	9.94
		Antimony	0.766	BJ	0.341	0.994
		Arsenic	2.29		0.205	0.497
		Barium	199		0.0663	0.497
		Beryllium	0.262	J	0.0497	0.497
		Cadmium	0.0648	J	0.0475	0.497
		Calcium	10700		1.3	9.94
		Chromium	6.23		0.16	0.497
		Cobalt	2.74		0.0793	0.497
		Copper	4.4		0.202	0.497
		Iron	8210		1.56	9.94
		Lead	6.08		0.282	0.497
		Magnesium	2130		0.581	9.94
		Manganese	276		0.13	0.994
		Mercury	0.00553	J	0.000936	0.00952

See notes at end of table.

TABLE C-4. Non-radiological Results for Off-Site by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site (continued)	11	Nickel	5.29	B	0.0849	0.497
		Potassium	1340	B	3.55	9.94
		Selenium	0.161	U	0.161	0.497
		Silver	0.0897	U	0.0897	0.497
		Sodium	98		3.61	9.94
		Thallium	0.994	U	0.994	1.99
		Vanadium	18.8		0.0903	0.497
		Zinc	20.3		0.167	0.497
	25	Aluminum	4720		0.79	9.96
		Antimony	0.786	J	0.342	0.996
		Arsenic	3.05		0.206	0.498
		Barium	112		0.0664	0.498
		Beryllium	0.239	J	0.0498	0.498
		Cadmium	0.114	J	0.0476	0.498
		Calcium	40900	B	1.3	9.96
		Chromium	6.94		0.16	0.498
		Cobalt	2.33		0.0795	0.498
		Copper	6.13		0.202	0.498
		Iron	6800		1.56	9.96
		Lead	7.48		0.283	0.498
		Magnesium	1770		0.582	9.96
		Manganese	188		0.13	0.996
		Mercury	0.00527	J	0.000983	0.01
		Nickel	5.47		0.0851	0.498
		Potassium	1010		3.56	9.96
		Selenium	0.319	J	0.161	0.498
		Silver	0.0898	U	0.0898	0.498
		Sodium	200		3.62	9.96
		Thallium	0.996	U	0.996	1.99
		Vanadium	15.4		0.0904	0.498
		Zinc	26.7	B	0.168	0.498

See notes at end of table.

TABLE C-4. Non-radiological Results for Off-Site by Location for Calendar Year 2004, Soil (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site (concluded)	62	Aluminum	13900		0.776	9.78
		Antimony	0.478	BJ	0.336	0.978
		Arsenic	2.57		0.202	0.489
		Barium	156		0.0653	0.489
		Beryllium	0.623		0.0489	0.489
		Cadmium	0.346	J	0.0468	0.489
		Calcium	20200		1.28	9.78
		Chromium	14.8		0.158	0.489
		Cobalt	5.22		0.0781	0.489
		Copper	15.8		0.199	0.489
		Iron	12700		1.53	9.78
		Lead	16.1		0.278	0.489
		Magnesium	3710		1.14	19.6
		Manganese	414		0.128	0.978
		Mercury	0.0566		0.000922	0.00938
		Nickel	12.3	B	0.0836	0.489
		Potassium	3640	B	7	19.6
		Selenium	0.159	U	0.159	0.489
		Silver	0.0883	U	0.0883	0.489
		Sodium	57.4		3.55	9.78
		Thallium	0.978	U	0.978	1.96
		Vanadium	22.5		0.0888	0.489
		Zinc	61.2		0.165	0.489

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 2004, Soil

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter	4	Aluminum	9600	B	0.781	9.84
		Antimony	0.369	BJ	0.338	0.984
		Arsenic	1.99		0.203	0.492
		Barium	81.8		0.0656	0.492
		Beryllium	0.466	J	0.0492	0.492
		Cadmium	0.047	U	0.047	0.492
		Calcium	8980		1.28	9.84
		Chromium	9.48		0.159	0.492
		Cobalt	3.04		0.0785	0.492
		Copper	7.29		0.2	0.492
		Iron	9570	B	1.54	9.84
		Lead	8.04		0.279	0.492
		Magnesium	2980		0.576	9.84
		Manganese	173		0.129	0.984
		Mercury	0.00705	J	0.000981	0.00998
		Nickel	6.71		0.0841	0.492
		Potassium	2630		3.52	9.84
		Selenium	0.16	U	0.16	0.492
		Silver	0.0888	U	0.0888	0.492
		Sodium	47.9		3.57	9.84
		Thallium	2.28		0.984	1.97
		Vanadium	18.3		0.0894	0.492
		Zinc	26.4		0.166	0.492
	5	Aluminum	7230	B	0.778	9.8
		Antimony	0.337	BU	0.337	0.98
		Arsenic	1.68		0.202	0.49
		Barium	53.4		0.0654	0.49
		Beryllium	0.378	J	0.049	0.49
		Cadmium	0.0469	U	0.0469	0.49
		Calcium	1170		1.28	9.8
		Chromium	6.85		0.158	0.49
		Cobalt	2.32		0.0782	0.49
		Copper	4.98		0.199	0.49
		Iron	7310	B	1.54	9.8
		Lead	6.79		0.278	0.49
		Magnesium	1660		0.573	9.8
		Manganese	141		0.128	0.98
		Mercury	0.00332	J	0.000916	0.00932
		Nickel	4.63		0.0837	0.49
		Potassium	1770		3.51	9.8
		Selenium	0.903		0.159	0.49

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	5	Silver	0.0884	U	0.0884	0.49
		Sodium	33.3		3.56	9.8
		Thallium	1.69	J	0.98	1.96
		Vanadium	14.2		0.089	0.49
		Zinc	21.2		0.165	0.49
	12	Aluminum	13700		0.773	9.75
		Antimony	0.743	BJ	0.335	0.975
		Arsenic	2.76		0.201	0.487
		Barium	126		0.065	0.487
		Beryllium	0.534		0.0487	0.487
		Cadmium	0.223	J	0.0466	0.487
		Calcium	6710		1.27	9.75
		Chromium	14.3		0.157	0.487
		Cobalt	6.25		0.0778	0.487
		Copper	12.3		0.198	0.487
		Iron	15800		1.53	9.75
		Lead	13.7		0.277	0.487
		Magnesium	4250		0.57	9.75
		Manganese	324		0.127	0.975
		Mercury	0.0181		0.000947	0.00963
		Nickel	10.1	B	0.0832	0.487
		Potassium	2310	B	3.49	9.75
		Selenium	0.659		0.158	0.487
		Silver	0.0879	U	0.0879	0.487
		Sodium	70.7		3.54	9.75
		Thallium	0.975	U	0.975	1.95
		Vanadium	32.1		0.0885	0.487
		Zinc	76.4		0.164	0.487
	16	Aluminum	15900		0.785	9.9
		Antimony	0.858	J	0.34	0.99
		Arsenic	3.26		0.204	0.495
		Barium	143		0.066	0.495
		Beryllium	0.704		0.0495	0.495
		Cadmium	0.108	J	0.0473	0.495
		Calcium	8220	B	1.29	9.9
		Chromium	12.7		0.16	0.495
		Cobalt	7.74		0.079	0.495
		Copper	13.5		0.201	0.495
		Iron	22800		1.55	9.9
		Lead	13.7		0.281	0.495
		Magnesium	6070		1.16	19.8
		Manganese	444		0.13	0.99

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	16	Mercury	0.0163		0.000957	0.00974
		Nickel	10.5		0.0846	0.495
		Potassium	4060		7.08	19.8
		Selenium	0.501	J	0.321	0.99
		Silver	0.0893	U	0.0893	0.495
		Sodium	76.3		3.6	9.9
		Thallium	0.99	U	0.99	1.98
		Vanadium	38.7		0.0899	0.495
		Zinc	61.4	B	0.167	0.495
	19	Aluminum	10100	B	0.787	9.92
		Antimony	0.841	BJ	0.341	0.992
		Arsenic	2.7		0.205	0.496
		Barium	86.5		0.0662	0.496
		Beryllium	0.509		0.0496	0.496
		Cadmium	0.0474	U	0.0474	0.496
		Calcium	3590		1.29	9.92
		Chromium	17.1		0.16	0.496
		Cobalt	5.36		0.0792	0.496
		Copper	13.9		0.201	0.496
		Iron	13100	B	1.55	9.92
		Lead	16.3		0.281	0.496
		Magnesium	4000		0.58	9.92
		Manganese	290		0.13	0.992
		Mercury	0.0117		0.000972	0.00988
		Nickel	13.2		0.0847	0.496
		Potassium	2500		3.55	9.92
		Selenium	1.79		0.161	0.496
		Silver	0.0895	U	0.0895	0.496
		Sodium	65.1		3.6	9.92
		Thallium	3.32		0.992	1.98
		Vanadium	24.3		0.0901	0.496
		Zinc	38.8		0.167	0.496
	58	Aluminum	12900		0.778	9.8
		Antimony	0.741	BJ	0.337	0.98
		Arsenic	3.39		0.202	0.49
		Barium	278		0.0654	0.49
		Beryllium	0.556		0.049	0.49
		Cadmium	0.522		0.0469	0.49
		Calcium	33200		1.28	9.8
		Chromium	11.9		0.158	0.49
		Cobalt	4.58		0.0782	0.49
		Copper	13.2		0.199	0.49
		Iron	14800		1.54	9.8

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	58	Lead	19.7		0.278	0.49
		Magnesium	4680		0.573	9.8
		Manganese	247		0.128	0.98
		Mercury	0.0168		0.000909	0.00924
		Nickel	9.03	B	0.0837	0.49
		Potassium	2810	B	3.51	9.8
		Selenium	0.215	J	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	86.5		3.56	9.8
		Thallium	0.98	U	0.98	1.96
		Vanadium	31.3		0.089	0.49
		Zinc	74.5		0.165	0.49
	59	Aluminum	7780		0.79	9.96
		Antimony	0.342	U	0.342	0.996
		Arsenic	2.97		0.206	0.498
		Barium	215		0.0664	0.498
		Beryllium	0.356	J	0.0498	0.498
		Cadmium	0.228	J	0.0476	0.498
		Calcium	36600		1.3	9.96
		Chromium	11.5		0.16	0.498
		Cobalt	3.13		0.0795	0.498
		Copper	8.08		0.202	0.498
		Iron	9370		1.56	9.96
		Lead	20.1		0.283	0.498
		Magnesium	3290		0.582	9.96
		Manganese	149		0.13	0.996
		Mercury	0.00466	J	0.000954	0.00971
		Nickel	5.87		0.0851	0.498
		Potassium	1720		3.56	9.96
		Selenium	0.161	U	0.161	0.498
		Silver	0.16	J	0.0898	0.498
		Sodium	68.8	B	3.62	9.96
		Thallium	0.996	U	0.996	1.99
		Vanadium	23.7		0.0904	0.498
		Zinc	32		0.168	0.498

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	60	Aluminum	13500		0.792	9.98
		Antimony	0.727	BJ	0.343	0.998
		Arsenic	3.03		0.206	0.499
		Barium	135		0.0666	0.499
		Beryllium	0.598		0.0499	0.499
		Cadmium	0.19	J	0.0477	0.499
		Calcium	25800		1.3	9.98
		Chromium	13.6		0.161	0.499
		Cobalt	5.22		0.0796	0.499
		Copper	10.8		0.203	0.499
		Iron	15300		1.56	9.98
		Lead	8.65		0.566	0.998
		Magnesium	4710		1.17	20
		Manganese	327		0.131	0.998
		Mercury	0.0096	J	0.000968	0.00985
		Nickel	10.3	B	0.0852	0.499
		Potassium	3800	B	7.14	20
		Selenium	0.832		0.162	0.499
		Silver	0.09	U	0.09	0.499
		Sodium	70.1		3.62	9.98
		Thallium	0.998	U	0.998	2
		Vanadium	30.3		0.0906	0.499
		Zinc	40.1		0.168	0.499
	61	Aluminum	7900		0.779	9.82
		Antimony	0.716	J	0.337	0.982
		Arsenic	3.74		0.203	0.491
		Barium	175		0.0655	0.491
		Beryllium	0.354	J	0.0491	0.491
		Cadmium	0.147	J	0.047	0.491
		Calcium	37800	B	1.28	9.82
		Chromium	7.39		0.158	0.491
		Cobalt	2.81		0.0784	0.491
		Copper	7.56		0.199	0.491
		Iron	8420		1.54	9.82
		Lead	8.55		0.279	0.491
		Magnesium	3370		0.574	9.82
		Manganese	145		0.128	0.982
		Mercury	0.0121		0.000968	0.00985
		Nickel	5.51		0.0839	0.491
		Potassium	1570		3.51	9.82
		Selenium	0.425	J	0.159	0.491
		Silver	0.0886	U	0.0886	0.491

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	61	Sodium	142		3.57	9.82
		Thallium	0.982	U	0.982	1.96
		Vanadium	23		0.0892	0.491
		Zinc	26.1	B	0.165	0.491
	63	Aluminum	13400	B	0.793	10
		Antimony	0.624	J	0.343	1
		Arsenic	2.86		0.206	0.5
		Barium	142		0.0667	0.5
		Beryllium	0.661		0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	21900	B	1.3	10
		Chromium	14		0.161	0.5
		Cobalt	4.88		0.0798	0.5
		Copper	9.75		0.203	0.5
		Iron	13000	B	1.57	10
		Lead	11.6		0.284	0.5
		Magnesium	3750		0.585	10
		Manganese	307		0.131	1
		Mercury	0.00907	J	0.000936	0.00952
		Nickel	10		0.0854	0.5
		Potassium	2920		3.58	10
		Selenium	0.162	BU	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	83.3		3.63	10
		Thallium	2.46		1	2
		Vanadium	26.7		0.0908	0.5
		Zinc	38.1		0.168	0.5
	64	Aluminum	15000	B	0.787	9.92
		Antimony	0.943	J	0.341	0.992
		Arsenic	3.35		0.205	0.496
		Barium	124		0.0662	0.496
		Beryllium	0.832		0.0496	0.496
		Cadmium	0.0474	U	0.0474	0.496
		Calcium	15400	B	1.29	9.92
		Chromium	11.4		0.16	0.496
		Cobalt	8.38		0.0792	0.496
		Copper	16.2		0.201	0.496
		Iron	23400	B	1.55	9.92
		Lead	18.5		0.281	0.496
		Magnesium	7830		0.58	9.92
		Manganese	620		0.13	0.992
		Mercury	0.0163		0.00098	0.00997
		Nickel	10.1		0.0847	0.496

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	64	Potassium	4410		3.55	9.92
		Selenium	1.69	B	0.161	0.496
		Silver	0.0895	U	0.0895	0.496
		Sodium	98.4		3.6	9.92
		Thallium	5.64		0.992	1.98
		Vanadium	41.1		0.0901	0.496
		Zinc	81.6		0.167	0.496
	65E	Aluminum	23300		3.94	49.7
		Antimony	0.954	BJ	0.341	0.994
		Arsenic	4.99		0.205	0.497
		Barium	245		0.0663	0.497
		Beryllium	1.06		0.0497	0.497
		Cadmium	0.367	J	0.0475	0.497
		Calcium	40500		1.3	9.94
		Chromium	18.2		0.16	0.497
		Cobalt	10.6		0.397	2.49
		Copper	23		0.202	0.497
		Iron	29900		1.56	9.94
		Lead	20.7		1.41	2.49
		Magnesium	10300		2.91	49.7
		Manganese	720		0.13	0.994
		Mercury	0.0192		0.000944	0.0096
		Nickel	17.2	B	0.0849	0.497
		Potassium	5970	B	17.8	49.7
		Selenium	0.717		0.161	0.497
		Silver	0.0897	U	0.0897	0.497
		Sodium	132		3.61	9.94
		Thallium	4.97	U	4.97	9.94
		Vanadium	53.8		0.451	2.49
		Zinc	97.5		0.167	0.497
	80	Aluminum	14200	B	0.782	9.86
		Antimony	0.339	U	0.339	0.986
		Arsenic	4.7		0.204	0.493
		Barium	149		0.0658	0.493
		Beryllium	0.67		0.0493	0.493
		Cadmium	0.121	J	0.0471	0.493
		Calcium	70100	B	1.29	9.86
		Chromium	17		0.159	0.493
		Cobalt	4.92		0.0787	0.493
		Copper	11.6		0.2	0.493
		Iron	13300	B	1.55	9.86
		Lead	11.8		0.28	0.493

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	80	Magnesium	5030		0.577	9.86
		Manganese	313		0.129	0.986
		Mercury	0.0178		0.000975	0.00992
		Nickel	12.4		0.0842	0.493
		Potassium	3720		3.53	9.86
		Selenium	7.99	BU	7.99	24.7
		Silver	0.177	J	0.089	0.493
		Sodium	69.8		3.58	9.86
		Thallium	0.986	U	0.986	1.97
		Vanadium	27.3		0.0895	0.493
		Zinc	44.9		0.166	0.493
	81	Aluminum	10400	B	0.776	9.78
		Antimony	0.762	BJ	0.336	0.978
		Arsenic	2.4		0.202	0.489
		Barium	72.1		0.0653	0.489
		Beryllium	0.557		0.0489	0.489
		Cadmium	0.0468	U	0.0468	0.489
		Calcium	1610		1.28	9.78
		Chromium	9.8		0.158	0.489
		Cobalt	3.2		0.0781	0.489
		Copper	7.77		0.199	0.489
		Iron	10300	B	1.53	9.78
		Lead	11.2		0.278	0.489
		Magnesium	2510		0.572	9.78
		Manganese	200		0.128	0.978
		Mercury	0.00797	J	0.000913	0.00929
		Nickel	6.93		0.0836	0.489
		Potassium	2740		3.5	9.78
		Selenium	1.18		0.159	0.489
		Silver	0.0883	U	0.0883	0.489
		Sodium	47.4		3.55	9.78
		Thallium	2.58		0.978	1.96
		Vanadium	18.5		0.0888	0.489
		Zinc	28.4		0.165	0.489
	82	Aluminum	10300	B	0.79	9.96
		Antimony	0.52	BJ	0.342	0.996
		Arsenic	3.92		0.206	0.498
		Barium	139		0.0664	0.498
		Beryllium	0.556		0.0498	0.498
		Cadmium	0.0476	U	0.0476	0.498
		Calcium	39200		1.3	9.96
		Chromium	8.88		0.16	0.498
		Cobalt	4.19		0.0795	0.498

See notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Soil (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (concluded)	82	Copper	10.1		0.202	0.498
		Iron	11800	B	1.56	9.96
		Lead	7.69		0.283	0.498
		Magnesium	3970		0.582	9.96
		Manganese	178		0.13	0.996
		Mercury	0.00952		0.00092	0.00936
		Nickel	7.29		0.0851	0.498
		Potassium	2600		3.56	9.96
		Selenium	3.23	U	3.23	9.96
		Silver	0.336	J	0.0898	0.498
		Sodium	67.5		3.62	9.96
		Thallium	3.48		0.996	1.99
		Vanadium	28.3		0.0904	0.498
		Zinc	34.6		0.168	0.498

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 2004, Soil

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site	1	Aluminum	12900	B	0.793	10
		Antimony	1.07	B	0.343	1
		Arsenic	2.86		0.206	0.5
		Barium	142		0.0667	0.5
		Beryllium	0.702		0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	26100		1.3	10
		Chromium	12.3		0.161	0.5
		Cobalt	5.62		0.0798	0.5
		Copper	12.2		0.203	0.5
		Iron	16400	B	1.57	10
		Lead	11.6		0.284	0.5
		Magnesium	5030		0.585	10
		Manganese	365		0.131	1
		Mercury	0.00913	J	0.000948	0.00965
		Nickel	10.1		0.0854	0.5
		Potassium	5030		3.58	10
		Selenium	0.162	U	0.162	0.5
		Silver	0.104	J	0.0902	0.5
		Sodium	70.2		3.63	10
		Thallium	5.45		1	2
		Vanadium	30.1		0.0908	0.5
		Zinc	48.5		0.168	0.5
	2NE	Aluminum	10300		0.788	9.94
		Antimony	0.607	J	0.341	0.994
		Arsenic	2.56		0.205	0.497
		Barium	76.2		0.0663	0.497
		Beryllium	0.429	J	0.0497	0.497
		Cadmium	0.21	J	0.0475	0.497
		Calcium	6090	B	1.3	9.94
		Chromium	9.62		0.16	0.497
		Cobalt	2.9		0.0793	0.497
		Copper	5.96		0.202	0.497
		Iron	10100		1.56	9.94
		Lead	8.55		0.282	0.497
		Magnesium	2410		0.581	9.94
		Manganese	151		0.13	0.994
		Mercury	0.0104		0.00097	0.0099
		Nickel	6.23		0.0849	0.497
		Potassium	1970		3.55	9.94
		Selenium	0.161	U	0.161	0.497

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)		Silver	0.0897	U	0.0897	0.497
		Sodium	45.3		3.61	9.94
		Thallium	0.994	U	0.994	1.99
		Vanadium	19.3		0.0903	0.497
		Zinc	26.2	B	0.167	0.497
	2NW	Aluminum	8730		0.792	9.98
		Antimony	0.605	J	0.343	0.998
		Arsenic	3.25		0.206	0.499
		Barium	66.2		0.0666	0.499
		Beryllium	0.361	J	0.0499	0.499
		Cadmium	0.0894	J	0.0477	0.499
		Calcium	4250	B	1.3	9.98
		Chromium	8.51		0.161	0.499
		Cobalt	2.61		0.0796	0.499
		Copper	5.21		0.203	0.499
		Iron	9260		1.56	9.98
		Lead	6.07		0.283	0.499
		Magnesium	2050		0.584	9.98
		Manganese	142		0.131	0.998
		Mercury	0.00097	U	0.000972	0.00988
		Nickel	5.49		0.0852	0.499
		Potassium	1910		3.57	9.98
		Selenium	0.299	BJ	0.162	0.499

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	2NW	Silver	0.09	U	0.09	0.499
		Sodium	41.1		3.62	9.98
		Thallium	0.998	U	0.998	2
		Vanadium	18.1		0.0906	0.499
		Zinc	23.6		0.168	0.499
	2SE	Aluminum	9860		0.782	9.86
		Antimony	0.339	U	0.339	0.986
		Arsenic	2.14		0.204	0.493
		Barium	75.6		0.0658	0.493
		Beryllium	0.404	J	0.0493	0.493
		Cadmium	0.246	J	0.0471	0.493
		Calcium	6470	B	1.29	9.86
		Chromium	8.83		0.159	0.493
		Cobalt	2.57		0.0787	0.493
		Copper	4.97		0.2	0.493
		Iron	9180		1.55	9.86
		Lead	6.23		0.28	0.493
		Magnesium	2350		0.577	9.86
		Manganese	139		0.129	0.986
		Mercury	0.00163	J	0.000975	0.00992
		Nickel	5.86		0.0842	0.493
		Potassium	2060		3.53	9.86
		Selenium	0.47	BJ	0.16	0.493
		Silver	0.089	U	0.089	0.493
		Sodium	46.8		3.58	9.86
		Thallium	0.986	U	0.986	1.97
		Vanadium	19		0.0895	0.493
		Zinc	25.4		0.166	0.493
	2SW	Aluminum	7420		0.785	9.9
		Antimony	0.415	J	0.34	0.99
		Arsenic	1.81		0.204	0.495
		Barium	62.9		0.066	0.495
		Beryllium	0.333	J	0.0495	0.495
		Cadmium	0.0752	J	0.0473	0.495
		Calcium	7650	B	1.29	9.9
		Chromium	9.64		0.16	0.495
		Cobalt	2.54		0.079	0.495
		Copper	5.53		0.201	0.495
		Iron	8430		1.55	9.9
		Lead	5.62		0.281	0.495
		Magnesium	1980		0.579	9.9
		Manganese	140		0.13	0.99
		Mercury	0.00097	U	0.000972	0.00988

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	2SW	Nickel	5.2		0.0846	0.495
		Potassium	1410		3.54	9.9
		Selenium	0.437	BJ	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	51.7		3.6	9.9
		Thallium	0.99	U	0.99	1.98
		Vanadium	16.7		0.0899	0.495
		Zinc	36.6		0.167	0.495
	3	Aluminum	12300	B	0.792	9.98
		Antimony	0.631	BJ	0.343	0.998
		Arsenic	2.74		0.206	0.499
		Barium	100		0.0666	0.499
		Beryllium	0.594		0.0499	0.499
		Cadmium	0.0477	U	0.0477	0.499
		Calcium	10400		1.3	9.98
		Chromium	11.4		0.161	0.499
		Cobalt	3.39		0.0796	0.499
		Copper	13.4		0.203	0.499
		Iron	11600	B	1.56	9.98
		Lead	13.5		0.283	0.499
		Magnesium	3430		0.584	9.98
		Manganese	192		0.131	0.998
		Mercury	0.0102		0.000954	0.00971
		Nickel	7.99		0.0852	0.499
		Potassium	3210		3.57	9.98
		Selenium	0.162	U	0.162	0.499
		Silver	0.09	U	0.09	0.499
		Sodium	56		3.62	9.98
		Thallium	2.81		0.998	2
		Vanadium	21.3		0.0906	0.499
		Zinc	36.1		0.168	0.499
	6	Aluminum	15400	B	0.781	9.84
		Antimony	0.965	BJ	0.338	0.984
		Arsenic	2.94		0.203	0.492
		Barium	87.5		0.0656	0.492
		Beryllium	0.705		0.0492	0.492
		Cadmium	0.047	U	0.047	0.492
		Calcium	3510		1.28	9.84
		Chromium	13.8		0.159	0.492
		Cobalt	5.46		0.0785	0.492
		Copper	51.5		0.2	0.492
		Iron	13100	B	1.54	9.84
		Lead	11.9		0.279	0.492

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	6	Magnesium	3130		0.576	9.84
		Manganese	177		0.129	0.984
		Mercury	0.00855	J	0.000976	0.00993
		Nickel	16.3		0.0841	0.492
		Potassium	3210		3.52	9.84
		Selenium	1.17		0.16	0.492
		Silver	0.425	J	0.0888	0.492
		Sodium	46.3		3.57	9.84
		Thallium	3.35		0.984	1.97
		Vanadium	24.5		0.0894	0.492
		Zinc	41.3		0.166	0.492
	7	Aluminum	9870		0.787	9.92
		Antimony	0.341	U	0.341	0.992
		Arsenic	3.77		0.205	0.496
		Barium	70.5		0.0662	0.496
		Beryllium	0.477	J	0.0496	0.496
		Cadmium	0.0921	J	0.0474	0.496
		Calcium	2930	B	1.29	9.92
		Chromium	10.3		0.16	0.496
		Cobalt	3.41		0.0792	0.496
		Copper	8.33		0.201	0.496
		Iron	11100		1.55	9.92
		Lead	9.63		0.281	0.496
		Magnesium	2530		0.58	9.92
		Manganese	200		0.13	0.992
		Mercury	0.012		0.000942	0.00958
		Nickel	7.16		0.0847	0.496
		Potassium	2120		3.55	9.92
		Selenium	0.331	J	0.161	0.496
		Silver	0.0895	U	0.0895	0.496
		Sodium	58.2		3.6	9.92
		Thallium	0.992	U	0.992	1.98
		Vanadium	20		0.0901	0.496
		Zinc	28	B	0.167	0.496
	20	Aluminum	7710		0.793	10
		Antimony	4040	B	0.343	1
		Antimony* (mg/L)	1.59		0.0354	0.100
		Arsenic	1060		0.206	0.5
		Barium	93.9		0.0667	0.5
		Beryllium	0.362	J	0.05	0.5
		Cadmium	4.92		0.0478	0.5
		Calcium	14500		1.3	10
		Chromium	9.68		0.161	0.5

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	20	Cobalt	3.73		0.0798	0.5
		Copper	16.5		0.203	0.5
		Iron	10200		1.57	10
		Lead	94000		28.4	50
		Lead* (mg/L)	72.6	B	0.0266	0.050
		Magnesium	3240		0.585	10
		Manganese	229		0.131	1
		Mercury	0.0132		0.000959	0.00976
		Nickel	8.95	B	0.0854	0.5
		Potassium	2010	B	3.58	10
		Selenium	0.162	U	0.162	0.5
		Silver	2.44		0.0902	0.5
		Sodium	46.6		3.63	10
		Thallium	1	U	1	2
		Vanadium	18.5		0.0908	0.5
		Zinc	33.8		0.168	0.5
	32S	Aluminum	9600		0.79	9.96
		Antimony	0.478	BJ	0.342	0.996
		Arsenic	2.81		0.206	0.498
		Barium	150		0.0664	0.498
		Beryllium	0.434	J	0.0498	0.498
		Cadmium	0.577		0.0476	0.498
		Calcium	34700		1.3	9.96
		Chromium	9.19		0.16	0.498
		Cobalt	5.81		0.0795	0.498
		Copper	10.5		0.202	0.498
		Iron	14000		1.56	9.96
		Lead	7.88		0.283	0.498
		Magnesium	3660		0.582	9.96
		Manganese	210		0.13	0.996
		Mercury	0.0114		0.000957	0.00974
		Nickel	10.4	B	0.0851	0.498
		Potassium	2050	B	3.56	9.96
		Selenium	0.161	U	0.161	0.498
		Silver	0.0898	U	0.0898	0.498
		Sodium	77.5		3.62	9.96
		Thallium	0.996	U	0.996	1.99
		Vanadium	29.3		0.0904	0.498
		Zinc	49.9		0.168	0.498

See notes at end of table

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	33	Aluminum	11800		0.787	9.92
		Antimony	0.796	J	0.341	0.992
		Arsenic	17.5		0.205	0.496
		Barium	134		0.0662	0.496
		Beryllium	1.59		0.0496	0.496
		Cadmium	0.238	J	0.0474	0.496
		Calcium	44500	B	1.29	9.92
		Chromium	13.7		0.16	0.496
		Cobalt	6.64		0.0792	0.496
		Copper	10.3		0.201	0.496
		Iron	15900		1.55	9.92
		Lead	11.8		0.281	0.496
		Magnesium	5270		0.58	9.92
		Manganese	401		0.13	0.992
		Mercury	0.0194		0.000941	0.00957
		Nickel	14.2		0.0847	0.496
		Potassium	2970		3.55	9.92
		Selenium	0.161	U	0.161	0.496
		Silver	0.0895	U	0.0895	0.496
		Sodium	355		3.6	9.92
		Thallium	0.992	U	0.992	1.98
		Vanadium	30.7		0.0901	0.496
		Zinc	51.3	B	0.167	0.496
	34	Aluminum	17700		0.782	9.86
		Antimony	0.817	J	0.339	0.986
		Arsenic	6.33		0.204	0.493
		Barium	194		0.0658	0.493
		Beryllium	0.807		0.0493	0.493
		Cadmium	0.112	J	0.0471	0.493
		Calcium	14500	B	1.29	9.86
		Chromium	16.7		0.159	0.493
		Cobalt	5.86		0.0787	0.493
		Copper	10.4		0.2	0.493
		Iron	17000		1.55	9.86
		Lead	10.5		0.28	0.493
		Magnesium	4370		1.15	19.7
		Manganese	298		0.129	0.986
		Mercury	0.0134		0.000945	0.00962
		Nickel	13.9		0.0842	0.493
		Potassium	3820		7.05	19.7
		Selenium	0.561	J	0.32	0.986
		Silver	0.089	U	0.089	0.493
		Sodium	62.9		3.58	9.86

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	34	Thallium	0.986	U	0.986	1.97
		Vanadium	31.4		0.0895	0.493
		Zinc	43.2	B	0.166	0.493
	35	Aluminum	8990	B	0.792	9.98
		Antimony	0.516	BJ	0.343	0.998
		Arsenic	2.4		0.206	0.499
		Barium	63.3		0.0666	0.499
		Beryllium	0.463	J	0.0499	0.499
		Cadmium	0.0477	U	0.0477	0.499
		Calcium	2050		1.3	9.98
		Chromium	9.12		0.161	0.499
		Cobalt	2.66		0.0796	0.499
		Copper	6.21		0.203	0.499
		Iron	9400	B	1.56	9.98
		Lead	9.1		0.283	0.499
		Magnesium	2230		0.584	9.98
		Manganese	166		0.131	0.998
		Mercury	0.0098		0.00093	0.00946
		Nickel	5.86		0.0852	0.499
		Potassium	2300		3.57	9.98
		Selenium	1.08		0.162	0.499
		Silver	0.09	U	0.09	0.499
		Sodium	42.7		3.62	9.98
		Thallium	2.16		0.998	2
		Vanadium	16.7		0.0906	0.499
		Zinc	25.6		0.168	0.499
	41	Aluminum	9970	B	0.793	10
		Antimony	0.343	BU	0.343	1
		Arsenic	1.88		0.206	0.5
		Barium	71.1		0.0667	0.5
		Beryllium	0.558		0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	9590		1.3	10
		Chromium	9.63		0.161	0.5
		Cobalt	3		0.0798	0.5
		Copper	7.33		0.203	0.5
		Iron	9980	B	1.57	10
		Lead	10.8		0.284	0.5
		Magnesium	2770		0.585	10
		Manganese	161		0.131	1
		Mercury	0.00591	J	0.000927	0.00943

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	41	Nickel	6.76		0.0854	0.5
		Potassium	3060		3.58	10
		Selenium	0.162	U	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	40.3		3.63	10
		Thallium	2.37		1	2
		Vanadium	18.6		0.0908	0.5
		Zinc	36.3		0.168	0.5
	42	Aluminum	9170	B	0.792	9.98
		Antimony	0.465	BJ	0.343	0.998
		Arsenic	2.29		0.206	0.499
		Barium	74.8		0.0666	0.499
		Beryllium	0.584		0.0499	0.499
		Cadmium	0.0477	U	0.0477	0.499
		Calcium	27600		1.3	9.98
		Chromium	8.97		0.161	0.499
		Cobalt	3.2		0.0796	0.499
		Copper	7.83		0.203	0.499
		Iron	9990	B	1.56	9.98
		Lead	6.61		0.283	0.499
		Magnesium	3050		0.584	9.98
		Manganese	157		0.131	0.998
		Mercury	0.00565	J	0.000981	0.00998
		Nickel	7.18		0.0852	0.499
		Potassium	2800		3.57	9.98
		Selenium	6.47	U	6.47	20
		Silver	0.09	U	0.09	0.499
		Sodium	43.5		3.62	9.98
		Thallium	3.1		0.998	2
		Vanadium	18.9		0.0906	0.499
		Zinc	24.4		0.168	0.499
	43	Aluminum	9610	B	0.787	9.92
		Antimony	0.55	BJ	0.341	0.992
		Arsenic	2.38		0.205	0.496
		Barium	64.7		0.0662	0.496
		Beryllium	0.504		0.0496	0.496
		Cadmium	0.0474	U	0.0474	0.496
		Calcium	9510		1.29	9.92
		Chromium	9.3		0.16	0.496
		Cobalt	2.86		0.0792	0.496
		Copper	6.36		0.201	0.496
		Iron	9850	B	1.55	9.92
		Lead	6.03		0.281	0.496

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	43	Magnesium	2490		0.58	9.92
		Manganese	130		0.13	0.992
		Mercury	0.00332	J	0.000975	0.00992
		Nickel	6.33		0.0847	0.496
		Potassium	2580		3.55	9.92
		Selenium	0.161	U	0.161	0.496
		Silver	0.0895	U	0.0895	0.496
		Sodium	34.9		3.6	9.92
		Thallium	2.97		0.992	1.98
		Vanadium	20.4		0.0901	0.496
		Zinc	23.2		0.167	0.496
	45	Aluminum	12700		0.792	9.98
		Antimony	0.343	U	0.343	0.998
		Arsenic	5.07		0.206	0.499
		Barium	85.4		0.0666	0.499
		Beryllium	0.512		0.0499	0.499
		Cadmium	0.14	J	0.0477	0.499
		Calcium	7940	B	1.3	9.98
		Chromium	11.3		0.161	0.499
		Cobalt	3.03		0.0796	0.499
		Copper	7.81		0.203	0.499
		Iron	11200		1.56	9.98
		Lead	10.2		0.283	0.499
		Magnesium	3450		0.584	9.98
		Manganese	165		0.131	0.998
		Mercury	0.0651		0.00091	0.00926
		Nickel	7.27		0.0852	0.499
		Potassium	2470		3.57	9.98
		Selenium	0.377		0.162	0.499
		Silver	0.09	U	0.09	0.499
		Sodium	49.3		3.62	9.98
		Thallium	0.998	U	0.998	2
		Vanadium	21.6		0.0906	0.499
		Zinc	32.6	B	0.168	0.499
	46	Aluminum	9010		0.781	9.84
		Antimony	0.338	U	0.338	0.984
		Arsenic	2.54		0.203	0.492
		Barium	99.5		0.0656	0.492
		Beryllium	0.411	J	0.0492	0.492
		Cadmium	0.23	J	0.047	0.492
		Calcium	18500		1.28	9.84
		Chromium	8.97		0.159	0.492
		Cobalt	4.73		0.0785	0.492

