

Sandia Report
SAND2015-6153R
Unlimited Release
Printed September 2015

2014

ANNUAL SITE ENVIRONMENTAL REPORT

FOR

*Sandia National Laboratories,
Tonopah Test Range,*

NEVADA

&

Kauai Test Facility,

HAWAII

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Approved for public release; further dissemination unlimited.



**Sandia
National
Laboratories**



U.S. DEPARTMENT OF
ENERGY

NNSA
National Nuclear Security Administration

SAND2015-6153R
Unlimited Release
Printed September 2015

2014 Annual Site Environmental Report for Sandia National Laboratories, Tonopah Test Range, Nevada, and Kauai Test Facility, Hawaii

Produced by

Environmental Programs
Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185-0730

for

Department of Energy
National Nuclear Security Administration
Sandia Field Office

Abstract

Sandia National Laboratories (SNL) is a multiprogram laboratory managed and operated by Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA) under contract DE-AC04-94AL85000. The DOE/NNSA Sandia Field Office administers the contract and oversees contractor operations at the SNL, Tonopah Test Range (SNL/TTR) in Nevada and the SNL, Kauai Test Facility (SNL/KTF) in Hawaii. Sandia manages and conducts operations at SNL/TTR in support of the DOE/NNSA's Weapons Ordnance Program and has operated the site since 1957. Navarro Research and Engineering subcontracts with Sandia to administer most of the environmental programs at SNL/TTR. The DOE/NNSA/Nevada Field Office retains responsibility for cleanup and management of SNL/TTR Environmental Restoration sites. Sandia operates SNL/KTF as a rocket preparation launching and tracking facility. This Annual Site Environmental Report summarizes data and the compliance status of Sandia's sustainability, environmental protection, and monitoring programs at SNL/TTR and SNL/KTF during calendar year 2014. Major environmental programs include air quality, water quality, groundwater protection, terrestrial surveillance, waste management, pollution prevention, environmental restoration cleanup activities, and implementation of the National Environmental Policy Act. Sandia is responsible only for those environmental program activities related to its operations. Environmental monitoring and surveillance programs are required by [DOE O 231.1B, Change 1](#), *Environment, Safety, and Health Reporting*.

Issued by Sandia National Laboratories, operated for the United States Department of Energy by Sandia Corporation.

NOTICE: This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government, nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represent that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government, any agency thereof, or any of their contractors or subcontractors. The views and opinions expressed herein do not necessarily state or reflect those of the United States Government, any agency thereof, or any of their contractors.

Printed in the United States of America. This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831

Telephone: (865) 576-8401
Facsimile: (865) 576-5728
E-mail: reports@osti.gov
Online order: <http://www.osti.gov/scitech>

Available to the public from

U.S. Department of Commerce
National Technical Information Service
5301 Shawnee Rd
Alexandria, VA 22312

Telephone: (800) 553-6847
Facsimile: (703) 605-6900
E-mail: orders@ntis.gov
Online order: <http://www.ntis.gov/search>



2014 Annual Site Environmental Report

Sandia National Laboratories, Tonopah Test Range, Nevada, and Kauai Test Facility, Hawaii

Final approval date: August 2015

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

Prepared for

U.S. Department of Energy, National Nuclear Security Administration,
Sandia Field Office, Albuquerque, New Mexico

Prepared by

Sandia Corporation, Albuquerque, New Mexico
Environmental Programs

Acknowledgments

We wish to thank the following individuals who provided their time and expertise assisting in the production of the Sandia National Laboratories, Tonopah Test Range, Nevada (SNL/TTR) and Sandia National Laboratories, Kauai Test Facility, Hawaii (SNL/KTF) annual report.

Project Lead/Technical Reviewer

Stacy Griffith

DOE/NNSA/SFO Project Lead/Technical Reviewer

Karen Agogino

Document Production and Technical Editing

Angela M. Salas

Nancy White

Alexandra Minitrez

Shirley Coe

Contributing Authors

Avery, Penny

Bailey-White, Brenda

Barthel, Michael

Catechis, Christopher

Deal, Kathie

Eckstein, Joanna

Evelo, Stacie

Forston, William

Green, Kelly

Herring III, Allen

Lanton, Tiffany

Li, Jun

Martinez, Reuben

Mauser, Joseph

Miller, Amy

Miller, Mark

Nagy, Michael

Payne, Jennifer

Peek, Dennis

Reiser, Anita

Ricketson, Sherry

Roma, Charles

Salinas, Stephanie

Shain, Matthew

Ulrich, Rebecca

Note to the Reader

The goal of the SNL/TTR and SNL/KTF Annual Site Environmental Report is to present summary environmental data regarding environmental performance and compliance with environmental standards and requirements, and to highlight significant facility programs. In addition, the U.S. Department of Energy views this document as a valuable tool for maintaining a dialogue with our community about the environmental health of these sites. We continually strive to improve the quality of the contents as well as to include information that is important to you. Please provide feedback, comments, questions, or requests for copies of this report and/or appendices to:

U.S. Department of Energy National Nuclear Security Administration Sandia Field Office

P.O. Box 5400

Albuquerque, NM 87185-5400

Attention: Karen Agogino

The SNL/TTR and SNL/KTF Annual Site Environmental Report can be found at the following website:

<http://www.sandia.gov/news/publications/environmental/index.html>

This page intentionally left blank.

Contents

Appendices	iii
Figures	iii
Tables	iv
Acronyms and Abbreviations	v
Units of Measure	viii
SNL/TTR and SNL/KTF Executive Summary	1
Sandia National Laboratories, Tonopah Test Range.....	1
Sandia National Laboratories, Kauai Test Facility	4
PART ONE	7
Sandia National Laboratories, Tonopah Test Range, Nevada	7
Chapter 1. SNL/TTR Introduction	9
1.1. Mission	9
1.1.1 Operating Contract.....	9
1.2. Location Description.....	10
1.3. SNL/TTR History and Operations.....	10
1.4. SNL/TTR Activities and Facilities.....	12
1.4.1 Mission Control Center	13
1.4.2 Environmental Restoration Project.....	13
1.5. Environmental Setting.....	14
1.5.1 Site Description and Demographics.....	14
1.5.2 Geology.....	14
1.5.3 Surface Water.....	14
1.5.4 Groundwater.....	15
1.5.5 Climate	15
1.5.6 Vegetation	15
1.5.7 Wildlife.....	16
1.6. Double Tracks and Clean Slate Sites	16
Chapter 2. SNL/TTR Compliance Summary	25
2.1. Compliance Status with State Regulations	25
2.2. Compliance Status with Federal Regulations.....	26
2.2.1 Comprehensive Environmental Response, Compensation, and Liability Act.....	27
2.2.2 Emergency Planning and Community Right-to-Know Act.....	27
2.2.3 Resource Conservation and Recovery Act	28
2.2.4 Federal Facility Compliance Act	28
2.2.5 Clean Air Act and Clean Air Act Amendments of 1990	28
2.2.6 Wastewater.....	29
2.2.7 Safe Drinking Water Act	29
2.2.8 Toxic Substances Control Act.....	29
2.2.9 Federal Insecticide, Fungicide, and Rodenticide Act.....	30
2.2.10 National Environmental Policy Act	30
2.2.11 Endangered Species Act	30
2.2.12 Migratory Bird Treaty Act.....	31
2.2.13 Federal Facility Agreement and Consent Order Compliance for Environmental Restoration Activities	32
2.2.14 Cultural Resources Acts.....	32
2.2.15 Atomic Energy Act.....	33
2.2.16 Environmental Compliance Executive Orders	34