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	46	Copper	8.33		0.2	0.492
		Iron	12200		1.54	9.84
		Lead	11.7		0.279	0.492
		Magnesium	3380		0.576	9.84
		Manganese	216		0.129	0.984
		Mercury	0.00702	J	0.000948	0.00965
		Nickel	7.16		0.0841	0.492
		Potassium	2600		3.52	9.84
		Selenium	0.16	U	0.16	0.492
		Silver	0.0888	U	0.0888	0.492
		Sodium	63.7	B	3.57	9.84
		Thallium	0.984	U	0.984	1.97
		Vanadium	23.7		0.0894	0.492
		Zinc	46.2		0.166	0.492
	49	Aluminum	9640		0.793	10
		Antimony	0.701	J	0.343	1
		Arsenic	2.77		0.206	0.5
		Barium	87		0.0667	0.5
		Beryllium	0.447	J	0.05	0.5
		Cadmium	0.141	J	0.0478	0.5
		Calcium	11800		1.3	10
		Chromium	9.87		0.161	0.5
		Cobalt	4.23		0.0798	0.5
		Copper	7.64		0.203	0.5
		Iron	12300		1.57	10
		Lead	8.1		0.284	0.5
		Magnesium	3270		0.585	10
		Manganese	224		0.131	1
		Mercury	0.0211		0.00098	0.00997
		Nickel	7.53		0.0854	0.5
		Potassium	2450		3.58	10
		Selenium	0.162	U	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	61.9	B	3.63	10
		Thallium	1	U	1	2
		Vanadium	23.6		0.0908	0.5
		Zinc	29.6		0.168	0.5
	51	Aluminum	13800	B	0.775	9.77
		Antimony	0.392	BJ	0.335	0.977
		Arsenic	3.14		0.202	0.488
		Barium	128		0.0651	0.488
		Beryllium	0.764		0.0488	0.488
		Cadmium	0.0467	U	0.0467	0.488

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	51	Calcium	26100		1.27	9.77
		Chromium	29.2		0.157	0.488
		Cobalt	3.88		0.0779	0.488
		Copper	11.6		0.198	0.488
		Iron	12100	B	1.53	9.77
		Lead	10.5		0.277	0.488
		Magnesium	3900		0.571	9.77
		Manganese	152		0.128	0.977
		Mercury	0.013		0.000975	0.00992
		Nickel	9.5		0.0834	0.488
		Potassium	3400		3.49	9.77
		Selenium	3.17	U	3.17	9.77
		Silver	0.132	J	0.0881	0.488
		Sodium	54.3		3.55	9.77
		Thallium	2.62		0.977	1.95
		Vanadium	24.1		0.0887	0.488
		Zinc	58.4		0.164	0.488
	52	Aluminum	9060		0.79	9.96
		Antimony	0.782	J	0.342	0.996
		Arsenic	2.67		0.206	0.498
		Barium	85.5		0.0664	0.498
		Beryllium	0.412	J	0.0498	0.498
		Cadmium	0.0519	J	0.0476	0.498
		Calcium	18500	B	1.3	9.96
		Chromium	8.82		0.16	0.498
		Cobalt	2.91		0.0795	0.498
		Copper	5.22		0.202	0.498
		Iron	9340		1.56	9.96
		Lead	5.72		0.283	0.498
		Magnesium	2740		0.582	9.96
		Manganese	141		0.13	0.996
		Mercury	0.00113	J	0.000962	0.00979
		Nickel	6.19		0.0851	0.498
		Potassium	1720		3.56	9.96
		Selenium	0.209	BJ	0.161	0.498
		Silver	0.376	J	0.0898	0.498
		Sodium	61.2		3.62	9.96
		Thallium	0.996	U	0.996	1.99
		Vanadium	20.2		0.0904	0.498
		Zinc	26.9		0.168	0.498

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	53	Aluminum	8080		0.785	9.9
		Antimony	0.34	U	0.34	0.99
		Arsenic	1.51		0.204	0.495
		Barium	54.5		0.066	0.495
		Beryllium	0.327	J	0.0495	0.495
		Cadmium	0.0949	J	0.0473	0.495
		Calcium	1170	B	1.29	9.9
		Chromium	7.97		0.16	0.495
		Cobalt	2.45		0.079	0.495
		Copper	4.39		0.201	0.495
		Iron	8300		1.55	9.9
		Lead	7.45		0.281	0.495
		Magnesium	1700		0.579	9.9
		Manganese	151		0.13	0.99
		Mercury	0.00154	J	0.000968	0.00985
		Nickel	4.74		0.0846	0.495
		Potassium	1750		3.54	9.9
		Selenium	0.16	BU	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	38.9		3.6	9.9
		Thallium	0.99	U	0.99	1.98
		Vanadium	16.1		0.0899	0.495
		Zinc	20.4		0.167	0.495
	54	Aluminum	12600	B	0.782	9.86
		Antimony	0.525	BJ	0.339	0.986
		Arsenic	3.16		0.204	0.493
		Barium	111		0.0658	0.493
		Beryllium	0.579		0.0493	0.493
		Cadmium	0.337	J	0.0471	0.493
		Calcium	27200		1.29	9.86
		Chromium	10.2		0.159	0.493
		Cobalt	3.37		0.0787	0.493
		Copper	7.9		0.2	0.493
		Iron	10700	B	1.55	9.86
		Lead	6.56		0.28	0.493
		Magnesium	3310		0.577	9.86
		Manganese	139		0.129	0.986
		Mercury	0.0153		0.000932	0.00948
		Nickel	9.1		0.0842	0.493
		Potassium	2920		3.53	9.86
		Selenium	1.6	U	1.6	4.93
		Silver	0.101	J	0.089	0.493
		Sodium	48.1		3.58	9.86

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	54	Thallium	2.48		0.986	1.97
		Vanadium	23.5		0.0895	0.493
		Zinc	26		0.166	0.493
	55	Aluminum	10500	B	0.787	9.92
		Antimony	0.715	BJ	0.341	0.992
		Arsenic	2.59		0.205	0.496
		Barium	82.2		0.0662	0.496
		Beryllium	0.537		0.0496	0.496
		Cadmium	0.0474	U	0.0474	0.496
		Calcium	7270		1.29	9.92
		Chromium	9.74		0.16	0.496
		Cobalt	3.02		0.0792	0.496
		Copper	7.06		0.201	0.496
		Iron	10400	B	1.55	9.92
		Lead	9.78		0.281	0.496
		Magnesium	3270		0.58	9.92
		Manganese	191		0.13	0.992
		Mercury	0.00811	J	0.000945	0.00962
		Nickel	6.92		0.0847	0.496
		Potassium	3040		3.55	9.92
		Selenium	0.813		0.161	0.496
		Silver	0.0895	U	0.0895	0.496
		Sodium	57.2		3.6	9.92
		Thallium	2.55		0.992	1.98
		Vanadium	19		0.0901	0.496
		Zinc	30.3		0.167	0.496
	56	Aluminum	7650	B	15.9	200
		Antimony	6.87	U	6.87	20
		Arsenic	4.13	U	4.13	10
		Barium	91.4		0.0667	0.5
		Beryllium	0.506		0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	129000	B	26.1	200
		Chromium	6.63		0.161	0.5
		Cobalt	3.99		0.0798	0.5
		Copper	13.6		0.203	0.5
		Iron	9240	B	1.57	10
		Lead	12.8		5.67	10
		Magnesium	3960		11.7	200
		Manganese	186		0.131	1
		Mercury	0.00502	J	0.00093	0.00946
		Nickel	7.41		0.0854	0.5
		Potassium	1480		3.58	10
		Selenium	8.11	BU	8.11	25
		Silver	1.8	U	1.8	10
		Sodium	88.4	J	72.6	200
		Thallium	20	U	20	40
		Vanadium	23.3		0.0908	0.5
		Zinc	37.9		0.168	0.5
	57	Aluminum	9290		0.785	9.9
		Antimony	0.34	BU	0.34	0.99
		Arsenic	3.61		0.204	0.495
		Barium	196		0.132	0.99
		Beryllium	0.421	J	0.0495	0.495
		Cadmium	0.216	J	0.0473	0.495
		Calcium	57000		2.58	19.8
		Chromium	8.99		0.16	0.495
		Cobalt	4.16		0.079	0.495
		Copper	8.67		0.201	0.495
		Iron	13300		1.55	9.9
		Lead	7.15		0.562	0.99
		Magnesium	5150		1.16	19.8
		Manganese	224		0.13	0.99
		Mercury	0.00992		0.000919	0.00935
		Nickel	7.1	B	0.0846	0.495
		Potassium	1920	B	3.54	9.9

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	57	Selenium	0.382	J	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	97.6		7.19	19.8
		Thallium	0.99	U	0.99	1.98
		Vanadium	34.7		0.0899	0.495
		Zinc	111		0.167	0.495
	66	Aluminum	13000	B	0.77	9.71
		Antimony	0.613	BJ	0.333	0.971
		Arsenic	3.73		0.2	0.485
		Barium	119		0.0648	0.485
		Beryllium	0.806		0.0485	0.485
		Cadmium	0.0464	U	0.0464	0.485
		Calcium	28400		1.27	9.71
		Chromium	11.9		0.156	0.485
		Cobalt	4.45		0.0775	0.485
		Copper	10.5		0.197	0.485
		Iron	12400	B	1.52	9.71
		Lead	8.67		0.275	0.485
		Magnesium	4250		0.568	9.71
		Manganese	226		0.127	0.971
		Mercury	0.00823	J	0.000953	0.00969
		Nickel	9.77		0.0829	0.485
		Potassium	3390		3.47	9.71
		Selenium	3.15	U	3.15	9.71
		Silver	0.108	J	0.0876	0.485
		Sodium	70.1		3.53	9.71
		Thallium	2.52		0.971	1.94
		Vanadium	25.6		0.0882	0.485
		Zinc	33.5		0.163	0.485
	76	Aluminum	11800	B	0.787	9.92
		Antimony	0.756	BJ	0.341	0.992
		Arsenic	2.56		0.205	0.496
		Barium	69.8		0.0662	0.496
		Beryllium	0.596		0.0496	0.496
		Cadmium	0.0474	U	0.0474	0.496
		Calcium	2220		1.29	9.92
		Chromium	10.8		0.16	0.496
		Cobalt	3.77		0.0792	0.496
		Copper	8.26		0.201	0.496
		Iron	12100	B	1.55	9.92
		Lead	9.48		0.281	0.496
		Magnesium	2820		0.58	9.92
		Manganese	179		0.13	0.992

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2004, Soil (concluded) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (concluded)	78	Lead	8.17		0.283	0.498
		Magnesium	2670		0.582	9.96
		Manganese	198		0.13	0.996
		Mercury	0.00447	J	0.00093	0.00946
		Nickel	6.95		0.0851	0.498
		Potassium	2260		3.56	9.96
		Selenium	1.46		0.161	0.498
		Silver	0.0898	U	0.0898	0.498
		Sodium	45.1		3.62	9.96
		Thallium	2.59		0.996	1.99
		Vanadium	17.5		0.0904	0.498
		Zinc	26.1		0.168	0.498

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.
TCLP = Toxic Characteristic Leaching Procedure

TABLE C-7. Non-radiological Results for Off-site by Location for Calendar Year 2004, Vegetation
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site	8	Aluminum	214		0.781	9.84
		Antimony	0.512	J	0.338	0.984
		Arsenic	0.299	J	0.203	0.492
		Barium	15.5		0.0656	0.492
		Beryllium	0.0492	U	0.0492	0.492
		Cadmium	0.047	U	0.047	0.492
		Calcium	3760	B	1.28	9.84
		Chromium	1.18		0.159	0.492
		Cobalt	0.0848	J	0.0785	0.492
		Copper	3.83		0.2	0.492
		Iron	239		1.54	9.84
		Lead	0.279	U	0.279	0.492
		Magnesium	1140		2.88	49.2
		Manganese	61.6		0.129	0.984
		Mercury	0.00152	J	0.000975	0.00992
		Nickel	0.961		0.0841	0.492
		Potassium	7500		17.6	49.2
		Selenium	0.58		0.16	0.492
		Silver	0.0888	U	0.0888	0.492
		Sodium	514	B	17.9	49.2
		Thallium	0.984	U	0.984	1.97
		Vanadium	0.563	B	0.0894	0.492
		Zinc	20.8		0.166	0.492
	9	Aluminum	368		0.776	9.78
		Antimony	0.765	J	0.336	0.978
		Arsenic	0.426	J	0.202	0.489
		Barium	7.65		0.0653	0.489
		Beryllium	0.0489	U	0.0489	0.489
		Cadmium	0.169	J	0.0468	0.489
		Calcium	6080	B	1.28	9.78
		Chromium	0.538		0.158	0.489
		Cobalt	0.0781	U	0.0781	0.489
		Copper	2.59		0.199	0.489
		Iron	456		1.53	9.78
		Lead	0.335	J	0.278	0.489
		Magnesium	2100		2.86	48.9
		Manganese	64.2		0.128	0.978
		Mercury	0.00097	U	0.000968	0.00985
		Nickel	0.578		0.0836	0.489
		Potassium	7430		17.5	48.9
		Selenium	0.159	U	0.159	0.489

See notes at end of table.

TABLE C-7. Non-radiological Results for Off-site by Location for Calendar Year 2004, Vegetation (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site (continued)	9	Silver	0.0883	U	0.0883	0.489
		Sodium	2670	B	17.8	48.9
		Thallium	0.978	U	0.978	1.96
		Vanadium	1.06	B	0.0888	0.489
		Zinc	12		0.165	0.489
	11	Aluminum	20.9		0.792	9.98
		Antimony	0.343	U	0.343	0.998
		Arsenic	0.271	J	0.206	0.499
		Barium	3.61		0.0666	0.499
		Beryllium	0.0499	U	0.0499	0.499
		Cadmium	0.0477	U	0.0477	0.499
		Calcium	1130	B	1.3	9.98
		Chromium	0.416	J	0.161	0.499
		Cobalt	0.0796	U	0.0796	0.499
		Copper	2.41		0.203	0.499
		Iron	36.2		1.56	9.98
		Lead	0.283	U	0.283	0.499
		Magnesium	896		2.92	49.9
		Manganese	39.9		0.131	0.998
		Mercury	0.00098	U	0.000983	0.01
		Nickel	0.431	J	0.0852	0.499
		Potassium	6960		17.8	49.9
		Selenium	0.162	U	0.162	0.499
		Silver	0.09	U	0.09	0.499
		Sodium	174	B	3.62	9.98
		Thallium	0.998	U	0.998	2
		Vanadium	0.21	BJ	0.0906	0.499
		Zinc	9.61		0.168	0.499
	25	Aluminum	43		0.778	9.8
		Antimony	0.337	BU	0.337	0.98
		Arsenic	0.202	U	0.202	0.49
		Barium	2.47	B	0.0654	0.49
		Beryllium	0.049	U	0.049	0.49
		Cadmium	0.0469	U	0.0469	0.49
		Calcium	3070	B	1.28	9.8
		Chromium	0.429	BJ	0.158	0.49
		Cobalt	0.0782	U	0.0782	0.49
		Copper	1.44		0.199	0.49
		Iron	55.4		3.07	19.6
		Lead	0.278	U	0.278	0.49
		Magnesium	308	B	1.15	19.6

See notes at end of table.

TABLE C-7. Non-radiological Results for Off-site by Location for Calendar Year 2004, Vegetation (concluded) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site (concluded)	25	Manganese	25.4		0.128	0.98
		Mercury	0.0162	J	0.00584	0.0594
		Nickel	0.0837	U	0.0837	0.49
		Potassium	3940		7.01	19.6
		Selenium	0.318	U	0.318	0.98
		Silver	0.0884	U	0.0884	0.49
		Sodium	16		3.56	9.8
		Thallium	0.98	U	0.98	1.96
		Vanadium	0.089	U	0.089	0.49
		Zinc	7.28		0.165	0.49
	62	Aluminum	7.91	J	0.781	9.84
		Antimony	0.338	U	0.338	0.984
		Arsenic	0.203	U	0.203	0.492
		Barium	5.47		0.0656	0.492
		Beryllium	0.0492	U	0.0492	0.492
		Cadmium	0.047	U	0.047	0.492
		Calcium	3270	B	1.28	9.84
		Chromium	0.264	J	0.159	0.492
		Cobalt	0.0785	U	0.0785	0.492
		Copper	1.66		0.2	0.492
		Iron	16		1.54	9.84
		Lead	0.279	U	0.279	0.492
		Magnesium	642		2.88	49.2
		Manganese	4.59		0.129	0.984
		Mercury	0.00091	U	0.000905	0.0092
		Nickel	0.175	J	0.0841	0.492
		Potassium	3900		17.6	49.2
		Selenium	0.16	U	0.16	0.492
		Silver	0.0888	U	0.0888	0.492
		Sodium	23.3	B	3.57	9.84
		Thallium	0.984	U	0.984	1.97
		Vanadium	0.124	BJ	0.0894	0.492
		Zinc	3.36		0.166	0.492

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 Perimeter by Location for Calendar Year 2004, Vegetation

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter	4	Aluminum	181		0.79	9.96
		Antimony	0.397	BJ	0.342	0.996
		Arsenic	0.656		0.206	0.498
		Barium	10.3		0.0664	0.498
		Beryllium	0.0498	U	0.0498	0.498
		Cadmium	0.0482	J	0.0476	0.498
		Calcium	4230	B	1.3	9.96
		Chromium	0.358	J	0.16	0.498
		Cobalt	0.0795	U	0.0795	0.498
		Copper	5.75		0.202	0.498
		Iron	176		1.56	9.96
		Lead	0.283	U	0.283	0.498
		Magnesium	867		2.91	49.8
		Manganese	22.4		0.13	0.996
		Mercury	0.00472	U	0.00472	0.048
		Nickel	0.773	B	0.0851	0.498
		Potassium	11000		17.8	49.8
		Selenium	0.956		0.161	0.498
		Silver	0.0898	U	0.0898	0.498
		Sodium	19	B	3.62	9.96
		Thallium	0.996	U	0.996	1.99
		Vanadium	0.398	J	0.0904	0.498
		Zinc	13.3		0.168	0.498
	5	Aluminum	111		0.779	9.82
		Antimony	0.595	BJ	0.337	0.982
		Arsenic	0.334	J	0.203	0.491
		Barium	8.13		0.0655	0.491
		Beryllium	0.0491	U	0.0491	0.491
		Cadmium	0.0627	J	0.047	0.491
		Calcium	3510	B	1.28	9.82
		Chromium	0.341	J	0.158	0.491
		Cobalt	0.0995	J	0.0784	0.491
		Copper	4.87		0.199	0.491
		Iron	100		1.54	9.82
		Lead	0.279	U	0.279	0.491
		Magnesium	1430		2.87	49.1
		Manganese	25.6		0.128	0.982
		Mercury	0.00388	U	0.00388	0.0395
		Nickel	0.594	B	0.0839	0.491
		Potassium	9150		17.6	49.1
		Selenium	0.195	J	0.159	0.491
		Silver	0.0886	U	0.0886	0.491

See notes at end of table.

TABLE C-8. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Vegetation (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	60	Mercury	0.00097	U	0.000967	0.00984
		Nickel	0.405	J	0.0831	0.486
		Potassium	18400		34.8	97.3
		Selenium	0.158	U	0.158	0.486
		Silver	0.0877	U	0.0877	0.486
		Sodium	1280	B	35.3	97.3
		Thallium	0.973	U	0.973	1.95
		Vanadium	0.192	BJ	0.0883	0.486
		Zinc	5.82		0.164	0.486
	63	Aluminum	1.02	BJ	0.788	9.94
		Antimony	0.341	U	0.341	0.994
		Arsenic	1.03	U	1.03	2.49
		Barium	6.18		0.0663	0.497
		Beryllium	0.0497	U	0.0497	0.497
		Cadmium	0.0475	U	0.0475	0.497
		Calcium	4540	B	1.3	9.94
		Chromium	0.243	J	0.16	0.497
		Cobalt	0.0793	U	0.0793	0.497
		Copper	7.84		0.202	0.497
		Iron	24.3	B	1.56	9.94
		Lead	0.282	U	0.282	0.497
		Magnesium	641		0.581	9.94
		Manganese	40.1		0.13	0.994
		Mercury	0.0045	U	0.0045	0.0458
		Nickel	0.586		0.0849	0.497
		Potassium	7020		3.55	9.94
		Selenium	0.161	BU	0.161	0.497
		Silver	0.0897	U	0.0897	0.497
		Sodium	8.79	J	3.61	9.94
		Thallium	0.994	U	0.994	1.99
		Vanadium	0.0903	U	0.0903	0.497
		Zinc	36.9		0.167	0.497
	64	Aluminum	41.3	B	0.771	9.73
		Antimony	0.334	U	0.334	0.973
		Arsenic	0.201	U	0.201	0.486
		Barium	4.34		0.0649	0.486
		Beryllium	0.0486	U	0.0486	0.486
		Cadmium	0.0465	U	0.0465	0.486
		Calcium	3820	B	1.27	9.73
		Chromium	0.263	J	0.157	0.486
		Cobalt	0.0776	U	0.0776	0.486

See notes at end of table

TABLE C-8. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Vegetation (concluded) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (concluded)	64	Copper	2.61		0.197	0.486
		Iron	80.3	B	1.52	9.73
		Lead	0.276	U	0.276	0.486
		Magnesium	1150		0.569	9.73
		Manganese	14.4		0.127	0.973
		Mercury	0.00496	U	0.00496	0.0504
		Nickel	0.113	J	0.0831	0.486
		Potassium	11200		3.48	9.73
		Selenium	0.878	B	0.158	0.486
		Silver	0.0877	U	0.0877	0.486
		Sodium	5.04	J	3.53	9.73
		Thallium	0.973	U	0.973	1.95
		Vanadium	0.0883	U	0.0883	0.486
		Zinc	6.83		0.164	0.486
	82	Aluminum	180		1.86	2.95
		Antimony	0.0492	U	0.0492	0.394
		Arsenic	0.0886	U	0.0886	0.591
		Barium	5.25		0.0492	0.394
		Beryllium	0.0118	U	0.0118	0.0394
		Cadmium	0.024	J	0.00787	0.197
		Calcium	3200		7.87	19.7
		Chromium	0.854	B	0.0925	0.591
		Cobalt	0.0984	U	0.0984	0.197
		Copper	5.38		0.126	0.197
		Iron	179		1.4	4.92
		Lead	0.23	J	0.0374	0.394
		Magnesium	905		1.59	1.97
		Manganese	14.5		0.0433	0.984
		Mercury	0.00522	U	0.00522	0.0531
		Nickel	0.604		0.0256	0.394
		Potassium	9590		9.04	59.1
		Selenium	0.269	J	0.128	0.984
		Silver	0.00984	U	0.00984	0.197
		Sodium	20	J	3.88	49.2
		Thallium	0.0197	U	0.0197	0.0984
		Vanadium	0.734	U	0.734	1.97
		Zinc	17.2	B	0.12	1.97

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 On-Site by Location for Calendar Year 2004, Vegetation

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site	2NE	Aluminum	91.1		0.793	10
		Antimony	0.343	BU	0.343	1
		Arsenic	0.206	U	0.206	0.5
		Barium	6.78	B	0.0667	0.5
		Beryllium	0.05	U	0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	2820	B	1.3	10
		Chromium	0.257	BJ	0.161	0.5
		Cobalt	0.0798	U	0.0798	0.5
		Copper	2.55		0.203	0.5
		Iron	74.8		3.13	20
		Lead	0.284	U	0.284	0.5
		Magnesium	707	B	1.17	20
		Manganese	7.2		0.131	1
		Mercury	0.0067	J	0.00573	0.0583
		Nickel	0.277	J	0.0854	0.5
		Potassium	3660		7.15	20
		Selenium	0.67	J	0.324	1
		Silver	0.0902	U	0.0902	0.5
		Sodium	9.46	J	3.63	10
		Thallium	1	U	1	2
		Vanadium	0.0908	U	0.0908	0.5
		Zinc	12		0.168	0.5
	2NW	Aluminum	102		0.778	9.8
		Antimony	0.67	BJ	0.337	0.98
		Arsenic	0.336	J	0.202	0.49
		Barium	6.19		0.0654	0.49
		Beryllium	0.049	U	0.049	0.49
		Cadmium	0.0816	BJ	0.0469	0.49
		Calcium	2620		1.28	9.8
		Chromium	0.293	J	0.158	0.49
		Cobalt	0.0782	U	0.0782	0.49
		Copper	3.42		0.199	0.49
		Iron	80.5		1.54	9.8
		Lead	0.298	J	0.278	0.49
		Magnesium	1100		2.87	49
		Manganese	9.7		0.128	0.98
		Mercury	0.00131	BJ	0.000964	0.0098
		Nickel	0.603		0.0837	0.49
		Potassium	8640		17.5	49
		Selenium	0.693		0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	8.22	J	3.56	9.8
		Thallium	0.98	U	0.98	1.96
		Vanadium	0.176	J	0.089	0.49
		Zinc	4.7		0.165	0.49
	6	Aluminum	78.2		0.792	9.98
		Antimony	0.582	BJ	0.343	0.998
		Arsenic	0.457	J	0.206	0.499
		Barium	8.1		0.0666	0.499
		Beryllium	0.0499	U	0.0499	0.499
		Cadmium	0.0477	U	0.0477	0.499
		Calcium	2990	B	1.3	9.98
		Chromium	0.504		0.161	0.499
		Cobalt	0.118	J	0.0796	0.499
		Copper	3.03		0.203	0.499
		Iron	75.8		1.56	9.98
		Lead	0.531		0.283	0.499
		Magnesium	1190		2.92	49.9
		Manganese	11.2		0.131	0.998
		Mercury	0.00522	U	0.00522	0.0531
		Nickel	0.961	B	0.0852	0.499
		Potassium	7600		17.8	49.9
		Selenium	1.21		0.162	0.499

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2004, Vegetation (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	6	Silver	0.09	U	0.09	0.499
		Sodium	17.3	B	3.62	9.98
		Thallium	0.998	U	0.998	2
		Vanadium	0.21	J	0.0906	0.499
		Zinc	7.7		0.168	0.499
	20	Aluminum	181		0.785	9.9
		Antimony	0.34	U	0.34	0.99
		Arsenic	0.328	J	0.204	0.495
		Barium	9.27		0.066	0.495
		Beryllium	0.0495	U	0.0495	0.495
		Cadmium	0.174	J	0.0473	0.495
		Calcium	3420	B	1.29	9.9
		Chromium	0.354	J	0.16	0.495
		Cobalt	0.0885	J	0.079	0.495
		Copper	5.23		0.201	0.495
		Iron	218		1.55	9.9
		Lead	3.32		0.281	0.495
		Magnesium	770		2.9	49.5
		Manganese	16.4		0.13	0.99
		Mercury	0.00093	U	0.000929	0.00945
		Nickel	0.672		0.0846	0.495
		Potassium	7860		17.7	49.5
		Selenium	0.675		0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	20.4	B	3.6	9.9
		Thallium	0.99	U	0.99	1.98
		Vanadium	0.535	B	0.0899	0.495
		Zinc	6.25		0.167	0.495
	33	Aluminum	15.9		0.782	9.86
		Antimony	0.345	BJ	0.339	0.986
		Arsenic	0.204	U	0.204	0.493
		Barium	1.3	B	0.0658	0.493
		Beryllium	0.0493	U	0.0493	0.493
		Cadmium	0.0471	U	0.0471	0.493
		Calcium	594	B	1.29	9.86
		Chromium	0.278	BJ	0.159	0.493
		Cobalt	0.0787	U	0.0787	0.493
		Copper	0.869		0.2	0.493
		Iron	21.5		3.09	19.7
		Lead	0.28	U	0.28	0.493
		Magnesium	454	B	1.15	19.7

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2004, Vegetation (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	33	Manganese	8.94		0.129	0.986
		Mercury	0.00653	J	0.00531	0.0541
		Nickel	0.473	J	0.0842	0.493
		Potassium	4480		7.05	19.7
		Selenium	0.474	J	0.32	0.986
		Silver	0.089	U	0.089	0.493
		Sodium	1610		3.58	9.86
		Thallium	0.986	U	0.986	1.97
		Vanadium	0.0895	U	0.0895	0.493
		Zinc	5.46		0.166	0.493
	34	Aluminum	209		0.779	9.82
		Antimony	0.337	BU	0.337	0.982
		Arsenic	0.401	J	0.203	0.491
		Barium	21.3	B	0.0655	0.491
		Beryllium	0.0491	U	0.0491	0.491
		Cadmium	0.047	U	0.047	0.491
		Calcium	3990	B	1.28	9.82
		Chromium	0.389	BJ	0.158	0.491
		Cobalt	0.0784	U	0.0784	0.491
		Copper	2.31		0.199	0.491
		Iron	200		3.08	19.6
		Lead	0.279	U	0.279	0.491
		Magnesium	557	B	1.15	19.6
		Manganese	20.7		0.128	0.982
		Mercury	0.00431	J	0.00322	0.0328
		Nickel	0.321	J	0.0839	0.491
		Potassium	4820		7.03	19.6
		Selenium	0.873	J	0.318	0.982
		Silver	0.0886	U	0.0886	0.491
		Sodium	13.9		3.57	9.82
		Thallium	0.982	U	0.982	1.96
		Vanadium	0.303	J	0.0892	0.491
		Zinc	8.2		0.165	0.491
	35	Aluminum	235		0.788	9.94
		Antimony	0.731	BJ	0.341	0.994
		Arsenic	0.442	J	0.205	0.497
		Barium	11.3		0.0663	0.497
		Beryllium	0.0497	U	0.0497	0.497
		Cadmium	0.0842	J	0.0475	0.497
		Calcium	2480	B	1.3	9.94
		Chromium	0.495	J	0.16	0.497

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2004, Vegetation (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	35	Cobalt	0.0793	U	0.0793	0.497
		Copper	3.58		0.202	0.497
		Iron	208		1.56	9.94
		Lead	0.282	U	0.282	0.497
		Magnesium	731		2.91	49.7
		Manganese	8.86		0.13	0.994
		Mercury	0.00536	U	0.00536	0.0545
		Nickel	0.309	BJ	0.0849	0.497
		Potassium	6110		17.8	49.7
		Selenium	0.838		0.161	0.497
		Silver	0.0897	U	0.0897	0.497
		Sodium	17.5	B	3.61	9.94
		Thallium	0.994	U	0.994	1.99
		Vanadium	0.402	J	0.0903	0.497
		Zinc	3.64		0.167	0.497
	43	Aluminum	211		0.782	9.86
		Antimony	0.614	BJ	0.339	0.986
		Arsenic	0.514		0.204	0.493
		Barium	11.9		0.0658	0.493
		Beryllium	0.0493	U	0.0493	0.493
		Cadmium	0.0833	J	0.0471	0.493
		Calcium	3830	B	1.29	9.86
		Chromium	0.36	J	0.159	0.493
		Cobalt	0.0946	J	0.0787	0.493
		Copper	3.34		0.2	0.493
		Iron	173		1.55	9.86
		Lead	0.28	U	0.28	0.493
		Magnesium	779		2.88	49.3
		Manganese	15.4		0.129	0.986
		Mercury	0.00573	U	0.00573	0.0583
		Nickel	0.513	B	0.0842	0.493
		Potassium	10100		17.6	49.3
		Selenium	0.94		0.16	0.493
		Silver	0.089	U	0.089	0.493
		Sodium	19	B	3.58	9.86
		Thallium	0.986	U	0.986	1.97
		Vanadium	0.406	J	0.0895	0.493
		Zinc	4.74		0.166	0.493

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2004, Vegetation (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	45	Aluminum	168		0.787	9.92
		Antimony	0.341	BU	0.341	0.992
		Arsenic	0.519		0.205	0.496
		Barium	11.2	B	0.0662	0.496
		Beryllium	0.0496	U	0.0496	0.496
		Cadmium	0.0474	U	0.0474	0.496
		Calcium	3190	B	1.29	9.92
		Chromium	0.608	B	0.16	0.496
		Cobalt	0.0792	U	0.0792	0.496
		Copper	3.39		0.201	0.496
		Iron	121		3.11	19.8
		Lead	0.281	U	0.281	0.496
		Magnesium	1270	B	1.16	19.8
		Manganese	11		0.13	0.992
		Mercury	0.012	J	0.0059	0.06
		Nickel	0.361	J	0.0847	0.496
		Potassium	5750		7.1	19.8
		Selenium	0.322	U	0.322	0.992
		Silver	0.0895	U	0.0895	0.496
		Sodium	9.88	J	3.6	9.92
		Thallium	0.992	U	0.992	1.98
		Vanadium	0.208	J	0.0901	0.496
		Zinc	8.41		0.167	0.496
	46	Aluminum	93.8		1.84	2.92
		Antimony	0.0487	U	0.0487	0.39
		Arsenic	0.0877	U	0.0877	0.585
		Barium	11.7		0.0487	0.39
		Beryllium	0.0117	U	0.0117	0.039
		Cadmium	0.114	J	0.0078	0.195
		Calcium	3670		7.8	19.5
		Chromium	0.781	B	0.0916	0.585
		Cobalt	0.0975	U	0.0975	0.195
		Copper	5.24		0.125	0.195
		Iron	111		1.39	4.87
		Lead	0.147	J	0.037	0.39
		Magnesium	770		1.58	1.95
		Manganese	19.4		0.0429	0.975
		Mercury	0.00457	J	0.00415	0.0423
		Nickel	0.344	J	0.0253	0.39
		Potassium	10300		8.96	58.5
		Selenium	0.328	J	0.127	0.975
		Silver	0.00975	U	0.00975	0.195
		Sodium	16.4	J	3.84	48.7

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2004, Vegetation (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	46	Thallium	0.0195	U	0.0195	0.0975
		Vanadium	0.727	U	0.727	1.95
		Zinc	7.93	B	0.119	1.95
	51	Aluminum	107		0.781	9.84
		Antimony	0.693	BJ	0.338	0.984
		Arsenic	0.587		0.203	0.492
		Barium	11.1		0.0656	0.492
		Beryllium	0.0492	U	0.0492	0.492
		Cadmium	0.0702	J	0.047	0.492
		Calcium	3850	B	1.28	9.84
		Chromium	0.423	J	0.159	0.492
		Cobalt	0.137	J	0.0785	0.492
		Copper	8.11		0.2	0.492
		Iron	99.7		1.54	9.84
		Lead	0.279	U	0.279	0.492
		Magnesium	873		2.88	49.2
		Manganese	14.4		0.129	0.984
		Mercury	0.00573	U	0.00573	0.0583
		Nickel	0.351	BJ	0.0841	0.492
		Potassium	8120		17.6	49.2
		Selenium	1.18		0.16	0.492
		Silver	0.0888	U	0.0888	0.492
		Sodium	19.4	B	3.57	9.84
		Thallium	0.984	U	0.984	1.97
		Vanadium	0.245	J	0.0894	0.492
		Zinc	51.2		0.166	0.492
	52	Aluminum	186		0.775	9.77
		Antimony	0.488	BJ	0.335	0.977
		Arsenic	0.383	J	0.202	0.488
		Barium	8.56		0.0651	0.488
		Beryllium	0.0488	U	0.0488	0.488
		Cadmium	0.0567	BJ	0.0467	0.488
		Calcium	3340		1.27	9.77
		Chromium	0.315	J	0.157	0.488
		Cobalt	0.0779	U	0.0779	0.488
		Copper	5.23		0.198	0.488
		Iron	154		1.53	9.77
		Lead	0.277	U	0.277	0.488
		Magnesium	1540		2.86	48.8
		Manganese	21.5		0.128	0.977
		Mercury	0.00172	BJ	0.000983	0.01
		Nickel	0.723		0.0834	0.488