2.2.17	Department of Energy Directives	34
2.2.18	Quality Assurance	34
2.3.	Audits in 2014.....	35
2.4.	Environmental Permits	36
2.5.	Occurrence Reporting.....	36
Chapter 3.	SNL/TTR Environmental Programs	37
3.1.	Environmental Programs.....	37
3.1.1	Environmental Restoration Project Activities	37
3.1.2	Waste Management Program	39
3.1.3	Spill Prevention Control and Countermeasures Plan	40
3.1.4	National Environmental Policy Act Program	41
3.1.5	Additional Environmental Monitoring Activities at SNL/TTR.....	41
3.1.6	Summary of Release Reporting.....	42
3.2.	Terrestrial Surveillance Program	42
3.2.1	Regulatory Criteria	43
3.2.2	Sample Locations and Media	43
3.2.3	Field Methods, Analytical Parameters, and Quality Control Procedures.....	48
3.2.4	Sample Result Analysis and Methodology	48
3.2.5	Summary of Terrestrial Surveillance Program Activities and Results in 2014	50
3.3.	Air Quality Compliance Program.....	54
3.3.1	National Emission Standards for Hazardous Air Pollutants.....	54
3.3.2	Nonradiological Air Emissions.....	55
3.4.	Water Quality Programs	56
3.4.1	Production Well Monitoring.....	56
3.4.2	Water Conservation	58
3.4.3	Sewage System and Septic Tank Monitoring.....	59
3.4.4	Stormwater Sampling.....	59
PART TWO.....	61	
Sandia National Laboratories, Kauai Test Facility, Hawaii	61	
Chapter 4. SNL/KTF Introduction	63	
4.1.	Mission.....	63
4.1.1	Operating Contract	63
4.2.	Location Description.....	64
4.3.	Facilities and Operations	64
4.4.	Rocket Launches in 2014.....	66
4.5.	Demographics	66
Chapter 5. SNL/KTF Compliance Summary.....	67	
5.1.	Compliance Status with Federal Regulations	67
5.1.1	Comprehensive Environmental Response, Compensation, and Liability Act	68
5.1.2	Superfund Amendments and Reauthorization Act.....	68
5.1.3	Resource Conservation and Recovery Act	69
5.1.4	Federal Facility Compliance Act.....	69
5.1.5	National Environmental Policy Act.....	70
5.1.6	Endangered Species Act.....	70
5.1.7	Cultural Resources Acts	74
5.1.8	Migratory Bird Treaty Act of 1918.....	74
5.1.9	Environmental Compliance Executive Orders.....	74
5.1.10	Department of Energy Directives	74
5.1.11	Clean Air Act and Clean Air Act Amendments of 1990.....	74
5.1.12	Clean Water Act	75
5.1.13	Oil Storage Guidelines.....	75
5.1.14	Safe Drinking Water Act.....	75

5.1.15 Toxic Substances Control Act.....	75
5.1.16 Federal Insecticide, Fungicide, and Rodenticide Act.....	75
5.2. Releases and Occurrences.....	75
Chapter 6. SNL/KTF Environmental Programs	77
6.1. Environmental Programs.....	77
6.1.1 National Environmental Policy Act Program.....	77
6.1.2 Environmental Restoration Project.....	77
6.2. Environmental Surveillance and Monitoring Programs.....	77
6.2.1 Water Quality Program.....	78
6.2.2 Air Quality Compliance Program.....	78
6.2.3 Meteorological Monitoring.....	78
6.2.4 Noise Monitoring.....	79
6.3. Terrestrial Surveillance Program.....	79
6.3.1 Statistical Analysis.....	79
6.3.2 Sampling Locations	80
6.4. Waste Management Program	81
Glossary	83
References.....	87
Executive Orders	89
DOE Directives	89
Code of Federal Regulations.....	90
Federal Acts and Statutes.....	90
State of Hawaii Environmental Regulations.....	91
State of Nevada Environmental Regulations	91
Distribution	93

Appendices

All appendices are located on the CD attached to the back inside cover of this report.

Appendix A. 2014 SNL/TTR Terrestrial Surveillance Results (See attached CD)

Appendix B. 2014 SNL/TTR Wastewater Sampling Results..... (See attached CD)

Appendix C. SNL/KTF Sampling Location Maps..... (See attached CD)

Figures

Figure 1-1. SNL/TTR location within the boundaries of NNTR.....	11
Figure 1-2. SNL/TTR Main Lake Underground Recovery at Cactus Flat, August 2014.....	12
Figure 1-3. SNL/TTR Operations Center before remodel.....	13
Figure 1-4. SNL/TTR Operations Center after remodel	13
Figure 1-5. SNL/TTR soils project air-monitoring stations located at the Range Operations Center (400), Clean Slate 1 (402), and Clean Slate 3 (401)	18
Figure 1-6. SNL/TTR Station 400 measures radiological and meteorological conditions near the ROC	20
Figure 1-7. SNL/TTR solar-powered air sampler, saltation sensor, and meteorological tower (background, center, and foreground, respectively) at Station 401, located along the north fence that bounds the Clean Slate 3 contamination area	22
Figure 1-8. SNL/TTR solar-powered air sampler, saltation sensor, and meteorological tower (center right, foreground left, and center left, respectively) at Station 402, located along the north fence that bounds the Clean Slate 1 contamination area	23
Figure 1-9. SNL/TTR wind speed and PM ₁₀ trends for stations 400, 401, and 402, January 1–December 31, 2014	24

Figure 3-1. SNL/TTR diesel fuel tank (1,000 gal) at Building 24-51.....	41
Figure 3-2. SNL/TTR on-site terrestrial surveillance locations	45
Figure 3-3. SNL/TTR perimeter terrestrial surveillance locations	46
Figure 3-4. SNL/TTR off-site terrestrial surveillance locations.....	47
Figure 3-5. SNL/TTR historical plutonium-239/240 and americium-241 at sampling location S-51	52
Figure 3-6. SNL/TTR TLD exposure rates by year and location classification.....	53
Figure 3-7. SNL/TTR Production Well 6 pump house, provides Area 3 drinking water.....	56
Figure 3-8. SNL/TTR water treatment facility arsenic removal system.....	58
Figure 3-9. SNL/TTR water treatment facility CO ₂ pH adjustment system	58
Figure 4-1. SNL/KTF location on Kauai, Hawaii.....	65

Tables

Table 1-1. SNL/TTR Project Roller Coaster test information	17
Table 1-2. SNL/TTR gross alpha results for sampling stations, 2014	21
Table 1-3. SNL/TTR gross beta results for sampling stations, 2014	21
Table 2-1. SNL/TTR applicable State of Nevada Administrative Code.....	25
Table 2-2. SNL/TTR applicable major environmental regulations and statutes.....	26
Table 2-3. SNL/TTR applicable EPCRA reporting requirements, 2014.....	27
Table 2-4. SNL/TTR protected species potentially occurring in Nye County, Nevada	31
Table 2-5. SNL/TTR environmental audits, 2014.....	35
Table 2-6. SNL/TTR permits, 2014.....	36
Table 3-1. SNL/TTR status of CAU remediation activities, 2014.....	38
Table 3-2. SNL/TTR waste generated.....	39
Table 3-3. SNL/TTR waste shipped.....	39
Table 3-4. SNL/TTR material recycled or energy-recovered and shipped off-site, 2014.....	40
Table 3-5. SNL/TTR on-site terrestrial surveillance locations, sample media, and parameters.....	43
Table 3-6. SNL/TTR perimeter terrestrial surveillance locations, sample media, and parameters.....	44
Table 3-7. SNL/TTR off-site terrestrial surveillance locations, sample media, and parameters	44
Table 3-8. SNL/TTR priority decision matrix and actions.....	49
Table 3-9. SNL/TTR various reference values for metals in soil (all units in mg/kg).....	50
Table 3-10. SNL/TTR radiological summary statistics, 2000–2014	51
Table 3-11. SNL/TTR radiological summary statistics for Priority-1 and Priority-2 sample locations, 2014.....	52
Table 3-12. SNL/TTR TLD exposure rate summary statistics by location classification, 2000–2014.....	53
Table 3-13. SNL/TTR metals summary statistics for Priority-3 sample locations.....	54
Table 3-14. SNL/TTR average air concentration	55
Table 3-15. SNL/TTR calculated dose assessment results for on-site receptor, 1996–1997	55
Table 3-16. SNL/TTR routine production well monitoring.....	57
Table 5-1. SNL/KTF applicable major environmental regulations and statutes.....	67
Table 5-2. SNL/KTF permits in place	68
Table 5-3. SNL/KTF applicable EPCRA reporting requirements, 2014	69
Table 5-4. SNL/KTF threatened and endangered species potentially occurring on Kauai, Hawaii.....	70
Table 6-1. SNL/KTF summary statistics for metals in soil, 2012 (all units in mg/kg)	79
Table 6-2. SNL/KTF on-site terrestrial surveillance locations.....	80
Table 6-3. SNL/KTF off-site terrestrial surveillance locations.....	81

Acronyms and Abbreviations

Acronym/Abbreviation		Definition
A	AEA	Atomic Energy Act
	AP	air permit
	ASER	Annual Site Environmental Report
	AST	aboveground storage tank
B	bgs	below ground surface
	BLM	Bureau of Land Management
	BMP	best management practice
C	CAA	Clean Air Act
	CAS	Corrective Action Site
	CAU	Corrective Action Unit
	CDX	Countermeasures Demonstration Experiment
	CEMP	Community Environmental Monitoring Program
	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
	CFR	Code of Federal Regulations
D	DEHP	di(2-ethylhexyl) phthalate
	DOD	U.S. Department of Defense
	DOE	U.S. Department of Energy
	DRI	Desert Research Institute
E	EDE	effective dose equivalent
	EHS	extremely hazardous substance
	EMS	Environmental Management System
	EO	Executive Order
	EPA	U.S. Environmental Protection Agency
	EPCRA	Emergency Planning and Community Right-to-Know Act
	ER	Environmental Restoration
	ESA	Endangered Species Act
	ES&H	Environment, Safety, and Health
F	FDID	Fire Department Identification
	FFACO	Federal Facility Agreement and Consent Order
	FIDLER	field instrument for detection of low energy radiation
	FTU	Flight Test Unit
G	GOES	Geostationary Operational Environmental Satellite
H	HAP	hazardous air pollutant

Acronym/Abbreviation		Definition
I	IOC	inorganic compound
	ISMS	Integrated Safety Management System
	ISO	International Organization for Standardization
K	KTF	Kauai Test Facility
M	MBAS	methylene blue active substances
	MBTA	Migratory Bird Treaty Act
	MCL	maximum contaminant level
	MDA	minimum detectable activity
	MEI	maximally exposed individual
	MOU	memorandum of understanding
N	NAC	Nevada Administrative Code
	NAFB	Nellis Air Force Base
	NAFR	Nellis Air Force Range
	Navarro	Navarro Research and Engineering
	ND	not detectable
	NDEP	Nevada Division of Environmental Protection
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants
	NFO	Nevada Field Office
	NFPA	National Fire Protection Association
	NNSA	National Nuclear Security Administration
	NNSS	National Nuclear Security Site
	NO _x	nitrogen oxide
	NPDES	National Pollutant Discharge Elimination System
	NRS	Nevada Revised Statute
	NTTR	Nevada Test and Training Range
	NV	Nevada
	NWHR	Nevada Wild Horse Range
O	O&M	Operation and Maintenance
P	PCB	polychlorinated biphenyl
	Permit, the	Department of the Air Force Permit to the National Nuclear Security Administration to Use Property Located on the Nevada Test and Training Range, Nevada
	pH	potential of hydrogen
	PIC	pressurized ion chamber
	PM ₁₀	particulate matter that has a diameter equal to or less than 10 microns
	PMRF	Pacific Missile Range Facility
	Pu	plutonium
	PWS	public water system

Acronym/Abbreviation		Definition
R	RCRA	Resource Conservation and Recovery Act
	ROC	Range Operations Center
	RPDP	Radiation Protection Dosimetry Program
S	Sandia	Sandia Corporation
	SARA	Superfund Amendments and Reauthorization Act
	SFO	Sandia Field Office
	SHPO	State Historic Preservation Office
	SNL	Sandia National Laboratories
	SNL/KTF	Sandia National Laboratories, Kauai Test Facility
	SNL/NM	Sandia National Laboratories, New Mexico
	SNL/TTR	Sandia National Laboratories, Tonopah Test Range
	SOC	synthetic organic compound
	SO _x	sulphur oxide
	SPCC	Spill Prevention Control and Countermeasures
	STARS	Strategic Target System
	SWPPP	Stormwater Pollution Prevention Plan
T	TAL	Target Analyte List
	TLD	thermoluminescent dosimeter
	TRI	Toxic Release Inventory
	TS	Terrestrial Surveillance (Program)
	TSCA	Toxic Substances Control Act
	TTR	Tonopah Test Range
	TTR/FD	Tonopah Test Range Fire Department
U	U.S.	United States
	USAF	U.S. Air Force
V	VOC	volatile organic compound
W	WRCC	Western Regional Climate Center

Units of Measure

Unit	Definition
Bq/m ³	Becquerel per cubic meter
°C	degrees Celsius
Ci/m ³	curies per cubic meter
°F	degrees Fahrenheit
ft	feet
gal	gallon
kg	kilogram
lb	pound
μ	micron
μCi/mL	microcuries per milliliter
μg/m ²	micrograms per square meter
mg/kg	milligrams per kilogram
mph	miles per hour
mrem/yr	millirems per year
mR/yr	milliroentgen per year
mSv/yr	millisievert per year
pCi/g	picocuries per gram
ppb	parts per billion
ppm	parts per million

SNL/TTR and SNL/KTF Executive Summary

Sandia National Laboratories (SNL) is one of the nation's multiprogram national security laboratories. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates the Tonopah Test Range (TTR) in Nevada and the Kauai Test Facility (KTF) in Hawaii for the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA). The DOE/NNSA/Sandia Field Office (SFO) administers the contract and oversees contractor operations at the sites.

This Annual Site Environmental Report (ASER) was prepared in accordance with and as required by:

- [DOE O 231.1B, Change 1, Environment, Safety, and Health Reporting](#)
- [DOE O 435.1, Change 1, Radioactive Waste Management](#) (DOE Certified Date 2007)
- [DOE O 458.1, Change 3, Radiation Protection of the Public and the Environment](#)
- [DOE O 232.2 Admin. Change 1, Occurrence Reporting and Processing of Operations Information](#)

This ASER summarizes data from environmental protection and monitoring programs SNL/TTR and SNL/KTF for calendar year 2014. It also discusses Sandia's compliance with environmental statutes, regulations, and permit provisions, and it highlights significant environmental programs and efforts at SNL/TTR and SNL/KTF. This report is a key component of DOE's efforts to keep the public informed about environmental conditions throughout the DOE/NNSA complex.

Sandia National Laboratories, Tonopah Test Range

Sandia conducts operations at SNL/TTR in support of the DOE/NNSA's Weapons Ordnance Program. Sandia's activities involve research and development and the testing of weapon components and delivery systems. Many of these activities require a remote testing range with a long flight corridor for air drops and rocket launches. There were no reportable environmental occurrences in 2014.

The following environmental programs are in place at SNL/TTR:

- Waste Management Program
- Environmental Restoration (ER) Project
- Terrestrial Surveillance Program
- Water Quality Program
- Air Quality Compliance Program
- National Environmental Policy Act (NEPA) Program

Waste Management Program

Waste generated during 2014 at SNL/TTR included hazardous waste regulated by the Resource Conservation and Recovery Act (RCRA) and nonhazardous industrial and sanitary solid waste. All hazardous waste was shipped to permitted treatment, storage, and disposal facilities. Waste minimization and recycling efforts are integrated into the Waste Management Program. See Section 3.1.2 for more

information. Sandia does not handle waste generated by ER activities. The Nevada Division of Environmental Protection (NDEP) conducted an unannounced inspection of SNL/TTR Waste Management activities on April 15, 2014; no deficiencies were noted. See Section 3.1.2 for more information.

Environmental Restoration Project

ER Project activities at SNL/TTR and the Nevada Test and Training Range (NTTR) are conducted through the DOE/NNSA/Nevada Field Office (NFO). ER sites that are scheduled for remediation or that have been closed at SNL/TTR include areas impacted from target tests and detonations, including nonimpacted surface debris and areas impacted by ordnance, depleted uranium, heavy metals, and fuel spills. ER activities in 2014 included characterizing, packaging, and transporting 6,000 cubic feet of low-level waste from Clean Slate II to the National Nuclear Security Site. This waste was generated during the 1996 and 1997 remediation effort at Double Tracks and Clean Slate I. See Section 3.1.1 for more information.

Other ER activities conducted on the SNL/TTR and NTTR sites in 2014 consisted of the annual post-closure inspections of closed and use-restricted industrial sites and inspections of radiological postings at the Clean Slate and Double Tracks sites. The inspections were conducted in May 2014, and minor erosion and subsidence repairs were completed in July 2014. Vegetation monitoring was also conducted at select sites in June 2014.

In addition, air samples were collected routinely throughout the year at various locations on the SNL/TTR and NTTR sites.