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2004, Vegetation (concluded) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (concluded)	52	Potassium	9580		17.5	48.8
		Selenium	1.15		0.158	0.488
		Silver	0.0881	U	0.0881	0.488
		Sodium	8.29	J	3.55	9.77
		Thallium	0.977	U	0.977	1.95
		Vanadium	0.251	J	0.0887	0.488
		Zinc	17.6		0.164	0.488
	55	Aluminum	181		0.792	9.98
		Antimony	0.964	BJ	0.343	0.998
		Arsenic	0.265	J	0.206	0.499
		Barium	18.4		0.0666	0.499
		Beryllium	0.0499	U	0.0499	0.499
		Cadmium	0.0944	J	0.0477	0.499
		Calcium	4230	B	1.3	9.98
		Chromium	0.364	J	0.161	0.499
		Cobalt	0.0796	U	0.0796	0.499
		Copper	4.5		0.203	0.499
		Iron	162		1.56	9.98
		Lead	0.347	J	0.283	0.499
		Magnesium	872		2.92	49.9
		Manganese	20.9		0.131	0.998
		Mercury	0.00404	U	0.00404	0.0411
		Nickel	7.77	B	0.0852	0.499
		Potassium	8430		17.8	49.9
		Selenium	0.793		0.162	0.499
		Silver	0.09	U	0.09	0.499
		Sodium	21.4	B	3.62	9.98
		Thallium	0.998	U	0.998	2
		Vanadium	0.31	J	0.0906	0.499
		Zinc	5.82		0.168	0.499

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 Off-Site by Location for Calendar Year 2004, Sediment

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site	8	Aluminum	9840		0.792	9.98
		Antimony	0.879	BJ	0.343	0.998
		Arsenic	3.91		0.206	0.499
		Barium	251		0.0666	0.499
		Beryllium	0.526		0.0499	0.499
		Cadmium	0.0863	J	0.0477	0.499
		Calcium	22100		1.3	9.98
		Chromium	8.31		0.161	0.499
		Cobalt	3.64		0.0796	0.499
		Copper	7.91		0.203	0.499
		Iron	10500		1.56	9.98
		Lead	7.3		0.283	0.499
		Magnesium	4170		0.584	9.98
		Manganese	226		0.131	0.998
		Mercury	0.0134		0.000933	0.00949
		Nickel	7.28	B	0.0852	0.499
		Potassium	1930	B	3.57	9.98
		Selenium	0.64		0.162	0.499
		Silver	0.09	U	0.09	0.499
		Sodium	304		3.62	9.98
		Thallium	0.998	U	0.998	2
		Vanadium	22.2		0.0906	0.499
		Zinc	25.6		0.168	0.499
	11	Aluminum	5200		0.788	9.94
		Antimony	0.341	BU	0.341	0.994
		Arsenic	2.12		0.205	0.497
		Barium	115		0.0663	0.497
		Beryllium	0.273	J	0.0497	0.497
		Cadmium	0.0641	J	0.0475	0.497
		Calcium	14400		1.3	9.94
		Chromium	5.13		0.16	0.497
		Cobalt	2.37		0.0793	0.497
		Copper	3.74		0.202	0.497
		Iron	6450		1.56	9.94
		Lead	3.38		0.282	0.497
		Magnesium	2480		0.581	9.94
		Manganese	161		0.13	0.994
		Mercury	0.00729	J	0.000951	0.00968
		Nickel	4.44	B	0.0849	0.497
		Potassium	1060	B	3.55	9.94
		Selenium	0.234	J	0.161	0.497
		Silver	0.0897	U	0.0897	0.497

See notes at end of table.

TABLE C-10. Non-radiological Results for Off-Site by Location for Calendar Year 2004, Sediment (concluded) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site (concluded)	11	Sodium	124		3.61	9.94
		Thallium	0.994	U	0.994	1.99
		Vanadium	13.8		0.0903	0.497
		Zinc	16.9		0.167	0.497
	68	Aluminum	5780		0.778	9.8
		Antimony	0.501	J	0.337	0.98
		Arsenic	4.56		0.202	0.49
		Barium	116		0.131	0.98
		Beryllium	0.352	J	0.049	0.49
		Cadmium	0.126	J	0.0469	0.49
		Calcium	95500	B	2.56	19.6
		Chromium	7.37		0.158	0.49
		Cobalt	2.6		0.0782	0.49
		Copper	4.2		0.199	0.49
		Iron	7730		1.54	9.8
		Lead	4.98		0.278	0.49
		Magnesium	3420		1.15	19.6
		Manganese	279		0.128	0.98
		Mercury	0.00772	J	0.000959	0.00976
		Nickel	6.87		0.0837	0.49
		Potassium	1040		3.51	9.8
		Selenium	0.159	U	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	121		7.12	19.6
		Thallium	0.98	U	0.98	1.96
		Vanadium	15.4		0.089	0.49
		Zinc	20.5	B	0.165	0.49

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-11. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Sediment
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter	60	Aluminum	10700		0.776	9.78
		Antimony	0.336	BU	0.336	0.978
		Arsenic	2.42		0.202	0.489
		Barium	120		0.0653	0.489
		Beryllium	0.475	J	0.0489	0.489
		Cadmium	0.158	J	0.0468	0.489
		Calcium	24000		1.28	9.78
		Chromium	11.4		0.158	0.489
		Cobalt	4.75		0.0781	0.489
		Copper	8.53		0.199	0.489
		Iron	13600		1.53	9.78
		Lead	6.49		0.278	0.489
		Magnesium	4050		0.572	9.78
		Manganese	289		0.128	0.978
		Mercury	0.00425	J	0.00095	0.00966
		Nickel	8.94	B	0.0836	0.489
		Potassium	2250	B	3.5	9.78
		Selenium	0.159	U	0.159	0.489
		Silver	0.0883	U	0.0883	0.489
		Sodium	74.7		3.55	9.78
		Thallium	0.978	U	0.978	1.96
		Vanadium	27.4		0.0888	0.489
		Zinc	34.8		0.165	0.489
	65E	Aluminum	3620		1.56	19.6
		Antimony	0.909	BJ	0.337	0.98
		Arsenic	1.44		0.202	0.49
		Barium	23		0.0654	0.49
		Beryllium	0.291	J	0.049	0.49
		Cadmium	0.0747	J	0.0469	0.49
		Calcium	20600		1.28	9.8
		Chromium	2.29		0.158	0.49
		Cobalt	2.18		0.156	0.98
		Copper	4.01		0.199	0.49
		Iron	5890		1.54	9.8
		Lead	3.1		0.556	0.98
		Magnesium	1630		0.573	9.8
		Manganese	146		0.128	0.98
		Mercury	0.00097	U	0.00097	0.00987
		Nickel	2.9	B	0.0837	0.49
		Potassium	717	B	3.51	9.8
		Selenium	0.159	U	0.159	0.49

See notes at end of table.

TABLE C-11. Non-radiological Results for Perimeter by Location for Calendar Year 2004, Sediment (concluded) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (concluded)	65E	Silver	0.0884	U	0.0884	0.49
		Sodium	51.5		3.56	9.8
		Thallium	1.96	U	1.96	3.92
		Vanadium	11.8		0.178	0.98
		Zinc	16.5		0.165	0.49
	73	Aluminum	5220	B	0.784	9.88
		Antimony	1.21	B	0.339	0.988
		Arsenic	1.44		0.204	0.494
		Barium	79.6		0.0659	0.494
		Beryllium	0.448	J	0.0494	0.494
		Cadmium	0.0472	U	0.0472	0.494
		Calcium	22300		1.29	9.88
		Chromium	6.04		0.159	0.494
		Cobalt	3.66		0.0789	0.494
		Copper	5.5		0.201	0.494
		Iron	14400	B	1.55	9.88
		Lead	5.25		0.28	0.494
		Magnesium	3210		0.578	9.88
		Manganese	236		0.129	0.988
		Mercury	0.00094	U	0.000939	0.00955
		Nickel	4.59		0.0844	0.494
		Potassium	2020		3.53	9.88
		Selenium	0.16	U	0.16	0.494
		Silver	0.0891	U	0.0891	0.494
		Sodium	47		3.59	9.88
		Thallium	8.66		0.988	1.98
		Vanadium	25.2		0.0897	0.494
		Zinc	29.4		0.166	0.494

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. Non-radiological Results for On-Site by Location for Calendar Year 2004, Sediment

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site	72	Aluminum	8650	B	0.773	9.75
		Antimony	0.579	J	0.335	0.975
		Arsenic	6.08		0.201	0.487
		Barium	125		0.065	0.487
		Beryllium	0.743		0.0487	0.487
		Cadmium	0.0466	U	0.0466	0.487
		Calcium	61700	B	1.27	9.75
		Chromium	10.6		0.157	0.487
		Cobalt	4.18		0.0778	0.487
		Copper	8.23		0.198	0.487
		Iron	8400	B	1.53	9.75
		Lead	8.2		0.277	0.487
		Magnesium	5050		0.57	9.75
		Manganese	210		0.127	0.975
		Mercury	0.00514	J	0.000962	0.00979
		Nickel	8.12		0.0832	0.487
		Potassium	2210		3.49	9.75
		Selenium	7.9	BU	7.9	24.4
		Silver	0.0959	J	0.0879	0.487

See notes at end of table.

TABLE C-12. Non-radiological Results for On-Site by Location for Calendar Year 2004, Sediment (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	72	Sodium	232		3.54	9.75
		Thallium	0.975	U	0.975	1.95
		Vanadium	20.3		0.0885	0.487
		Zinc	23.5		0.164	0.487
	74	Aluminum	15000		0.781	9.84
		Antimony	0.389	J	0.338	0.984
		Arsenic	3.37		0.203	0.492
		Barium	157		0.0656	0.492
		Beryllium	0.67		0.0492	0.492
		Cadmium	0.218	J	0.047	0.492
		Calcium	29800	B	1.28	9.84
		Chromium	14.3		0.159	0.492
		Cobalt	6.57		0.0785	0.492
		Copper	12.6		0.2	0.492
		Iron	18300		1.54	9.84
		Lead	13.6		0.279	0.492
		Magnesium	6130		2.88	49.2
		Manganese	431		0.129	0.984
		Mercury	0.00736	J	0.000967	0.00984
		Nickel	11.8		0.0841	0.492
		Potassium	5610		17.6	49.2
		Selenium	0.798	BU	0.798	2.46
		Silver	0.0888	U	0.0888	0.492
		Sodium	81.9		3.57	9.84
		Thallium	0.984	U	0.984	1.97
		Vanadium	33.9		0.0894	0.492
		Zinc	51.2		0.166	0.492
	75	Aluminum	11500		0.775	9.77
		Antimony	0.632	J	0.335	0.977
		Arsenic	3.35		0.202	0.488
		Barium	122		0.0651	0.488
		Beryllium	0.577		0.0488	0.488
		Cadmium	0.167	J	0.0467	0.488
		Calcium	36800	B	1.27	9.77
		Chromium	13.4		0.157	0.488
		Cobalt	5.7		0.0779	0.488
		Copper	13.4		0.198	0.488
		Iron	14400		1.53	9.77
		Lead	11.2		0.277	0.488
		Magnesium	5140		0.571	9.77
		Manganese	302		0.128	0.977
		Mercury	0.00149	J	0.000978	0.00995
		Nickel	11.4		0.0834	0.488

See notes at end of table.

TABLE C-12. Non-radiological Results for On-Site by Location for Calendar Year 2004, Sediment (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	75	Potassium	2360		3.49	9.77
		Selenium	0.507	B	0.158	0.488
		Silver	0.0881	U	0.0881	0.488
		Sodium	114		3.55	9.77
		Thallium	0.977	U	0.977	1.95
		Vanadium	30.6		0.0887	0.488
		Zinc	41.6		0.164	0.488
	79	Aluminum	12100		0.793	10
		Antimony	0.521	BJ	0.343	1
		Arsenic	3.81		0.206	0.5
		Barium	164		0.334	2.5
		Beryllium	0.577		0.05	0.5
		Cadmium	0.426	J	0.0478	0.5
		Calcium	149000		6.52	50
		Chromium	14.7		0.161	0.5
		Cobalt	4.51		0.0798	0.5
		Copper	9.97		0.203	0.5
		Iron	11500		1.57	10
		Lead	8.69		0.284	0.5
		Magnesium	5390		2.92	50
		Manganese	338		0.131	1
		Mercury	0.0109		0.000968	0.00985
		Nickel	11.1	B	0.0854	0.5
		Potassium	2270	B	3.58	10
		Selenium	0.162	U	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	123		18.2	50
		Thallium	1	U	1	2
		Vanadium	23		0.0908	0.5
		Zinc	35.7		0.168	0.5
	83	Aluminum	12700		0.785	9.9
		Antimony	0.55	J	0.34	0.99
		Arsenic	3.04		0.204	0.495
		Barium	152		0.066	0.495
		Beryllium	0.545		0.0495	0.495
		Cadmium	0.197	J	0.0473	0.495
		Calcium	36300	B	1.29	9.9
		Chromium	11.3		0.16	0.495
		Cobalt	5.3		0.079	0.495
		Copper	12		0.201	0.495
		Iron	15100		1.55	9.9
		Lead	10.8		0.281	0.495
		Magnesium	5520		1.16	19.8

See notes at end of table.

TABLE C-12. Non-radiological Results for On-Site by Location for Calendar Year 2004, Sediment (continued) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	83	Manganese	347		0.13	0.99
		Mercury	0.0142		0.000954	0.00971
		Nickel	9.83		0.0846	0.495
		Potassium	4120		7.08	19.8
		Selenium	0.461	J	0.321	0.99
		Silver	0.0893	U	0.0893	0.495
		Sodium	80.5		3.6	9.9
		Thallium	0.99	U	0.99	1.98
		Vanadium	27.9		0.0899	0.495
		Zinc	50.2	B	0.167	0.495
	84	Aluminum	12700		0.784	9.88
		Antimony	1.06		0.339	0.988
		Arsenic	3.49		0.204	0.494
		Barium	137		0.0659	0.494
		Beryllium	0.639		0.0494	0.494
		Cadmium	0.174	J	0.0472	0.494
		Calcium	34200	B	1.29	9.88
		Chromium	13.5		0.159	0.494
		Cobalt	5.64		0.0789	0.494
		Copper	13.8		0.201	0.494
		Iron	14300		1.55	9.88
		Lead	12.7		0.28	0.494
		Magnesium	5510		0.578	9.88
		Manganese	304		0.129	0.988
		Mercury	0.011		0.000951	0.00968
		Nickel	11.4		0.0844	0.494
		Potassium	2630		3.53	9.88
		Selenium	0.639		0.16	0.494
		Silver	0.0891	U	0.0891	0.494
		Sodium	108		3.59	9.88
		Thallium	0.988	U	0.988	1.98
		Vanadium	28.9		0.0897	0.494
		Zinc	43.7	B	0.166	0.494
	85	Aluminum	9500		0.778	9.8
		Antimony	0.337	U	0.337	0.98
		Arsenic	3.26		0.202	0.49
		Barium	120		0.131	0.98
		Beryllium	0.433	J	0.049	0.49
		Cadmium	0.121	J	0.0469	0.49
		Calcium	52900	B	2.56	19.6
		Chromium	13.1		0.158	0.49
		Cobalt	3.74		0.0782	0.49

See notes at end of table.