Terrestrial Surveillance Program

The Terrestrial Surveillance Program at SNL/TTR collects and analyzes environmental media samples annually to determine whether there has been a radiological or nonradiological release to the environment due to SNL/TTR operations. In addition to collecting environmental media (soil), ambient external gamma radiation levels are measured using environmental thermoluminescent dosimeters (TLDs). During 2014, soil samples were collected from 6 on-site, 8 perimeter, and 14 off-site locations. TLDs were collected on a quarterly basis from 6 on-site, 3 perimeter, and 3 off-site locations. See Section 3.2 for more information.

In 2014, soils were analyzed for radiological and nonradiological constituents. The results showed that annual monitoring is required at location S-51, where it continues to be identified as a Priority-1 for americium-241. This location at the edge of South Plume Area is expected to have elevated readings and is consistent with the hot particle theory, where the presence of americium-241 or plutonium-239/240 in a heterogeneous sample skews the apparent average concentration, making it appear greater than it is. Sampling and trend analyses will continue at S-51.

Nonradiological monitoring of Target Analyte List (TAL) metals for soil samples was conducted at 13 on-site locations, and one location was identified as Priority-3 for cadmium. This value is assumed to represent natural background at this location.

Water Quality Program

The NDEP permits the Public Water System (PWS) at SNL/TTR as a nontransient, non-community water system under identification number NV003014. Production Well 6 supplies potable water for the SNL/TTR Area 3 Drinking Water Distribution System and the Area 3 Fire Protection Water Distribution System. See Section 3.4 for more information. In 2014, NDEP conducted a Sanitary Survey of the PWS; no findings or discrepancies were noted.

The PWS water is routinely sampled and analyzed per the NDEP requirements to demonstrate conformance with primary drinking water standards. In 2014, all PWS sample results were below the maximum contaminant levels established for the substances monitored.

SNL/TTR also has an NDEP-permitted treatment system for arsenic removal (permit number NV-3014-TP-11-12NTNC). The arsenic removal system has performed well since the installation of a carbon dioxide (potential of hydrogen [pH] adjustment) system in June 2008. The arsenic removal media was replaced with new media in February 2013. PWS arsenic levels throughout 2014 were at or below the detection limit of 1 ppb. The arsenic removal media should last approximately five years before a media change-out is required.

Wastewater discharges at SNL/TTR did not negatively impact the U.S. Air Force-held National Pollutant Discharge Elimination System permit in 2014.

Five septic tank systems are located on-site at SNL/TTR, which are owned by DOE/NNSA (the newest of which is inactive). None of these systems required maintenance, sampling, or pumping in 2014.

Oil Storage and Spill Control

The Spill Prevention Control and Countermeasures Plan (required under the Clean Water Act) describes the oil storage facilities at SNL/TTR and the mitigation controls in place to prevent inadvertent discharges of oil. Oil storage facilities subject to regulations include oil storage tanks (aboveground storage tanks, underground storage tanks, and transformers), bulk storage areas (multiple containers), and temporary or portable tanks. Sandia currently operates seven aboveground storage tanks. See Section 3.1.3 for more information.

Air Quality Compliance Program

The National Emission Standards for Hazardous Air Pollutants regulate radiological air emissions. The only radionuclide sources at SNL/TTR are the three Clean Slate sites, which are sources of diffuse radionuclide emissions as a result of the resuspension of contaminated soils. These sites currently are being addressed by DOE/NNSA/SFO under the ER Project. The calculated dose for the maximally exposed individual was 0.024 mrem/yr, which is approximately 400 times less than the 10 mrem/yr standard set by the U.S. Environmental Protection Agency (EPA) as specified in Title 40 Code of Federal Regulations (CFR), Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities.” Based on this value, it is not required that an annual dose assessment be calculated for the SNL/TTR site. See Section 3.3 for more information.

SNL/TTR’s Class II Air Quality Permit requires emission reports from significant nonradionuclide sources. At SNL/TTR, these sources include a portable screen, multiple generators, and maintenance shop activities.

National Environmental Policy Act Program

At SNL/TTR, NEPA compliance is coordinated between personnel from SNL/TTR, SNL, New Mexico (SNL/NM), and the DOE/NNSA/SFO. Personnel from SNL/TTR and the SNL/NM NEPA team supported the DOE/NNSA/SFO in analyzing projects at SNL/TTR, such as the upgrade of a fiber-optic cable communications loop and a series of liquid natural gas burn and dispersal experiments. This support included participation in the development of an archaeological survey for a proposed 50-mile loop needed to install fiber-optic cable communication and in the completion of a SAND report that mapped the archaeological surveys at SNL/TTR between 1974 and 2014. See Section 3.1.4 for more information.

In addition to these activities, the SNL/NM NEPA team completed ten NEPA checklists for SNL/TTR, five of which were transmitted to the DOE/NNSA/SFO for review and determination in 2014.

Sandia National Laboratories, Kauai Test Facility

SNL/KTF personnel provide rocket preparation, launching, and tracking support for DOE/NNSA, as well as providing support to other U.S. government agencies. SNL/KTF exists as a facility within the boundaries of the U.S. Department of Defense, Pacific Missile Range Facility (PMRF). SNL/KTF is located on the island of Kauai at the north end of the PMRF near Nohili Point; it has been used as an active rocket launching facility since 1962.

The EPA recommended continued reevaluation for environmental contamination due to past ordnance activity near the site. Rocket exhaust continues to be the main source of metals and other nonreportable air emission releases. The EPA's recommendation is addressed by collecting environmental soil samples for TAL metal analysis every five years. See Section 3.1.4 for more information.

The following environmental programs are in place at SNL/KTF:

- NEPA Program
- Water quality programs
- Air Quality Compliance Program
- Terrestrial Surveillance Program
- Waste Management Program

National Environmental Policy Act Program

At SNL/KTF, NEPA compliance is coordinated between personnel from SNL/KTF, SNL/NM, and the DOE/NNSA/SFO. In 2014, the SNL/NM NEPA team continued to provide support to several programmatic activities performed at either KTF or PMRF. See Section 6.1.1 for more information.

In addition to these activities, the NEPA team completed four NEPA checklists for SNL/KTF, three of which were transmitted to the DOE/NNSA/SFO for review and determination in 2014.

Water Quality Program

In 2014, there were no compliance issues with respect to any state or federal water pollution regulations at SNL/KTF. See Section 6.2.1 for more information.

Drinking water at SNL/KTF is obtained through local facilities and suppliers. No wells provide drinking water at the site.

The limited quantity of sanitary sewage released at the facility does not impact any protected waters; no state inspections were conducted during 2014. As a best management practice, personnel periodically perform sampling. All three on-site septic tanks were inspected, sampled, and pumped in 2013. Historically, no contaminants have been identified above the reporting limits from these past sampling events. During 2014, no septic tank systems were sampled at SNL/KTF.

Air Quality Compliance Program

SNL/KTF was in compliance with all air quality permit conditions in 2014. The State of Hawaii requires annual and semiannual reports to document emissions and monitoring activities. The two Semi-Annual Monitoring Report Forms and the Annual Emissions Report 2014 were submitted to the State of Hawaii within specified timelines. These reports document that the site is in compliance with permitted operating limits. See Section 6.2.2 for more information.

Terrestrial Surveillance Program

Terrestrial surveillance is conducted every five years at SNL/KTF. Sampling was conducted in 2012, which confirmed that SNL/KTF operations made no detectable environmental impact. Sampling was not conducted in 2014. See Section [6.3](#) for more information.

Waste Management Program

Some hazardous waste is generated through normal operations at SNL/KTF. Sandia is classified as a conditionally exempt small-quantity generator, and follows applicable RCRA requirements. See Section [6.4](#) for more information.

This page intentionally left blank.



PART ONE

Sandia National Laboratories, Tonopah Test Range, Nevada

This page intentionally left blank.



Chapter 1. SNL/TTR Introduction

This Annual Site Environmental Report (ASER) is prepared in accordance with and as required by U.S. Department of Energy (DOE) Order 231.1B, *Environment, Safety, and Health Reporting* (DOE O 231.1B, Change 1). Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates the Tonopah Test Range (TTR) in Nevada for the DOE/National Nuclear Security Administration (NNSA). DOE/NNSA owns TTR, and the DOE/NNSA/Sandia Field Office (SFO) in Albuquerque, New Mexico, oversees the site.