TABLE C-12. Non-radiological Results for On-Site by Location for Calendar Year 2004, Sediment (concluded) *(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)*

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (concluded)	85	Copper	5.73		0.199	0.49
		Iron	11000		1.54	9.8
		Lead	8.01		0.278	0.49
		Magnesium	3130		1.15	19.6
		Manganese	227		0.128	0.98
		Mercury	0.0049	J	0.000976	0.00993
		Nickel	8.8		0.0837	0.49
		Potassium	1750		3.51	9.8
		Selenium	0.318	U	0.318	0.98
		Silver	0.0884	U	0.0884	0.49
		Sodium	95.9		7.12	19.6
		Thallium	0.98	U	0.98	1.96
		Vanadium	24.8		0.089	0.49
		Zinc	25.8	B	0.165	0.49

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-13. Radiological Replicate Results for Calendar Year 2004, Soil

Location Type	Location	Sample ID	Analyte	Units	Activity (± 2 σ) and/or Concentration	Decision Level	Detection Limit	Average	Std Dev	CV
Off-Site	11	065157-001	Cesium-137	pCi/g	0.07 ± 0.0133	0.00719	0.0148	0.06	0.01	21.84%
		065157-002	Cesium-137	pCi/g	0.0465 ± 0.0103	0.00483	0.00987			
		065157-003	Cesium-137	pCi/g	0.0521 ± 0.0096	0.00511	0.0105			
		065157-001	Uranium	µg/g	0.522	0.00589	0.0393	0.56	0.03	5.94%
		065157-002	Uranium	µg/g	0.558	0.00584	0.0389			
		065157-003	Uranium	µg/g	0.588	0.00587	0.0391			
Perimeter	64	065117-001	Cesium-137	pCi/g	0.47 ± 0.0392	0.00765	0.0157	0.51	0.05	9.81%
		065117-002	Cesium-137	pCi/g	0.569 ± 0.0451	0.00768	0.0157			
		065117-003	Cesium-137	pCi/g	0.503 ± 0.0494	0.00913	0.0188			
		065117-001	Uranium	µg/g	1.05	0.00589	0.0393	1.00	0.15	15.07%
		065117-002	Uranium	µg/g	0.831	0.00588	0.0392			
		065117-003	Uranium	µg/g	1.12	0.00583	0.0388			
On-Site	20	065131-001	Cesium-137	pCi/g	0.352 ± 0.0367	0.00704	0.0144	0.36	0.03	7.80%
		065131-002	Cesium-137	pCi/g	0.339 ± 0.051	0.012	0.0246			
		065131-003	Cesium-137	pCi/g	0.393 ± 0.0231	0.00805	0.0165			
		065131-001	Uranium	µg/g	0.569	0.00596	0.0398	0.55	0.03	4.68%
		065131-002	Uranium	µg/g	0.522	0.00594	0.0396			
		065131-003	Uranium	µg/g	0.564	0.00588	0.0392			
	33	065107-001	Cesium-137	pCi/g	0.0969 ± 0.0163	0.00879	0.0181	0.10	0.02	18.17%
		065107-002	Cesium-137	pCi/g	0.0822 ± 0.0174	0.00858	0.0176			
		065107-003	Cesium-137	pCi/g	0.118 ± 0.0224	0.00942	0.0194			
		065107-001	Uranium	µg/g	1.18	0.00592	0.0394	1.34	0.15	11.05%
		065107-002	Uranium	µg/g	1.47	0.00594	0.0396			
		065107-003	Uranium	µg/g	1.38	0.00588	0.0392			
	53	065148-001	Cesium-137	pCi/g	0.182 ± 0.0248	0.00762	0.0157	0.16	0.02	13.40%
		065148-002	Cesium-137	pCi/g	0.147 ± 0.0168	0.00686	0.0142			
		065148-003	Cesium-137	pCi/g	0.144 ± 0.0238	0.00889	0.0183			
		065148-001	Uranium	µg/g	0.342	0.00583	0.0388	0.32	0.02	6.94%
		065148-002	Uranium	µg/g	0.298	0.00585	0.039			
		065148-003	Uranium	µg/g	0.327	0.00581	0.0388			

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. Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.
CV = coefficient of variation
Std Dev = standard deviation

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TABLE C-14. Radiological Replicate Results for Calendar Year 2004, Sediment

Location Type	Location	Sample ID	Analyte	Units	Activity (± 2 σ) and/or Concentration	Decision Level	Detection Limit	Average	Std Dev	CV
Off-Site	11	065159-001	Cesium-137	pCi/g	0.0388 ± 0.0117	0.00576	0.0117	0.06	0.02	38.61%
		065159-002	Cesium-137	pCi/g	0.0865 ± 0.0149	0.00908	0.0188			
		065159-003	Cesium-137	pCi/g	0.0603 ± 0.017	0.00906	0.0187			
		065159-001	Uranium	µg/g	0.493	0.00589	0.0393	0.50	0.02	4.49%
		065159-002	Uranium	µg/g	0.522	0.00594	0.0396			
		065159-003	Uranium	µg/g	0.478	0.00588	0.0392			
On-Site	74	065073-001	Cesium-137	pCi/g	0.198 ± 0.0232	0.00601	0.0123	0.17	0.04	25.33%
		065073-002	Cesium-137	pCi/g	0.179 ± 0.0379	0.0128	0.0264			
		065073-003	Cesium-137	pCi/g	0.118 ± 0.02	0.00767	0.0158			
		065073-001	Uranium	µg/g	0.788	0.00594	0.0396	0.74	0.04	6.02%
		065073-002	Uranium	µg/g	0.716	0.00596	0.0398			
		065073-003	Uranium	µg/g	0.707	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. Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.
CV = coefficient of variation
Std Dev = standard deviation

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TABLE C-15. Radiological Replicate Results for Calendar Year 2004, Vegetation

Location Type	Location	Sample ID	Analyte	Units	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit	Average	Std Dev	CV
Off-Site	11	065158-001	Cesium-137	pCi/g	-0.036 ± 0.0577	U	0.043	0.09	-0.02	0.02	-103.11%
		065158-002	Cesium-137	pCi/g	0.0303 ± 0.0321	U	0.0263	0.0548			
		065158-003	Cesium-137	pCi/g	-0.00564 ± 0.0759	U	0.0598	0.125			
		065158-001	Uranium	µg/g	0.00589	U	0.00589	0.0393	0.01	0.00	1.31%
		065158-002	Uranium	µg/g	0.006	U	0.006	0.04			
		065158-003	Uranium	µg/g	0.00647	J	0.00588	0.0392			
On-Site	33	065108-001	Cesium-137	pCi/g	0.00055 ± 0.062	U	0.049	0.101	0.00	0.02	2647.24%
		065108-002	Cesium-137	pCi/g	0.0235 ± 0.0683	U	0.0551	0.115			
		065108-003	Cesium-137	pCi/g	-0.0215 ± 0.0631	U	0.0493	0.103			
		065108-001	Uranium	µg/g	0.00592	U	0.00592	0.0394	0.01	0.00	0.83%
		065108-002	Uranium	µg/g	0.00599	U	0.00599	0.0399			
		065108-003	Uranium	µg/g	0.00784	J	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 organic and inorganic analytes the result is less than the effective decision level. 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.
CV = coefficient of variation
Std Dev = standard deviation
J = Estimated value, the analyte concentration fell above the effective MDL and Below the effective PQL.

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TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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
Off-Site	11	065157-001	Aluminum	4960		0.788	9.94	4840.00	308.06	6.36%
		065157-002	Aluminum	5070		0.792	9.98			
		065157-003	Aluminum	4490		0.776	9.78			
		065157-001	Antimony	0.766	BJ	0.341	0.994	0.66	0.16	24.81%
		065157-002	Antimony	0.471	BJ	0.343	0.998			
		065157-003	Antimony	0.741	BJ	0.336	0.978			
		065157-001	Arsenic	2.29		0.205	0.497	2.24	0.05	2.05%
		065157-002	Arsenic	2.23		0.206	0.499			
		065157-003	Arsenic	2.2		0.202	0.489			
		065157-001	Barium	199		0.0663	0.497	170.33	25.32	14.87%
		065157-002	Barium	161		0.0666	0.499			
		065157-003	Barium	151		0.0653	0.489			
		065157-001	Beryllium	0.262	J	0.0497	0.497	0.26	0.01	4.28%
		065157-002	Beryllium	0.27	J	0.0499	0.499			
		065157-003	Beryllium	0.248	J	0.0489	0.489			
		065157-001	Cadmium	0.0648	J	0.0475	0.497	0.08	0.02	28.47%
		065157-002	Cadmium	0.0733	J	0.0477	0.499			
		065157-003	Cadmium	0.109	J	0.0468	0.489			
		065157-001	Calcium	10700		1.3	9.94	11233.33	923.76	8.22%
		065157-002	Calcium	12300		1.3	9.98			
		065157-003	Calcium	10700		1.28	9.78			
		065157-001	Chromium	6.23		0.16	0.497	6.22	0.04	0.58%
		065157-002	Chromium	6.25		0.161	0.499			
		065157-003	Chromium	6.18		0.158	0.489			
		065157-001	Cobalt	2.74		0.0793	0.497	2.65	0.10	3.83%
		065157-002	Cobalt	2.67		0.0796	0.499			
		065157-003	Cobalt	2.54		0.0781	0.489			
		065157-001	Copper	4.4		0.202	0.497	4.51	0.29	6.54%
		065157-002	Copper	4.84		0.203	0.499			
		065157-003	Copper	4.28		0.199	0.489			
		065157-001	Iron	8210		1.56	9.94	7983.33	302.38	3.79%
		065157-002	Iron	8100		1.56	9.98			
		065157-003	Iron	7640		1.53	9.78			
		065157-001	Lead	6.08		0.282	0.497	5.87	0.25	4.28%
		065157-002	Lead	5.93		0.283	0.499			
		065157-003	Lead	5.59		0.278	0.489			
		065157-001	Magnesium	2130		0.581	9.94	2123.33	80.21	3.78%
		065157-002	Magnesium	2200		0.584	9.98			
		065157-003	Magnesium	2040		0.572	9.78			
		065157-001	Manganese	276		0.13	0.994	282.00	7.94	2.81%
		065157-002	Manganese	291		0.131	0.998			
		065157-003	Manganese	279		0.128	0.978			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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
Off-Site (continued)	11	065157-001	Mercury	0.00553	J	0.00094	0.00952	0.01	0.00	7.95%
		065157-002	Mercury	0.00646	J	0.00095	0.00966			
		065157-003	Mercury	0.00622	J	0.00091	0.00923			
		065157-001	Nickel	5.29	B	0.0849	0.497	4.95	0.54	10.82%
		065157-002	Nickel	5.22	B	0.0852	0.499			
		065157-003	Nickel	4.33	B	0.0836	0.489			
		065157-001	Potassium	1340	B	3.55	9.94		150.44	12.57%
		065157-002	Potassium	1210	B	3.57	9.98			
		065157-003	Potassium	1040	B	3.5	9.78			
		065157-001	Selenium	0.161	U	0.161	0.497	0.16	0.00	0.88%
		065157-002	Selenium	0.397	J	0.162	0.499			
		065157-003	Selenium	0.159	U	0.159	0.489			
		065157-001	Silver	0.0897	U	0.0897	0.497	0.09	0.00	1.02%
		065157-002	Silver	0.09	U	0.09	0.499			
		065157-003	Silver	0.0883	U	0.0883	0.489			
		065157-001	Sodium	98		3.61	9.94	95.13	4.46	4.68%
		065157-002	Sodium	97.4		3.62	9.98			
		065157-003	Sodium	90		3.55	9.78			
		065157-001	Thallium	0.994	U	0.994	1.99	0.99	0.01	1.07%
		065157-002	Thallium	0.998	U	0.998	2			
		065157-003	Thallium	0.978	U	0.978	1.96			
		065157-001	Vanadium	18.8		0.0903	0.497	18.40	0.40	2.17%
		065157-002	Vanadium	18.4		0.0906	0.499			
		065157-003	Vanadium	18		0.0888	0.489			
		065157-001	Zinc	20.3		0.167	0.497	24.53	5.77	23.50%
		065157-002	Zinc	31.1		0.168	0.499			
		065157-003	Zinc	22.2		0.165	0.489			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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	065117-001	Aluminum	15000	B	0.787	9.92	14733.33	251.66	1.71%
		065117-002	Aluminum	14700	B	0.782	9.86			
		065117-003	Aluminum	14500	B	0.785	9.9			
		065117-001	Antimony	0.943	J	0.341	0.992	0.67	0.29	43.25%
		065117-002	Antimony	0.366	J	0.339	0.986			
		065117-003	Antimony	0.701	J	0.34	0.99			
		065117-001	Arsenic	3.35		0.205	0.496	3.25	0.33	10.09%
		065117-002	Arsenic	3.51		0.204	0.493			
		065117-003	Arsenic	2.88		0.204	0.495			
		065117-001	Barium	124		0.0662	0.496	118.67	4.73	3.98%
		065117-002	Barium	117		0.0658	0.493			
		065117-003	Barium	115		0.066	0.495			
		065117-001	Beryllium	0.832		0.0496	0.496	0.80	0.03	4.23%
		065117-002	Beryllium	0.788		0.0493	0.493			
		065117-003	Beryllium	0.766		0.0495	0.495			
		065117-001	Cadmium	0.0474	U	0.0474	0.496	0.05	0.00	0.32%
		065117-002	Cadmium	0.0471	U	0.0471	0.493			
		065117-003	Cadmium	0.0473	U	0.0473	0.495			
		065117-001	Calcium	15400	B	1.29	9.92	13066.67	2107.92	16.13%
		065117-002	Calcium	11300	B	1.29	9.86			
		065117-003	Calcium	12500	B	1.29	9.9			
		065117-001	Chromium	11.4		0.16	0.496	10.70	0.70	6.54%
		065117-002	Chromium	10.7		0.159	0.493			
		065117-003	Chromium	10		0.16	0.495			
		065117-001	Cobalt	8.38		0.0792	0.496	7.95	0.45	5.67%
		065117-002	Cobalt	7.98		0.0787	0.493			
		065117-003	Cobalt	7.48		0.079	0.495			
		065117-001	Copper	16.2		0.201	0.496	15.57	0.55	3.54%
		065117-002	Copper	15.2		0.2	0.493			
		065117-003	Copper	15.3		0.201	0.495			
		065117-001	Iron	23400	B	1.55	9.92	22766.67	1365.04	6.00%
		065117-002	Iron	23700	B	1.55	9.86			
		065117-003	Iron	21200	B	1.55	9.9			
		065117-001	Lead	18.5		0.281	0.496	17.23	1.25	7.26%
		065117-002	Lead	17.2		0.28	0.493			
		065117-003	Lead	16		0.281	0.495			
		065117-001	Magnesium	7830		0.58	9.92	7743.33	125.03	1.61%
		065117-002	Magnesium	7800		0.577	9.86			
		065117-003	Magnesium	7600		0.579	9.9			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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 (continued)	64	065117-001	Manganese	620		0.13	0.992	611.00	12.29	2.01%
		065117-002	Manganese	616		0.129	0.986			
		065117-003	Manganese	597		0.13	0.99			
		065117-001	Mercury	0.0163		0.00098	0.00997	0.02	0.00	11.61%
		065117-002	Mercury	0.0145		0.00092	0.00932			
		065117-003	Mercury	0.0183		0.00096	0.00972			
		065117-001	Nickel	10.1		0.0847	0.496	9.58	0.46	4.79%
		065117-002	Nickel	9.41		0.0842	0.493			
		065117-003	Nickel	9.23		0.0846	0.495			
		065117-001	Potassium	4410		3.55	9.92	4266.67	125.03	2.93%
		065117-002	Potassium	4210		3.53	9.86			
		065117-003	Potassium	4180		3.54	9.9			
		065117-001	Selenium	1.69	B	0.161	0.496	2.01	0.39	19.60%
		065117-002	Selenium	2.45	B	0.16	0.493			
		065117-003	Selenium	1.89	B	0.16	0.495			
		065117-001	Silver	0.0895	U	0.0895	0.496	0.09	0.00	0.28%
		065117-002	Silver	0.089	U	0.089	0.493			
		065117-003	Silver	0.0893	U	0.0893	0.495			
		065117-001	Sodium	98.4		3.6	9.92	94.40	4.39	4.65%
		065117-002	Sodium	89.7		3.58	9.86			
		065117-003	Sodium	95.1		3.6	9.9			
		065117-001	Thallium	5.64		0.992	1.98	5.06	0.51	10.13%
		065117-002	Thallium	4.68		0.986	1.97			
		065117-003	Thallium	4.85		0.99	1.98			
		065117-001	Vanadium	41.1		0.0901	0.496	38.77	2.84	7.33%
		065117-002	Vanadium	39.6		0.0895	0.493			
		065117-003	Vanadium	35.6		0.0899	0.495			
		065117-001	Zinc	81.6		0.167	0.496	79.43	2.57	3.23%
		065117-002	Zinc	80.1		0.166	0.493			
		065117-003	Zinc	76.6		0.167	0.495			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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	065131-001	Aluminum	7710		0.793	10	9083.33	1234.27	13.59%
		065131-002	Aluminum	9440		0.781	9.84			
		065131-003	Aluminum	10100		0.784	9.88			
		065131-001	Antimony	4040	B	0.343	1	2020.50	2856.00	141.35%
		065131-002	Antimony	0.853	BJ	0.338	0.984			
		065131-003	Antimony	1	B	0.339	0.988			
		065131-001	Antimony*	1.59		0.0354	0.1	1.67	0.66	39.74%
		065131-002	Antimony*	1.05		0.0354	0.1			
		065131-003	Antimony*	2.37		0.0354	0.1			
		065131-001	Arsenic	1060		0.206	0.5	355.40	610.20	171.69%
		065131-002	Arsenic	3.07		0.203	0.492			
		065131-003	Arsenic	3.13		0.204	0.494			
		065131-001	Barium	93.9		0.0667	0.5	96.50	2.33	2.41%
		065131-002	Barium	97.2		0.0656	0.492			
		065131-003	Barium	98.4		0.0659	0.494			
		065131-001	Beryllium	0.362	J	0.05	0.5	0.40	0.03	8.21%
		065131-002	Beryllium	0.409	J	0.0492	0.492			
		065131-003	Beryllium	0.425	J	0.0494	0.494			
		065131-001	Cadmium	4.92		0.0478	0.5	4.49	1.96	43.67%
		065131-002	Cadmium	6.2		0.047	0.492			
		065131-003	Cadmium	2.35		0.0472	0.494			
		065131-001	Calcium	14500		1.3	10	15066.67	896.29	5.95%
		065131-002	Calcium	16100		1.28	9.84			
		065131-003	Calcium	14600		1.29	9.88			
		065131-001	Chromium	9.68		0.161	0.5	11.99	2.18	18.15%
		065131-002	Chromium	14		0.159	0.492			
		065131-003	Chromium	12.3		0.159	0.494			
		065131-001	Cobalt	3.73		0.0798	0.5	3.99	0.23	5.73%
		065131-002	Cobalt	4.16		0.0785	0.492			
		065131-003	Cobalt	4.08		0.0789	0.494			
		065131-001	Copper	16.5		0.203	0.5	12.37	3.58	28.96%
		065131-002	Copper	10.2		0.2	0.492			
		065131-003	Copper	10.4		0.201	0.494			
		065131-001	Iron	10200		1.57	10	12500.00	2066.40	16.53%
		065131-002	Iron	14200		1.54	9.84			
		065131-003	Iron	13100		1.55	9.88			
		065131-001	Lead	94000		28.4	50	31406.07	54207.95	172.60%
		065131-002	Lead	71.2		0.279	0.492			
		065131-003	Lead	147		0.28	0.494			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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 (continued)	20	065131-001	Lead*	72.6	B	0.0266	0.05	67.63	34.32	50.75%
		065131-002	Lead*	31.1	B	0.0266	0.05			
		065131-003	Lead*	99.2	B	0.0266	0.05			
		065131-001	Magnesium	3240		0.585	10	3550.00	281.60	7.93%
		065131-002	Magnesium	3620		0.576	9.84			
		065131-003	Magnesium	3790		0.578	9.88			
		065131-001	Manganese	229		0.131	1	249.00	17.78	7.14%
		065131-002	Manganese	255		0.129	0.984			
		065131-003	Manganese	263		0.129	0.988			
		065131-001	Mercury	0.0132		0.00096	0.00976	0.01	0.00	16.02%
		065131-002	Mercury	0.0105		0.00097	0.0099			
		065131-003	Mercury	0.0145		0.00095	0.00966			
		065131-001	Nickel	8.95	B	0.0854	0.5	9.66	0.68	7.02%
		065131-002	Nickel	10.3	B	0.0841	0.492			
		065131-003	Nickel	9.74	B	0.0844	0.494			
		065131-001	Potassium	2010	B	3.58	10	2373.33	338.58	14.27%
		065131-002	Potassium	2430	B	3.52	9.84			
		065131-003	Potassium	2680	B	3.53	9.88			
		065131-001	Selenium	0.162	U	0.162	0.5	0.16	0.00	0.88%
		065131-002	Selenium	0.16	U	0.16	0.492			
		065131-003	Selenium	0.71		0.16	0.494			
		065131-001	Silver	2.44		0.0902	0.5	0.09	0.00	0.24%
		065131-002	Silver	0.0888	U	0.0888	0.492			
		065131-003	Silver	0.0891	U	0.0891	0.494			
		065131-001	Sodium	46.6		3.63	10	52.70	6.05	11.48%
		065131-002	Sodium	52.8		3.57	9.84			
		065131-003	Sodium	58.7		3.59	9.88			
		065131-001	Thallium	1	U	1	2	0.99	0.01	0.84%
		065131-002	Thallium	0.984	U	0.984	1.97			
		065131-003	Thallium	0.988	U	0.988	1.98			
		065131-001	Vanadium	18.5		0.0908	0.5	24.13	5.01	20.77%
		065131-002	Vanadium	28.1		0.0894	0.492			
		065131-003	Vanadium	25.8		0.0897	0.494			
		065131-001	Zinc	33.8		0.168	0.5	36.67	2.76	7.52%
		065131-002	Zinc	36.9		0.166	0.492			
		065131-003	Zinc	39.3		0.166	0.494			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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 (continued)	33	065107-001	Aluminum	11800		0.787	9.92	11700.00	173.21	1.48%
		065107-002	Aluminum	11500		0.793	10			
		065107-003	Aluminum	11800		0.793	10			
		065107-001	Antimony	0.796	J	0.341	0.992	0.87	0.10	11.28%
		065107-002	Antimony	0.934	J	0.343	1			
		065107-003	Antimony	1.05		0.343	1			
		065107-001	Arsenic	17.5		0.205	0.496	19.80	2.07	10.44%
		065107-002	Arsenic	20.4		0.206	0.5			
		065107-003	Arsenic	21.5		0.206	0.5			
		065107-001	Barium	134		0.0662	0.496	128.67	7.57	5.88%
		065107-002	Barium	120		0.0667	0.5			
		065107-003	Barium	132		0.0667	0.5			
		065107-001	Beryllium	1.59		0.0496	0.496	1.87	0.26	13.86%
		065107-002	Beryllium	2.1		0.05	0.5			
		065107-003	Beryllium	1.93		0.05	0.5			
		065107-001	Cadmium	0.238	J	0.0474	0.496	0.22	0.04	15.89%
		065107-002	Cadmium	0.243	J	0.0478	0.5			
		065107-003	Cadmium	0.18	J	0.0478	0.5			
		065107-001	Calcium	44500	B	1.29	9.92	44600.00	173.21	0.39%
		065107-002	Calcium	44500	B	1.3	10			
		065107-003	Calcium	44800	B	1.3	10			
		065107-001	Chromium	13.7		0.16	0.496	13.10	0.72	5.50%
		065107-002	Chromium	12.3		0.161	0.5			
		065107-003	Chromium	13.3		0.161	0.5			
		065107-001	Cobalt	6.64		0.0792	0.496	7.45	0.71	9.55%
		065107-002	Cobalt	7.96		0.0798	0.5			
		065107-003	Cobalt	7.76		0.0798	0.5			
		065107-001	Copper	10.3		0.201	0.496	9.97	0.31	3.08%
		065107-002	Copper	9.69		0.203	0.5			
		065107-003	Copper	9.93		0.203	0.5			
		065107-001	Iron	15900		1.55	9.92	16033.33	709.46	4.42%
		065107-002	Iron	15400		1.57	10			
		065107-003	Iron	16800		1.57	10			
		065107-001	Lead	11.8		0.281	0.496	11.27	0.55	4.89%
		065107-002	Lead	10.7		0.284	0.5			
		065107-003	Lead	11.3		0.284	0.5			
		065107-001	Magnesium	5270		0.58	9.92	5243.33	161.66	3.08%
		065107-002	Magnesium	5390		0.585	10			
		065107-003	Magnesium	5070		1.17	20			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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 (continued)	33	065107-001	Manganese	401		0.13	0.992	430.67	27.06	6.28%
		065107-002	Manganese	437		0.131	1			
		065107-003	Manganese	454		0.131	1			
		065107-001	Mercury	0.0194		0.00094	0.00957	0.03	0.01	25.34%
		065107-002	Mercury	0.0322		0.00093	0.00946			
		065107-003	Mercury	0.0246		0.00098	0.00995			
		065107-001	Nickel	14.2		0.0847	0.496	15.03	0.72	4.81%
		065107-002	Nickel	15.4		0.0854	0.5			
		065107-003	Nickel	15.5		0.0854	0.5			
		065107-001	Potassium	2970		3.55	9.92	2980.00	45.83	1.54%
		065107-002	Potassium	2940		3.58	10			
		065107-003	Potassium	3030		7.15	20			
		065107-001	Selenium	0.161	U	0.161	0.496	0.36	0.06	17.53%
		065107-002	Selenium	0.399	J	0.162	0.5			
		065107-003	Selenium	0.311	J	0.162	0.5			
		065107-001	Silver	0.0895	U	0.0895	0.496	0.09	0.00	0.45%
		065107-002	Silver	0.0902	U	0.0902	0.5			
		065107-003	Silver	0.0902	U	0.0902	0.5			
		065107-001	Sodium	355		3.6	9.92	384.67	74.10	19.26%
		065107-002	Sodium	330		3.63	10			
		065107-003	Sodium	469		3.63	10			
		065107-001	Thallium	0.992	U	0.992	1.98	1.00	0.00	0.46%
		065107-002	Thallium	1	U	1	2			
		065107-003	Thallium	1	U	1	2			
		065107-001	Vanadium	30.7		0.0901	0.496	30.70	1.80	5.86%
		065107-002	Vanadium	28.9		0.0908	0.5			
		065107-003	Vanadium	32.5		0.0908	0.5			
		065107-001	Zinc	51.3	B	0.167	0.496	54.00	2.38	4.41%
		065107-002	Zinc	54.9	B	0.168	0.5			
		065107-003	Zinc	55.8	B	0.168	0.5			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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 (continued)	53	065148-001	Aluminum	8080		0.785	9.9	7973.33	115.90	1.45%
		065148-002	Aluminum	7990		0.776	9.78			
		065148-003	Aluminum	7850		0.782	9.86			
		065148-001	Antimony	0.34	U	0.34	0.99	0.75	0.20	26.40%
		065148-002	Antimony	0.612	J	0.336	0.978			
		065148-003	Antimony	0.893	J	0.339	0.986			
		065148-001	Arsenic	1.51		0.204	0.495	1.64	0.18	11.04%
		065148-002	Arsenic	1.85		0.202	0.489			
		065148-003	Arsenic	1.57		0.204	0.493			
		065148-001	Barium	54.5		0.066	0.495	55.10	0.66	1.19%
		065148-002	Barium	55.8		0.0653	0.489			
		065148-003	Barium	55		0.0658	0.493			
		065148-001	Beryllium	0.327	J	0.0495	0.495	0.33	0.01	2.05%
		065148-002	Beryllium	0.331	J	0.0489	0.489			
		065148-003	Beryllium	0.318	J	0.0493	0.493			
		065148-001	Cadmium	0.0949	J	0.0473	0.495	0.10	0.01	13.54%
		065148-002	Cadmium	0.117	J	0.0468	0.489			
		065148-003	Cadmium	0.0919	J	0.0471	0.493			
		065148-001	Calcium	1170	B	1.29	9.9	1250.00	80.00	6.40%
		065148-002	Calcium	1250	B	1.28	9.78			
		065148-003	Calcium	1330	B	1.29	9.86			
		065148-001	Chromium	7.97		0.16	0.495	7.69	0.41	5.35%
		065148-002	Chromium	7.89		0.158	0.489			
		065148-003	Chromium	7.22		0.159	0.493			
		065148-001	Cobalt	2.45		0.079	0.495	2.44	0.08	3.32%
		065148-002	Cobalt	2.51		0.0781	0.489			
		065148-003	Cobalt	2.35		0.0787	0.493			
		065148-001	Copper	4.39		0.201	0.495	4.55	0.16	3.52%
		065148-002	Copper	4.71		0.199	0.489			
		065148-003	Copper	4.54		0.2	0.493			
		065148-001	Iron	8300		1.55	9.9	8136.67	543.72	6.68%
		065148-002	Iron	8580		1.53	9.78			
		065148-003	Iron	7530		1.55	9.86			
		065148-001	Lead	7.45		0.281	0.495	7.60	0.17	2.27%
		065148-002	Lead	7.79		0.278	0.489			
		065148-003	Lead	7.57		0.28	0.493			
		065148-001	Magnesium	1700		0.579	9.9	1690.00	17.32	1.02%
		065148-002	Magnesium	1700		0.572	9.78			
		065148-003	Magnesium	1670		0.577	9.86			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2004, 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 (continued)	53	065148-001	Manganese	151		0.13	0.99	149.00	2.65	1.78%
		065148-002	Manganese	150		0.128	0.978			
		065148-003	Manganese	146		0.129	0.986			
		065148-001	Mercury	0.00154	J	0.00097	0.00985	0.00	0.00	17.84%
		065148-002	Mercury	0.00196	J	0.00097	0.00988			
		065148-003	Mercury	0.0014	J	0.00093	0.00948			
		065148-001	Nickel	4.74		0.0846	0.495	4.60	0.30	6.50%
		065148-002	Nickel	4.81		0.0836	0.489			
		065148-003	Nickel	4.26		0.0842	0.493			
		065148-001	Potassium	1750		3.54	9.9	1703.33	41.63	2.44%
		065148-002	Potassium	1690		3.5	9.78			
		065148-003	Potassium	1670		3.53	9.86			
		065148-001	Selenium	0.16	BU	0.16	0.495	0.33	0.01	4.04%
		065148-002	Selenium	0.323	BJ	0.159	0.489			
		065148-003	Selenium	0.342	BJ	0.16	0.493			
		065148-001	Silver	0.0893	U	0.0893	0.495	0.09	0.00	0.58%
		065148-002	Silver	0.0883	U	0.0883	0.489			
		065148-003	Silver	0.089	U	0.089	0.493			
		065148-001	Sodium	38.9		3.6	9.9	38.67	1.07	2.77%
		065148-002	Sodium	39.6		3.55	9.78			
		065148-003	Sodium	37.5		3.58	9.86			
		065148-001	Thallium	0.99	U	0.99	1.98	0.98	0.01	0.62%
		065148-002	Thallium	0.978	U	0.978	1.96			
		065148-003	Thallium	0.986	U	0.986	1.97			
		065148-001	Vanadium	16.1		0.0899	0.495	15.77	1.43	9.07%
		065148-002	Vanadium	17		0.0888	0.489			
		065148-003	Vanadium	14.2		0.0895	0.493			
		065148-001	Zinc	20.4		0.167	0.495	20.47	0.50	2.46%
		065148-002	Zinc	21		0.165	0.489			
		065148-003	Zinc	20		0.166	0.493			