Part One of this ASER summarizes the environmental protection and monitoring programs in place at Sandia National Laboratories, Tonopah Test Range (SNL/TTR) during calendar year 2014 unless otherwise noted. Sandia makes this report available to the general public in printed and electronic form.

1.1. Mission

Sandia's enduring core mission is to provide science and engineering support for the nation's nuclear weapons stockpile. Today, the mission encompasses additional critical aspects of national security, including developing technologies and strategies for responding to emerging threats, protecting and preventing the disruption of critical infrastructures, and supporting the nonproliferation of weapons of mass destruction. Sandia also collaborates with representatives from other government agencies, the industrial sector, and universities to develop and commercialize new technologies. Information about recent technologies developed at Sandia can be found at:

<http://www.sandia.gov/news/index.html>

1.1.1 Operating Contract

DOE O 436.1, *Departmental Sustainability*, was established to ensure that Environmental Management Systems (EMSs) and site sustainability are at the forefront of environmental excellence. At Sandia, the intent of the order is implemented for an International Organization for Standardization (ISO) 14001-certified EMS. SNL, New Mexico (SNL/NM) and SNL, California received their initial ISO 14001 certifications in June 2009 and September 2006, respectively, with recertification occurring every three years. These independent certifications will be combined in 2015 to streamline Sandia's processes and maximize the efficient use of corporate resources. Although it is not part of the scope of the certification, Sandia implements EMS at SNL/TTR consistent with the ISO 14001 standard (ISO 2004). Conformance to the standard is verified through internal EMS assessments. SNL/TTR assessments were conducted in 2011 and 2014.

The Prime Contract states that Sandia must comply with DOE directives that establish specific requirements for environmental programs. The four primary DOE directives currently on the contract that pertain to environmental protection and management are as follows:

- DOE O 231.1B, Change 1, *Environment, Safety, and Health Reporting*, ensures that the DOE receives information about the events that have affected or could adversely affect the health, safety, and security of the public or workers, the environment, the operations of DOE facilities, or DOE's credibility. This ASER is prepared in accordance with and as required by this order.
- DOE O 435.1, Change 1, *Radioactive Waste Management*, establishes requirements to manage radioactive waste in a manner that protects the environment and worker and public health and safety.

Under this order, DOE contractor-operated facilities are required to plan, document, execute, and evaluate the management of radioactive waste.

- [DOE O 458.1, Change 3, *Radiation Protection of the Public and the Environment*](#), sets radiation protection standards for DOE operations so that radiation exposures to members of the public and the environment are as low as reasonably achievable and maintained within established limits of the order.
- [DOE O 232.2 Admin. Change 1, *Occurrence Reporting and Processing of Operations Information*](#), provides timely notification to the DOE complex of events that could adversely affect: public or DOE worker health and safety, the environment, national security, or DOE's reputation.

The environmental programs summarized here include waste management; air, water, and terrestrial monitoring and surveillance; the Environmental Restoration (ER) Project; and the National Environmental Policy Act Program. [DOE O 231.1B, Change 1, *Environment, Safety, and Health Reporting*](#), specifies the requirements for environmental monitoring conducted at and around the SNL/TTR site. This ASER is an important component of DOE's efforts to keep the public informed about environmental conditions at DOE/NNSA facilities.

1.2. Location Description

SNL/TTR is located on approximately 280 square miles (179,200 acres) of withdrawn land, which is permitted from the U.S. Air Force (USAF) within the boundaries of the Nevada Test and Training Range (NTTR); it is used to support DOE/NNSA and USAF activities and missions. Navarro Research and Engineering (Navarro) performs or supports most environmental program functions at SNL/TTR on behalf of Sandia, including environmental media sampling, wastewater effluent and drinking water monitoring, water treatment, spill response, and waste management operations. Navarro also supports SNL/TTR during tests by operating optics equipment and recovering test objects.

1.3. SNL/TTR History and Operations

In 1940, President Franklin Delano Roosevelt withdrew approximately 5,000 square miles of federal land in Nevada to establish the Las Vegas Bombing and Gunnery Range (now referred to as NTTR), which is part of Nellis Air Force Base (NAFB).

Before acquiring SNL/TTR in 1956, Sandia used three other ranges as test sites: the Los Lunas Test Site (Kirtland Air Force Base Practice Bombing Range) in New Mexico, the Salton Sea Test Site in California, and the Yucca Flat Test Site in Nevada. SNL/TTR was selected as a test range after these facilities became inadequate. The atmosphere at Salton Sea Test Base became permeated with haze, which limited visibility and hampered photography in the mid-1950s. The Yucca Flat Test Site became inadequate, since it did not offer the flat terrain and long approach corridor required for the increasing emphasis on low-altitude approaches and deliveries.

The SNL/TTR site is located in the northwest corner of the (then) Las Vegas Bombing and Gunnery Range. A land-use permit from the USAF was obtained in 1956, and SNL/TTR became operational to test new weapon systems in 1957. The facilities built at SNL/TTR were designed and equipped to gather data on aircraft-delivered inert test vehicles under U.S. Atomic Energy Commission cognizance (now DOE). As technologies changed, the facilities and capabilities at SNL/TTR were expanded to accommodate tests related to DOE/NNSA's Weapons Ordnance Program.

The NAFB Complex includes several auxiliary small arms ranges and the NTTR, which is divided into the North Range and the South Range ([Figure 1-1](#)).

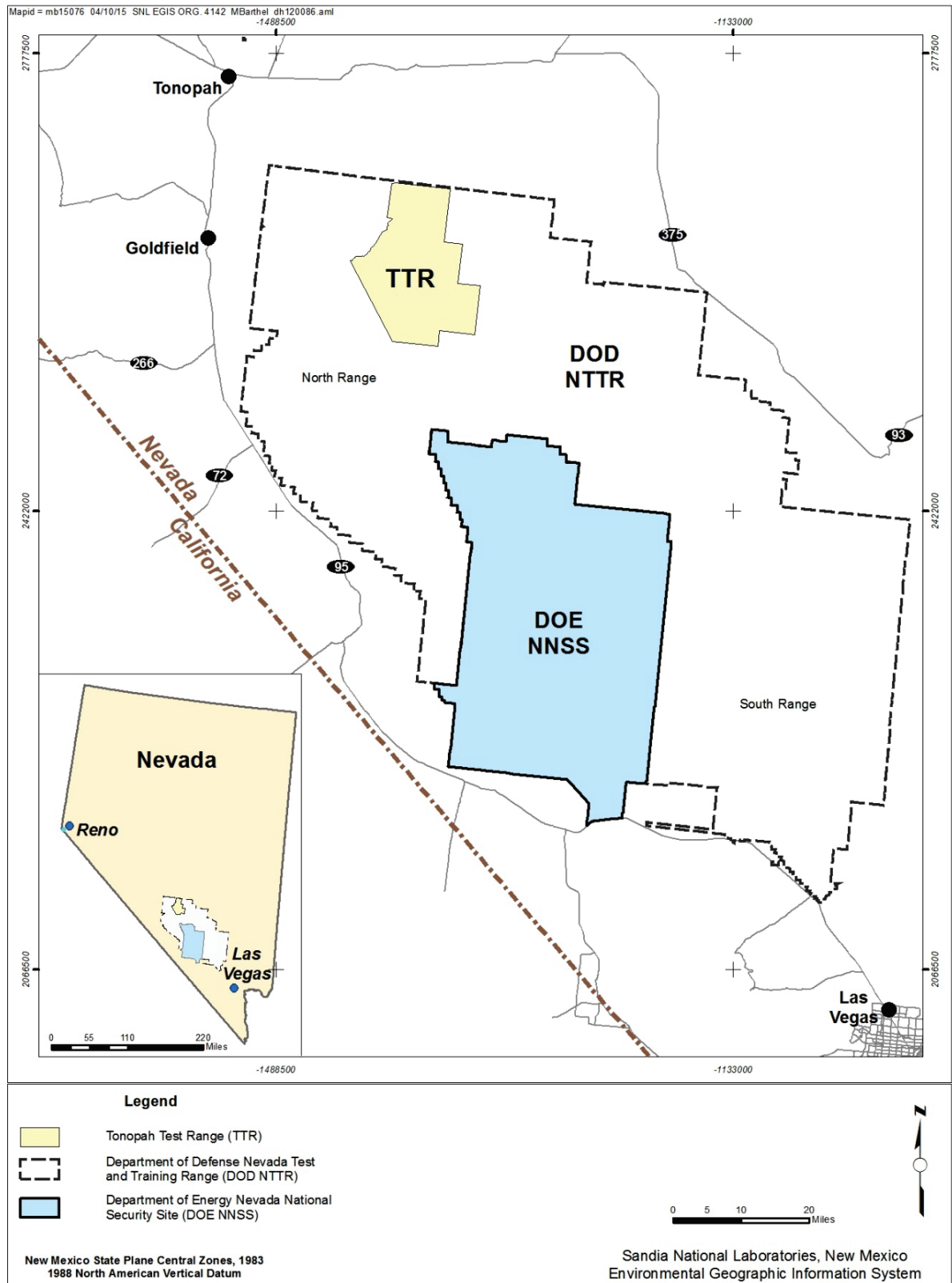


Figure 1-1. SNL/TTR location within the boundaries of NNTR

The Nevada National Security Site, formerly known as the Nevada Test Site, is located between the North and South ranges at NNTR. The entire NAFB Complex is comprised of approximately 3 million acres. SNL/TTR is located 32 miles southeast of Tonopah, Nevada. In April 2002, the USAF and NNSA signed a land-use permit, “Department of the Air Force Permit to the National Nuclear Security Administration to Use Property Located on the Nevada Test and Training Range, Nevada” (the Permit) ([USAF/DOE/NNSA 2002](#)). The Permit is valid from April 26, 2002, until October 5, 2019. The Permit reduced the size of SNL/TTR from approximately 335,655 acres to approximately 179,200 acres.

1.4. SNL/TTR Activities and Facilities

SNL/TTR is the testing range of choice for all national security missions. The range provides research and development test support for the DOE’s weapon programs, and it offers a unique test environment for use by other government agencies and their contractors. With capabilities such as modern electronic tracking instrumentation and data acquisition systems, SNL/TTR assures customers complete and accurate test data. SNL/TTR also provides facilities, a large land area, and the security to conduct a wide variety of tests.

Sandia conducts operations at SNL/TTR in support of the DOE/NNSA’s Weapons Ordnance Program. Sandia’s activities involve research and development and the testing of weapon components and delivery systems ([Figure 1-2](#)). Many of these activities require a remote testing range with a long flight corridor for air drops and rocket launches. Other activities include explosives tests and gun firings. No nuclear devices are tested at SNL/TTR.

Current DOE activities at SNL/TTR include:

- Air drop operations (test units dropped from aircraft)
- Explosives operations (render-safe operations, including handling, transporting, and storing explosives)
- Missile operations (ground- and air-launched missiles)

These activities require a remote range for both public safety and to maintain national security. The majority of test activities at SNL/TTR occur within Cactus Flat, a valley with almost no topographical relief flanked by mountains and hills.



Figure 1-2. SNL/TTR Main Lake Underground Recovery at Cactus Flat, August 2014

1.4.1 Mission Control Center

The SNL/TTR Control Point tower is a four-story structure that affords a 360-degree view of the site. It houses mission critical systems that coordinate all test activities during testing operations. The control tower houses the test director, camera control operators, Range Safety Officer, telemetry control operators, test engineer, computer operator, Test and Evaluation Command and Control System operator, telemetry personnel, and visitors during test operations. The fourth floor (Operations Center) of this facility was remodeled during 2014. Windows, lighting, flooring, and control electronics were replaced (Figure 1-3 and Figure 1-4).

SNL/TTR is instrumented with a wide array of signal-tracking equipment, including video, high-speed cameras, telemetry, and radar tracking devices that are used to characterize ballistics, aerodynamics, and parachute performance of test units.



Figure 1-3. SNL/TTR Operations Center before remodel



Figure 1-4. SNL/TTR Operations Center after remodel

1.4.2 Environmental Restoration Project

The Environmental Restoration (ER) Project at SNL/TTR was initiated in 1980 to address contamination resulting primarily from nuclear weapons testing and related support activities. In late 1992 and early 1993, an agreement was reached between DOE headquarters and the Albuquerque and Nevada field offices to designate responsibility for all ER sites to the DOE/Nevada Field Office (NFO). The NNSA was established in 2000. Today, responsibility for all ER sites still resides with the NNSA/NFO. However, the environmental program management of SNL/TTR, as discussed in this ASER, is a joint effort between SNL/TTR and SNL/NM employees and contractors, with oversight from DOE/NNSA/SFO.

1.5. Environmental Setting

The topography at SNL/TTR is characterized by a broad, flat valley bordered by two north- and south-trending mountain ranges: the Cactus Range to the west (occurring mostly within the boundaries of SNL/TTR) and the Kawich Range to the east. Cactus Flat is the valley floor, where the main operational area of SNL/TTR is located. An area of low hills outcrops in the south. Elevations range from 5,347 ft at the valley floor to 7,482 ft at Cactus Peak. The elevation of the town of Tonopah is 6,030 ft.

1.5.1 Site Description and Demographics

SNL/TTR is located within NTTR at its northwestern boundary. The area north of the SNL/TTR boundary is comprised of sparsely populated public lands jointly administered by the Bureau of Land Management (BLM) and the U.S. Forest Service. Cattle graze this land in winter and spring. There also is a substantial irrigated farming operation north of the range. SNL/TTR lies within a portion of the Nevada Wild Horse Range (NWHR) herd area, which is administered by the BLM.

The nearest residents are located in the towns of Goldfield, Nevada (2010 Census population 268) and Tonopah, Nevada (2010 Census population 2,478). Census data indicate a net resident loss of 550 people from the towns of Goldfield (loss of 88 residents) and Tonopah (loss of 462 residents) between the 2000 Census and the 2010 Census. Goldfield is located approximately 22 miles southwest of the site boundary, and Las Vegas, Nevada, is approximately 140 miles southeast of SNL/TTR. The total population within the 50-mile radius around SNL/TTR is approximately 6,450, which includes the potential population at SNL/TTR if all housing units at the site were occupied.

1.5.2 Geology

SNL/TTR is located in the western part of the Basin and Range geophysical province. This area is marked by horst and graben topography, a system of mountains and down-dropped fault valleys formed through regional extension. SNL/TTR is northeast of the Walker Lane lineament, a zone of transcurrent faulting and shear, and northwest of the Las Vegas Valley shear zone (Sinnock 1982).

The Cactus Range to the west of SNL/TTR is the remnant of a major volcanic center consisting of relatively young (six million years old) folded and faulted Tertiary volcanics. This range is one of at least five northwest trending, raised structural blocks that lie along the Las Vegas Valley/Walker Lane lineaments (ERDA 1975).

1.5.3 Surface Water

Drainage patterns within and near SNL/TTR are intermittent (ephemeral stream channels) and end in closed basins. Ephemeral streams occasionally carry spring runoff to the center of Cactus Flat, where there is a string of north-south trending dry lake beds; however, due to the high rate of evaporation, little is recharged to the groundwater (DRI 1991).

There are several small springs within the Cactus and Kawich ranges. Three occur within SNL/TTR's boundaries: Cactus Springs, Antelope Springs, and Silverbow Springs. Water from these springs does not travel more than approximately 100 ft before it dissipates through evaporation and infiltration. The effect on the landscape is purely local.

1.5.4 Groundwater

SNL/TTR obtains its water from local wells. The U.S. Geological Survey has recorded groundwater depths from 21 to 454 ft at the site. Groundwater is encountered at the Antelope Mine well in the Cactus Range at 21 ft bgs and at the EH2 well near the Tonopah Test Range Airport at 454 ft bgs. The depth to groundwater at the Area 9 well, located near the northern end of the site, is approximately 131 ft bgs. The static water level at the main water supply well for Area 3 (Production Well 6) is approximately 350 ft bgs.

1.5.5 Climate

The climate at SNL/TTR is typical of high desert, mid-latitude locations, with large diurnal and seasonal changes in temperature and little total rainfall. Temperature extremes at the test range vary from highs near 104°F in summer, with lows approaching –22°F in winter. July and August are the hottest months, with highs generally in the 90s°F during the day and dropping to the 50s°F at night. January conditions vary from highs of the 40s°F to lows of the teens °F.

Rainfall, though sparse, is dependent on elevation. Annual average rainfall in the desert valley floor is 4 inches, while in nearby mountains as much as 12 inches occurs ([USAF 1999](#)).