NOTES: * = Additional metal analysis by toxicity characteristic leaching procedure (TCLP). Units for TCLP analysis are in mg/L.

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 2004, 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
Off-Site	11	065159-001	Aluminum	5200		0.788	9.94	5863.33	732.83	12.50%
		065159-002	Aluminum	6650		0.779	9.82			
		065159-003	Aluminum	5740		0.775	9.77			
		065159-001	Arsenic	2.12		0.205	0.497	2.37	0.28	11.96%
		065159-002	Arsenic	2.68		0.203	0.491			
		065159-003	Arsenic	2.32		0.202	0.488			
		065159-001	Barium	115		0.0663	0.497	123.67	10.26	8.30%
		065159-002	Barium	121		0.0655	0.491			
		065159-003	Barium	135		0.0651	0.488			
		065159-001	Beryllium	0.273	J	0.0497	0.497	0.32	0.04	13.77%
		065159-002	Beryllium	0.36	J	0.0491	0.491			
		065159-003	Beryllium	0.315	J	0.0488	0.488			
		065159-001	Cadmium	0.0641	J	0.0475	0.497	0.08	0.01	17.05%
		065159-002	Cadmium	0.0797	J	0.047	0.491			
		065159-003	Cadmium	0.0906	J	0.0467	0.488			
		065159-001	Calcium	14400		1.3	9.94	17050.00	1484.92	8.71%
		065159-002	Calcium	18100	B	1.28	9.82			
		065159-003	Calcium	16000	B	1.27	9.77			
		065159-001	Chromium	5.13		0.16	0.497	5.57	0.39	6.96%
		065159-002	Chromium	5.87		0.158	0.491			
		065159-003	Chromium	5.7		0.157	0.488			
		065159-001	Cobalt	2.37		0.0793	0.497	2.52	0.20	7.81%
		065159-002	Cobalt	2.74		0.0784	0.491			
		065159-003	Cobalt	2.44		0.0779	0.488			
		065159-001	Copper	3.74		0.202	0.497	4.08	0.39	9.44%
		065159-002	Copper	4.5		0.199	0.491			
		065159-003	Copper	4.01		0.198	0.488			
		065159-001	Iron	6450		1.56	9.94	6780.00	311.93	4.60%
		065159-002	Iron	7070		1.54	9.82			
		065159-003	Iron	6820		1.53	9.77			
		065159-001	Lead	3.38		0.282	0.497	3.98	0.70	17.65%
		065159-002	Lead	4.75		0.279	0.491			
		065159-003	Lead	3.8		0.277	0.488			
		065159-001	Magnesium	2480		0.581	9.94	2746.67	275.38	10.03%
		065159-002	Magnesium	3030		0.574	9.82			
		065159-003	Magnesium	2730		0.571	9.77			
		065159-001	Manganese	161		0.13	0.994	170.00	9.00	5.29%
		065159-002	Manganese	179		0.128	0.982			
		065159-003	Manganese	170		0.128	0.977			
		065159-001	Mercury	0.00729	J	0.00095	0.00968	0.01	0.00	19.39%
		065159-002	Mercury	0.00628	J	0.00094	0.00954			
		065159-003	Mercury	0.00491	J	0.00096	0.00976			

See notes at end of table.

TABLE C-17. Non-Radiological Replicate Results for Calendar Year 2004, 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
Off-Site (continued)	11	065159-001	Nickel	4.44	B	0.0849	0.497	4.62	0.33	7.04%
		065159-002	Nickel	4.85		0.0839	0.491			
		065159-003	Nickel	4.39		0.0834	0.488			
		065159-001	Potassium	1060	B	3.55	9.94	1320.00	155.56	11.79%
		065159-002	Potassium	1430		3.51	9.82			
		065159-003	Potassium	1210		3.49	9.77			
		065159-001	Selenium	0.234	J	0.161	0.497	0.24	0.01	2.96%
		065159-002	Selenium	0.497		0.159	0.491			
		065159-003	Selenium	0.244	J	0.158	0.488			
		065159-001	Silver	0.0897	U	0.0897	0.497	0.09	0.00	0.87%
		065159-002	Silver	0.0886	U	0.0886	0.491			
		065159-003	Silver	0.233	J	0.0881	0.488			
		065159-001	Sodium	124		3.61	9.94	135.33	15.50	11.46%
		065159-002	Sodium	153		3.57	9.82			
		065159-003	Sodium	129		3.55	9.77			
		065159-001	Thallium	0.994	U	0.994	1.99	0.98	0.01	0.89%
		065159-002	Thallium	0.982	U	0.982	1.96			
		065159-003	Thallium	0.977	U	0.977	1.95			
		065159-001	Vanadium	13.8		0.0903	0.497	14.05	0.35	2.52%
		065159-002	Vanadium	13.8	B	0.0892	0.491			
		065159-003	Vanadium	14.3	B	0.0887	0.488			
		065159-001	Zinc	16.9		0.167	0.497	18.40	1.73	9.43%
		065159-002	Zinc	20.3		0.165	0.491			
		065159-003	Zinc	18		0.164	0.488			

See notes at end of table.

TABLE C-17. Non-Radiological Replicate Results for Calendar Year 2004, 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	065073-001	Aluminum	15000		0.781	9.84	14133.33	757.19	5.36%
		065073-002	Aluminum	13800		0.785	9.9			
		065073-003	Aluminum	13600		0.775	9.77			
		065073-001	Antimony	0.389	J	0.338	0.984	0.60	0.26	42.77%
		065073-002	Antimony	0.891	J	0.34	0.99			
		065073-003	Antimony	0.533	J	0.335	0.977			
		065073-001	Arsenic	3.37		0.203	0.492	2.96	0.39	13.20%
		065073-002	Arsenic	2.59		0.204	0.495			
		065073-003	Arsenic	2.93		0.202	0.488			
		065073-001	Barium	157		0.0656	0.492	145.67	10.26	7.05%
		065073-002	Barium	143		0.066	0.495			
		065073-003	Barium	137		0.0651	0.488			
		065073-001	Beryllium	0.67		0.0492	0.492	0.63	0.04	6.20%
		065073-002	Beryllium	0.609		0.0495	0.495			
		065073-003	Beryllium	0.598		0.0488	0.488			
		065073-001	Cadmium	0.218	J	0.047	0.492	0.20	0.02	8.77%
		065073-002	Cadmium	0.192	J	0.0473	0.495			
		065073-003	Cadmium	0.185	J	0.0467	0.488			
		065073-001	Calcium	29800	B	1.28	9.84	29466.67	1137.25	3.86%
		065073-002	Calcium	30400	B	1.29	9.9			
		065073-003	Calcium	28200	B	1.27	9.77			
		065073-001	Chromium	14.3		0.159	0.492	13.30	0.87	6.55%
		065073-002	Chromium	12.9		0.16	0.495			
		065073-003	Chromium	12.7		0.157	0.488			
		065073-001	Cobalt	6.57		0.0785	0.492	6.27	0.32	5.14%
		065073-002	Cobalt	6.32		0.079	0.495			
		065073-003	Cobalt	5.93		0.0779	0.488			
		065073-001	Copper	12.6		0.2	0.492	11.63	0.85	7.31%
		065073-002	Copper	11.3		0.201	0.495			
		065073-003	Copper	11		0.198	0.488			
		065073-001	Iron	18300		1.54	9.84	17500.00	692.82	3.96%
		065073-002	Iron	17100		1.55	9.9			
		065073-003	Iron	17100		1.53	9.77			
		065073-001	Lead	13.6		0.279	0.492	11.90	1.48	12.44%
		065073-002	Lead	10.9		0.281	0.495			
		065073-003	Lead	11.2		0.277	0.488			
		065073-001	Magnesium	6130		2.88	49.2	5723.33	352.75	6.16%
		065073-002	Magnesium	5500		2.9	49.5			
		065073-003	Magnesium	5540		2.86	48.8			
		065073-001	Manganese	431		0.129	0.984	404.67	22.85	5.65%
		065073-002	Manganese	390		0.13	0.99			
		065073-003	Manganese	393		0.128	0.977			
		065073-001	Mercury	0.00736	J	0.00097	0.00984	0.01	0.00	9.52%
		065073-002	Mercury	0.00785	J	0.00098	0.00992			
		065073-003	Mercury	0.00649	J	0.00092	0.00933			

See notes at end of table.