Winds are generally from the northwest in winter and early spring, switching to southerly directions during summer. The mountain-and-valley system channels the wind such that the wind seldom blows from eastern or southwestern directions. Dust storms are common in the spring, when monthly average wind speeds reach 15 mph. During the spring and fall, there may be a diurnal wind cycle, bringing northwest winds in the early hours and shifting to southerly winds by afternoon.

1.5.6 Vegetation

SNL/TTR is part of the Central Basin and Range Level III ecoregion as classified by the U.S. Environmental Protection Agency. SNL/TTR contains three further discrete, Level IV ecoregions within its boundaries. Vegetation and each of the Level IV ecoregions on SNL/TTR are described here:

- The Lahontan and Tonopah Playas ecoregion occurs at the lowest elevations of SNL/TTR. Little to no vegetation grows in this highly alkaline playa ecoregion. At SNL/TTR, four-wing saltbush (*Atriplex canescens*) grows along the playa edges.
- The surrounding low-lying non-playa areas that compose the majority of SNL/TTR lands are part of the Tonopah Basin ecoregion. This ecoregion on SNL/TTR is dominated by shrubs such as winterfat (*Krascheninnikovia lanata*), shadscale (*Atriplex confertifolia*), spiny hopsage (*Grayia spinosa*), and budsage (*Artemisia spinescens*). Lesser quantities of longspine horsebrush, four-wing saltbush, sagebrush (*Artemisia tridentata*), littleleaf horsebrush (*Tetradymia glabrata*), and snakeweed (*Gutierrezia sarothrae*) shrubs are also common. Indian ricegrass (*Achnatherum hymenoides*) and galleta (*Pleuraphis jamesii*) are grasses found throughout this ecoregion on SNL/TTR.
- The Tonopah Sagebrush Foothills ecoregion occurs in the higher elevation mountains on the west side of SNL/TTR. Dwarf sagebrush (*Artemisia arbuscula*) is the dominant plant species at the higher elevations of this ecoregion on SNL/TTR. Nevada jointfir (*Ephedra nevadensis*) grows along the drainages at all elevations and is a more dominant shrub at the lower elevations of this ecoregion on SNL/TTR, along with spiny greasewood (*Glossopetalon spinescens*), spiny hopsage, and budsage shrubs. Joshua tree (*Yucca brevifolia*) and juniper (*Juniperus species*) grow in the transition zone at the base of the mountains.

1.5.7 Wildlife

Wild horses are protected in Nevada, and their populations are monitored and managed. Though wild horses compete with livestock and wildlife for limited forage, their presence is tolerated because they are associated with regional national heritage. The NWHR comprises an area of 2,034 square miles (1,301,628 acres) and encompasses a significant portion of the northern NTTR, with herds common in Cactus Flat, Gold Flat, Kawich Valley, Goldfield Hills, and the Stonewall Mountains. The BLM has published Appropriate Management Levels (BLM's estimate of the maximum number of animals that are sustainable in a specific Herd Management Area) for the NWHR at 500 wild horses (BLM 2011).

Other mammals common to the area include pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), kit fox (*Vulpes macrotis*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), and gray fox (*Urocyon cinereoargenteus*). To a lesser extent, bighorn sheep (*Ovis canadensis*), mountain lion (*Felis concolor*), and wild burro (*Equus asinus*) are also present (USAF 1999; DRI 1991).

Horned larks (*Eremophila alpestris*) are prevalent throughout the Tonopah Basin ecoregion on SNL/TTR. Other common breeding bird species in this ecoregion include yellow warbler (*Dendroica petechia*), brewer's sparrow (*Spizella breweri*), and black-throated sparrow (*Amphispiza bilineata*). Birds commonly found in association with water sources at SNL/TTR in this ecoregion include Bullock's oriole (*Icterus bullockii*), common yellowthroat (*Geothlypis trichas*), mourning dove (*Enaida macroura*), and Wilson's warbler (*Cardellina pusilla*). The common raven (*Corvus corax*) is a common year-round resident.

Chukar (*Alectoris chukar*), rock wren (*Salpinctes obsoletus*), and Northern mockingbird (*Mimus polyglottos*) are bird species found in association with the higher elevation Tonopah Sagebrush Foothills ecoregion.

In general, the NTTR land withdrawal has had a positive effect on local plant and animal life. Since much of the withdrawal area is undisturbed by human activity, large habitat areas are protected from the effects of public use.

1.6. Double Tracks and Clean Slate Sites

In May and June 1963, Project Roller Coaster conducted a series of four nuclear weapons destruction tests that resulted in plutonium dispersal in surrounding soils. Three of these tests were conducted within the boundaries of SNL/TTR; the fourth was conducted on NTTR just west of SNL/TTR. The three Project Roller Coaster test sites at SNL/TTR are referred to as Clean Slate 1, Clean Slate 2, and Clean Slate 3. The fourth test site at NTTR is referred to as Double Tracks. In 1996 and 1997, interim corrective actions were performed at Double Tracks and Clean Slate 1. These actions resulted in remediation of the soil contamination to a level of less than or equal to 400 pCi/g of transuranics.

Table 1-1 summarizes test information related to the four Project Roller Coaster sites. DOE/NNSA/NFO is responsible for remediation of these and all other ER sites at SNL/TTR (refer to Chapter 3). Sandia will continue to be responsible for all other environmental compliance at these sites.

In addition to the activities conducted in 1996 at Double Tracks and in 1997 at Clean Slate 1, the initial cleanup of each Clean Slate site was conducted shortly after each test. Test-related debris was bladed into a hole at test ground zero and backfilled. An initial fence was built around each test area where the soil contamination was set at approximately 1,000 µg/m² of plutonium. The soil survey was conducted on 61-meter grids with a handheld survey meter, a field instrument for detection of low-energy radiation (FIDLER). In 1973, additional outer fences were set at 40 pCi/g of plutonium in soil, also using the handheld-meter method. The areas are visually inspected each year to determine whether any fence repairs or sign replacement is required.

Table 1-1. SNL/TTR Project Roller Coaster test information

Test Name	CAU Number	Date of Test	Location	Status
Double Tracks	411	May 15, 1963	NTTR, North Range (west of SNL/TTR)	Interim closure
Clean Slate 1	412	May 25, 1963	SNL/TTR	Interim closure
Clean Slate 2	413	May 31, 1963	SNL/TTR	Remediation phase (suspended)
Clean Slate 3	414	June 9, 1963	SNL/TTR	Remediation has not started

NOTES: Source: Sampling and Analysis Plan for Clean Slate 1, September 1996 (IT 1996).

CAU = Corrective Action Unit

NTTR = Nevada Test and Training Range

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

In 1977, Edgerton, Gemeshausen, and Grier, Inc. performed an aerial radiological survey for the Nevada Applied Ecology Group (EG&G 1995). The aerial radiological surveys were undertaken to supplement the FIDLER and previous soil sample measurements of transuranics. The objective was to determine the extent of surficial distribution of plutonium and other transuranic elements dispersed during the Project Roller Coaster tests. Radiation isopleths showing soil activity due to americium-241, plutonium-239, and plutonium-240 were drawn for each area. The cumulative area of the diffuse sources, as determined by the aerial radiological survey, is approximately 4,900 acres. The survey found transuranic contamination outside the fenced area in the downwind direction (EG&G 1995). Subsequent aerial surveys were conducted in 1993 and 2006. These surveys confirmed previous survey results in terms of extent of contamination.

Air Monitoring at Environmental Restoration Sites

Remediation activities were conducted at Clean Slate 1 in 1997. The Desert Research Institute (DRI) collected air-monitoring data from several locations in the vicinity of Clean Slate 1 before, during, and after remediation activities. The data were presented to DOE/NNSA/NFO in the form of a draft report (DRI 1997). The report documented the as-left condition at the site, but did not require follow-up action.

During 2014, at the request of DOE/NNSA/NFO, DRI maintained three portable environmental monitoring stations (two installed in 2008 and the third installed in 2011) at SNL/TTR as part of the ER Project Soils Sub-Project (Figure 1-5). The primary objective of the monitoring stations is to evaluate whether and under what conditions there is wind transport of radiological contaminants from any of the Soils Sub-Project Corrective Action Units (CAUs) associated with Operation Roller Coaster on SNL/TTR.