TABLE C-17. Non-Radiological Replicate Results for Calendar Year 2004, 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	065073-001	Nickel	11.8		0.0841	0.492	11.03	0.67	6.03%
		065073-002	Nickel	10.6		0.0846	0.495			
		065073-003	Nickel	10.7		0.0834	0.488			
		065073-001	Potassium	5610		17.6	49.2	5126.67	423.60	8.26%
		065073-002	Potassium	4950		17.7	49.5			
		065073-003	Potassium	4820		17.5	48.8			
		065073-001	Silver	0.0888	U	0.0888	0.492	0.09	0.00	0.68%
		065073-002	Silver	0.0893	U	0.0893	0.495			
		065073-003	Silver	0.0881	U	0.0881	0.488			
		065073-001	Sodium	81.9		3.57	9.84	75.57	5.71	7.56%
		065073-002	Sodium	74		3.6	9.9			
		065073-003	Sodium	70.8		3.55	9.77			
		065073-001	Thallium	0.984	U	0.984	1.97	0.98	0.01	0.66%
		065073-002	Thallium	0.99	U	0.99	1.98			
		065073-003	Thallium	0.977	U	0.977	1.95			
		065073-001	Vanadium	33.9		0.0894	0.492	32.77	1.00	3.06%
		065073-002	Vanadium	32.4		0.0899	0.495			
		065073-003	Vanadium	32		0.0887	0.488			
		065073-001	Zinc	51.2		0.166	0.492	49.00	1.97	4.02%
		065073-002	Zinc	47.4		0.167	0.495			
		065073-003	Zinc	48.4		0.164	0.488			

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-18. Non-Radiological Replicate Results for Calendar Year 2004, 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
Off-Site	11	065158-001	Aluminum	20.9		0.792	9.98	20.13	6.19	30.72%
		065158-002	Aluminum	25.9		0.784	9.88			
		065158-003	Aluminum	13.6		0.788	9.94			
		065158-001	Antimony	0.343	U	0.343	0.998	0.34	0.00	0.83%
		065158-002	Antimony	0.339	U	0.339	0.988			
		065158-003	Antimony	0.4	J	0.341	0.994			
		065158-001	Arsenic	0.271	J	0.206	0.499	0.20	0.00	0.35%
		065158-002	Arsenic	0.204	U	0.204	0.494			
		065158-003	Arsenic	0.205	U	0.205	0.497			
		065158-001	Barium	3.61		0.0666	0.499	6.21	3.20	51.60%
		065158-002	Barium	9.79		0.0659	0.494			
		065158-003	Barium	5.23		0.0663	0.497			
		065158-001	Beryllium	0.0499	U	0.0499	0.499	0.05	0.00	0.51%
		065158-002	Beryllium	0.0494	U	0.0494	0.494			
		065158-003	Beryllium	0.0497	U	0.0497	0.497			
		065158-001	Cadmium	0.0477	U	0.0477	0.499	0.05	0.00	0.53%
		065158-002	Cadmium	0.0472	U	0.0472	0.494			
		065158-003	Cadmium	0.0475	U	0.0475	0.497			
		065158-001	Calcium	1130	B	1.3	9.98	1653.33	551.94	33.38%
		065158-002	Calcium	2230	B	1.29	9.88			
		065158-003	Calcium	1600	B	1.3	9.94			
		065158-001	Chromium	0.416	J	0.161	0.499	0.29	0.18	61.10%
		065158-002	Chromium	0.159	U	0.159	0.494			
		065158-003	Chromium	0.165	J	0.16	0.497			
		065158-001	Cobalt	0.0796	U	0.0796	0.499	0.08	0.00	0.44%
		065158-002	Cobalt	0.0789	U	0.0789	0.494			
		065158-003	Cobalt	0.0793	U	0.0793	0.497			
		065158-001	Copper	2.41		0.203	0.499	2.14	0.58	27.17%
		065158-002	Copper	1.47		0.201	0.494			
		065158-003	Copper	2.53		0.202	0.497			
		065158-001	Iron	36.2		1.56	9.98	35.40	3.18	8.97%
		065158-002	Iron	38.1		1.55	9.88			
		065158-003	Iron	31.9		1.56	9.94			
		065158-001	Lead	0.283	U	0.283	0.499	0.28	0.00	0.54%
		065158-002	Lead	0.28	U	0.28	0.494			
		065158-003	Lead	0.282	U	0.282	0.497			
		065158-001	Magnesium	896		2.92	49.9	751.67	193.34	25.72%
		065158-002	Magnesium	827		2.89	49.4			
		065158-003	Magnesium	532		2.91	49.7			
		065158-001	Manganese	39.9		0.131	0.998	129.97	91.07	70.07%
		065158-002	Manganese	222		0.129	0.988			
		065158-003	Manganese	128		0.13	0.994			

See notes at end of table.

TABLE C-18. Non-Radiological Replicate Results for Calendar Year 2004, 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
Off-Site (continued)	11	065158-001	Mercury	0.00098	U	0.00098	0.01	0.00	0.00	1.52%
		065158-002	Mercury	0.00096	U	0.00096	0.0098			
		065158-003	Mercury	0.00095	U	0.00095	0.00971			
		065158-001	Nickel	0.431	J	0.0852	0.499	0.29	0.15	51.53%
		065158-002	Nickel	0.134	J	0.0844	0.494			
		065158-003	Nickel	0.302	J	0.0849	0.497			
		065158-001	Potassium	6960		17.8	49.9	6526.67	378.59	5.80%
		065158-002	Potassium	6360		17.7	49.4			
		065158-003	Potassium	6260		17.8	49.7			
		065158-001	Selenium	0.162	U	0.162	0.499	0.16	0.00	0.88%
		065158-002	Selenium	0.16	U	0.16	0.494			
		065158-003	Selenium	0.434	J	0.161	0.497			
		065158-001	Silver	0.09	U	0.09	0.499	0.09	0.00	0.51%
		065158-002	Silver	0.0891	U	0.0891	0.494			
		065158-003	Silver	0.0897	U	0.0897	0.497			
		065158-001	Sodium	174	B	3.62	9.98	227.00	73.57	32.41%
		065158-002	Sodium	311	B	3.59	9.88			
		065158-003	Sodium	196	B	3.61	9.94			
		065158-001	Thallium	0.998	U	0.998	2	0.99	0.01	0.51%
		065158-002	Thallium	0.988	U	0.988	1.98			
		065158-003	Thallium	0.994	U	0.994	1.99			
		065158-001	Vanadium	0.21	BJ	0.0906	0.499	0.21	0.00	0.00%
		065158-002	Vanadium	0.21	BJ	0.0897	0.494			
		065158-003	Vanadium	0.21	BJ	0.0903	0.497			
		065158-001	Zinc	9.61		0.168	0.499	6.85	2.61	38.03%
		065158-002	Zinc	4.43		0.166	0.494			
		065158-003	Zinc	6.52		0.167	0.497			

See notes at end of table.

TABLE C-18. Non-Radiological Replicate Results for Calendar Year 2004, 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	065108-001	Aluminum	15.9		0.782	9.86	35.80	19.51	54.50%
		065108-002	Aluminum	54.9		0.793	10			
		065108-003	Aluminum	36.6		0.778	9.8			
		065108-001	Antimony	0.345	BJ	0.339	0.986	0.34	0.00	1.25%
		065108-002	Antimony	0.343	BU	0.343	1			
		065108-003	Antimony	0.337	BU	0.337	0.98			
		065108-001	Arsenic	0.204	U	0.204	0.493	0.20	0.00	0.70%
		065108-002	Arsenic	0.221	J	0.206	0.5			
		065108-003	Arsenic	0.202	U	0.202	0.49			
		065108-001	Barium	1.3	B	0.0658	0.493	2.19	0.86	39.10%
		065108-002	Barium	2.27	B	0.0667	0.5			
		065108-003	Barium	3.01	B	0.0654	0.49			
		065108-001	Beryllium	0.0493	U	0.0493	0.493	0.05	0.00	1.04%
		065108-002	Beryllium	0.05	U	0.05	0.5			
		065108-003	Beryllium	0.049	U	0.049	0.49			
		065108-001	Cadmium	0.0471	U	0.0471	0.493	0.05	0.00	1.00%
		065108-002	Cadmium	0.0478	U	0.0478	0.5			
		065108-003	Cadmium	0.0469	U	0.0469	0.49			
		065108-001	Calcium	594	B	1.29	9.86	1158.00	527.80	45.58%
		065108-002	Calcium	1240	B	1.3	10			
		065108-003	Calcium	1640	B	1.28	9.8			
		065108-001	Chromium	0.278	BJ	0.159	0.493	0.30	0.03	10.22%
		065108-002	Chromium	0.281	BJ	0.161	0.5			
		065108-003	Chromium	0.332	BJ	0.158	0.49			
		065108-001	Cobalt	0.0787	U	0.0787	0.493	0.08	0.00	1.04%
		065108-002	Cobalt	0.0798	U	0.0798	0.5			
		065108-003	Cobalt	0.0782	U	0.0782	0.49			
		065108-001	Copper	0.869		0.2	0.493	1.09	0.23	20.80%
		065108-002	Copper	1.07		0.203	0.5			
		065108-003	Copper	1.32		0.199	0.49			
		065108-001	Iron	21.5		3.09	19.7	50.40	27.44	54.45%
		065108-002	Iron	76.1		3.13	20			
		065108-003	Iron	53.6		3.07	19.6			
		065108-001	Lead	0.28	U	0.28	0.493	0.28	0.00	1.09%
		065108-002	Lead	0.284	U	0.284	0.5			
		065108-003	Lead	0.278	U	0.278	0.49			
		065108-001	Magnesium	454	B	1.15	19.7	549.00	109.66	19.97%
		065108-002	Magnesium	669	B	1.17	20			
		065108-003	Magnesium	524	B	1.15	19.6			
		065108-001	Manganese	8.94		0.129	0.986	13.21	7.18	54.39%
		065108-002	Manganese	21.5		0.131	1			
		065108-003	Manganese	9.18		0.128	0.98			

See notes at end of table.

TABLE C-18. Non-Radiological Replicate Results for Calendar Year 2004, 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-Stie (concl.)	33	065108-001	Mercury	0.00653	J	0.00531	0.0541	0.02	0.02	101.60%
		065108-002	Mercury	0.0108	J	0.00536	0.0545			
		065108-003	Mercury	0.0451	J	0.00457	0.0465			
		065108-001	Potassium	4480		7.05	19.7	4286.67	536.78	12.52%
		065108-002	Potassium	4700		7.15	20			
		065108-003	Potassium	3680		7.01	19.6			
		065108-001	Selenium	0.474	J	0.32	0.986	0.56	0.14	25.03%
		065108-002	Selenium	0.723	J	0.324	1			
		065108-003	Selenium	0.486	J	0.318	0.98			
		065108-001	Silver	0.089	U	0.089	0.493	0.09	0.00	1.03%
		065108-002	Silver	0.0902	U	0.0902	0.5			
		065108-003	Silver	0.0884	U	0.0884	0.49			
		065108-001	Sodium	1610		3.58	9.86	1300.33	362.91	27.91%
		065108-002	Sodium	1390		3.63	10			
		065108-003	Sodium	901		3.56	9.8			
		065108-001	Thallium	0.986	U	0.986	1.97	0.99	0.01	1.04%
		065108-002	Thallium	1	U	1	2			
		065108-003	Thallium	0.98	U	0.98	1.96			
		065108-001	Vanadium	0.0895	U	0.0895	0.493	0.13	0.05	37.81%
		065108-002	Vanadium	0.16	J	0.0908	0.5			
		065108-003	Vanadium	0.0925	J	0.089	0.49			
		065108-001	Zinc	5.46		0.166	0.493	5.89	0.79	13.45%
		065108-002	Zinc	6.8		0.168	0.5			
		065108-003	Zinc	5.4		0.165	0.49			

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-19. TLD Measurements by Quarter and Location Class for Calendar Year, 2004

Location Class	Location Number	1st Quarter (92 Days) Exposure (mR)	Error	2nd Quarter (104 Days) Exposure (mR)	Error	3rd Quarter (91 Days) Exposure (mR)	Error	4th Quarter (97 Days) Exposure (mR)	Error	Exposure Rate uR per hour	Error
Off-Site	10	28.4	0.7	22.1	3	28.5	0.7	31.3	1.2	11.97	0.37
	11	*	*	12.7	2.1	18	1.7	24.9	0.9	7.93	0.41
	21	26.9	1.3	16.6	1.9	21.2	0.9	26.5	0.7	9.90	0.28
	22	26.3	0.7	14	2.6	19.1	1.5	24.8	1	9.14	0.35
	23	25.8	1.2	15.9	1.9	20.8	1.5	24.5	0.7	9.44	0.30
	24	24.2	2	13.9	2.8	18.4	2.4	22.9	0.7	8.62	0.46
	25	25.9	0.8	15.3	2.2	21.1	1.6	25.3	0.7	9.51	0.32
	26	34.9	2	18.4	2.9	27.7	1.2	32.5	1.9	12.32	0.45
	27	26.8	1.6	*	*	21.2	0.9	25.9	1.5	11.00	0.35
	28	26.4	1.5	*	*	19.2	1.4	23.6	0.7	10.30	0.32
	29	23.5	1.2	12.9	1.2	18.2	1.7	22.5	0.8	8.37	0.27
	30	31.6	2	19.9	1.6	24.8	2.7	28.6	0.7	11.38	0.41
Perimeter	4	28.2	0.5	15.3	1.5	19.7	1.3	27	1.4	9.79	0.27
	5	26.1	1.8	12.8	2.1	17.6	1.5	23.7	0.4	8.70	0.34
	16	34.2	0.6	19.4	1.6	25.1	1.6	32.4	1.5	12.06	0.30
	18	27.2	0.6	14.7	2.3	22.8	1.1	26.6	0.5	9.91	0.29
	19	31	1	16.9	2	22.9	1.3	29	0.4	10.83	0.28
	39	27.7	1.6	14.7	2	19.1	1.6	25.7	0.6	9.46	0.33
	40	27.1	1	14.3	2.3	18.8	1.6	26.3	0.8	9.39	0.33
	81	29.5	1.3	16.1	2	21.3	1.2	27.1	0.8	10.20	0.30
On-Site	1	29.4	1.7	16.7	0.9	21.2	0.9	26.2	0.5	10.15	0.24
	2NW	26.6	1.9	13.8	2.2	18.1	0.9	24.7	0.4	9.03	0.33
	3	28.2	1.7	15.1	1.9	21.5	1.9	27.3	0.4	9.99	0.35
	6	27.6	1.4	14.2	1.7	20	1.8	26.3	0.5	9.56	0.31
	7	30.6	1.7	16	2	22.5	1.5	27.7	0.5	10.50	0.33
	20	30.4	0.8	16.1	2.3	21.6	0.9	27.6	0.4	10.38	0.29
	31	26.6	1	14.3	2	19	1.2	25.7	1.3	9.29	0.31
	41	28.1	2.5	15.8	2.5	*	*	27.8	1.7	10.20	0.56
	42	26.6	0.3	15.3	1.7	18.7	1.9	25.5	1.2	9.34	0.31
	43	26.7	1	15	2.1	20.2	0.9	24.6	0.5	9.39	0.28
	46	29.2	0.4	16.2	1	22.2	2.5	27.2	0.4	10.29	0.30
	47	30.2	0.9	15.7	1.7	20.8	1.3	24.5	0.4	9.90	0.26
	48	30.8	1.4	18	2.4	*	*	29.3	0.9	11.11	0.42
	66	28.5	0.4	14.9	2	21	1.1	26.9	0.4	9.91	0.26
Operational	45	39.2	0.3	20.8	2	28.2	1.1	32	0.9	13.04	0.27
	45E	37.2	0.4	16.5	3.1	22.4	1	27.2	0.4	11.21	0.36

NOTES: mR = Milliroentgen (10^{-3} roentgen); uR = microroentgen (10^{-6} roentgen)
*Dosimeter was not returned.
"Operational" refers to TLD locations that are near ongoing operations that may influence readings, such that they may not truly reflect "environmental" conditions.

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TABLE C-20. Summary TLD Results for Calendar Year 2004, SNL/NM

Location Class	Number of Locations	Mean Exposure Rate (uR/hour)	Median Exposure Rate (uR/hour)	Std Dev.	Minimum	Maximum
Community	12	10.0	9.7	1.4	7.9	12.3
Perimeter	8	10.0	9.8	1.0	8.7	12.1
On-Site	14	9.9	10.0	0.6	9.0	11.1
Operational	2	12.1	12.1	1.3	11.2	13.0

NOTES: uR = microroentgen (10^{-6} roentgen)
"Operational" refers to TLD locations that are near ongoing operations that may influence readings, such that they may not truly reflect "environmental" conditions.

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