One monitoring station (400) is located in the general vicinity of the Range Operations Center (ROC), the second station (401) is located on the north edge of Clean Slate 3, and the newest station (402) is located on the north edge of Clean Slate 1. The ROC station measures potential radionuclide concentrations associated with airborne particulates at the closest location where there are regular site workers. The station at Clean Slate 3 is located at the perimeter of the largest of the three SNL/TTR Soils Sub-Project CAUs. The station at Clean Slate 1 is located on the north perimeter of the soil CAU. The stations at Clean Slate 3 and Clean Slate 1 both measure the radionuclide concentration associated with airborne particulates at the boundaries of the sites in one of the predominant downwind directions.

The SNL/TTR stations collect data on selected meteorological and environmental parameters (e.g., wind speed and direction and airborne particulate concentration as a function of particulate size). In addition, airborne particulate samplers are deployed at each location to collect particulate samples for radiological analyses. Data are provided to the Western Regional Climate Center (WRCC) for management and incorporation into an SNL/TTR-specific database. The stations at the ROC and Clean Slate 3 have been in continuous operation since July 2008; the station installed at Clean Slate 1 became operational in August 2011.



Figure 1-5. SNL/TTR soils project air-monitoring stations located at the Range Operations Center (400), Clean Slate 1 (402), and Clean Slate 3 (401)

Monitoring Station Locations and Capabilities

Station 400 (a Portable Environmental Monitoring Station) is located south of the ROC. This station was located to provide data at the ROC, which has a greater concentration of Sandia personnel than the other two station locations. In addition, Station 400 was located where line power was available to operate the instruments. Station 401 and Station 402 are solar-powered with battery backup power; the batteries are recharged continuously by solar panels. All three stations consist of two primary components: an air sampler and an auxiliary meteorological tower. Station 401 is located along the fenced perimeter of the north end of Clean Slate 3. Station 402 is located along the fenced perimeter of the north end of Clean Slate 1. Their locations were initially selected based on a review of wind speed and direction data collected at the Tonopah Test Range Airport (Engelbrecht et al. 2008), as well as for ease of access. Though the Tonopah Airport wind data are of limited time duration, the topographic setting is more similar to the Clean Slate sites than stations with longer periods of record located within the town of Tonopah. On-site wind direction measurements have since confirmed the appropriateness of the station locations. Figure 1-5 shows the location of the monitoring stations at SNL/TTR.

All three monitoring stations are equipped with continuous low-volume air samplers (having a flow rate of approximately 2 cubic feet per minute), and filters are routinely collected every two weeks. These filters are delivered to the Radiological Services Laboratory at the University of Nevada, in Las Vegas, Nevada, for analyses. Standard analyses include gross alpha and beta measurements and gamma spectral analysis; samples may undergo alpha spectral analysis if initial gamma spectral analyses indicate the presence of americium-241, which could indicate that plutonium particles are being transported.

Station 400: Range Operations Center

Station 400 is a portable station with all monitoring and sampling systems mounted on a 7 ft by 14 ft trailer. The station is located approximately 100 yards south-southwest of the ROC. The station configuration as currently deployed is shown in Figure 1-6. Airborne dust particles are collected continuously using a Hi-Q air sampler. Filters are recovered and new filters deployed every two weeks. Sensors include an anemometer, a wind direction sampler, a pyranometer, a tipping rain bucket, a temperature and relative humidity probe, a barometric pressure sampler, a soil temperature probe, a pressurized ion chamber (PIC), and an ambient air particulate size profiler. Data from these sensors are collected and stored on a Campbell Scientific data logger and are then transmitted through a Geostationary Operational Environmental Satellite (GOES) transmitter to the WRCC. Regular quality assurance procedures include checking the PIC response and the air volume passing through the air sampler on a monthly basis, as well as performing data quality checks on the WRCC database. In addition to the real-time instruments and continuous air sampler, this station is equipped with a manually activated low-volume air sampler (AirMetrics MiniVol) that can collect air samples on quartz and Teflon filter media, which allows for different types of chemical and elemental analysis. This air sampler is intended to run in the event of nearby wildfire or in conditions of extreme dust storms; there may be value in distinguishing the relative contribution of organic and inorganic constituents during dust storms. The station is also equipped with an ambient air particulate size profiler (Met-One). The Met-One measures the concentration of suspended particulates in real time. Data can be used to determine whether high wind events are always associated with higher concentrations of suspended particulates, and whether there are correlations between particulate concentrations and radionuclide concentration.



Figure 1-6. SNL/TTR Station 400 measures radiological and meteorological conditions near the ROC

Station 400: Air Sampling Results

Station 400 is equipped with a continuous air particulate sampler from which a 4-inch glass-fiber air filter sample is collected every two weeks and then delivered to the Radiological Services Laboratory at the University of Nevada, Las Vegas, on a monthly basis for batch processing. Between December 23, 2013, and December 23, 2014, 26 air particulate filter samples were collected and then analyzed by gamma spectroscopy and for gross alpha and beta activity. Only naturally occurring radionuclides were identified and measured on these samples; beryllium-7 (24 samples) and lead-210 (10 samples) were the most commonly identified radionuclides, with occasional detections of potassium-40 (one sample) and protactinium-234 (one sample). No anthropogenic gamma-emitting radionuclides such as cesium-137, cobalt-60, or americium-241 have been detected. The mean annual gross alpha activity from all samples (Table 1-2) was $1.60 \times 10^{-15} \mu\text{Ci/mL}$, with a maximum of $3.50 \times 10^{-15} \mu\text{Ci/mL}$, a minimum of $0.28 \times 10^{-15} \mu\text{Ci/mL}$, and a standard deviation of $0.79 \times 10^{-15} \mu\text{Ci/mL}$. The mean annual gross beta activity from all samples (Table 1-3) was $1.79 \times 10^{-14} \mu\text{Ci/mL}$, with a maximum of $2.36 \times 10^{-14} \mu\text{Ci/mL}$, a minimum of $1.08 \times 10^{-14} \mu\text{Ci/mL}$, and a standard deviation of $0.35 \times 10^{-14} \mu\text{Ci/mL}$.

Table 1-2. SNL/TTR gross alpha results for sampling stations, 2014

Sampling Location	Number of Samples	Concentration ($\times 10^{-15}$ $\mu\text{Ci/mL}$ [3.7×10^{-5} Bq/m^3])			
		Mean	Standard Deviation	Minimum	Maximum
400	26	1.60	0.79	0.28	3.50
401	25	1.41	0.67	0.22	2.59
402	25	1.66	0.77	0.62	2.90

NOTE: SNL/TTR = Sandia National Laboratories, Tonopah Test Range

Table 1-3. SNL/TTR gross beta results for sampling stations, 2014

Sampling Location	Number of Samples	Concentration ($\times 10^{-14}$ $\mu\text{Ci/mL}$ [3.7×10^{-4} Bq/m^3])			
		Mean	Standard Deviation	Minimum	Maximum
400	26	1.79	0.35	1.08	2.36
401	25	1.46	0.28	0.95	1.92
402	25	1.94	0.37	1.32	2.60

NOTE: SNL/TTR = Sandia National Laboratories, Tonopah Test Range

Station 401: Clean Slate 3

Station 401 consists of a solar-powered air sampler (sampler and solar panels) mounted on a 7 ft by 14 ft trailer, plus a portable meteorological tower. The station is located on the north end of Clean Slate 3. Sensors include an anemometer, a temperature and relative humidity probe, a PIC, and a DustTrak aerosol monitor. Data from these sensors are collected and stored on a Campbell Scientific data logger and are then transmitted through a GOES transmitter to the WRCC. Regular quality assurance procedures include checking the PIC response and the air volume passing through the air sampler on a monthly basis, as well as performing data quality checks on the WRCC database. Working with Hi-Q Products Inc., DRI constructed this mobile version of a solar-powered air sampler based on a design currently being used by the USAF on NTTR. Internal airflow monitoring and self-adjustment capabilities allow the air sampler to maintain a near-constant flow rate. An internal totalizer computes the volume of air passed through the collection filter and the collector's run time. A saltation sensor was installed at Station 401 in August 2011. This instrument measures sand and particle movement by aeolian transport close to the ground surface. Saltation is a wind-driven process and is an important mechanism for transport of soil material in desert environments. DRI monitors the frequency of saltation events as a function of wind speed and wind direction at Station 401. Solar panels, with battery assist, provide power for the air sampler and the meteorological station. The configurations of the solar-powered air sampler and the portable meteorological station are shown in [Figure 1-7](#).

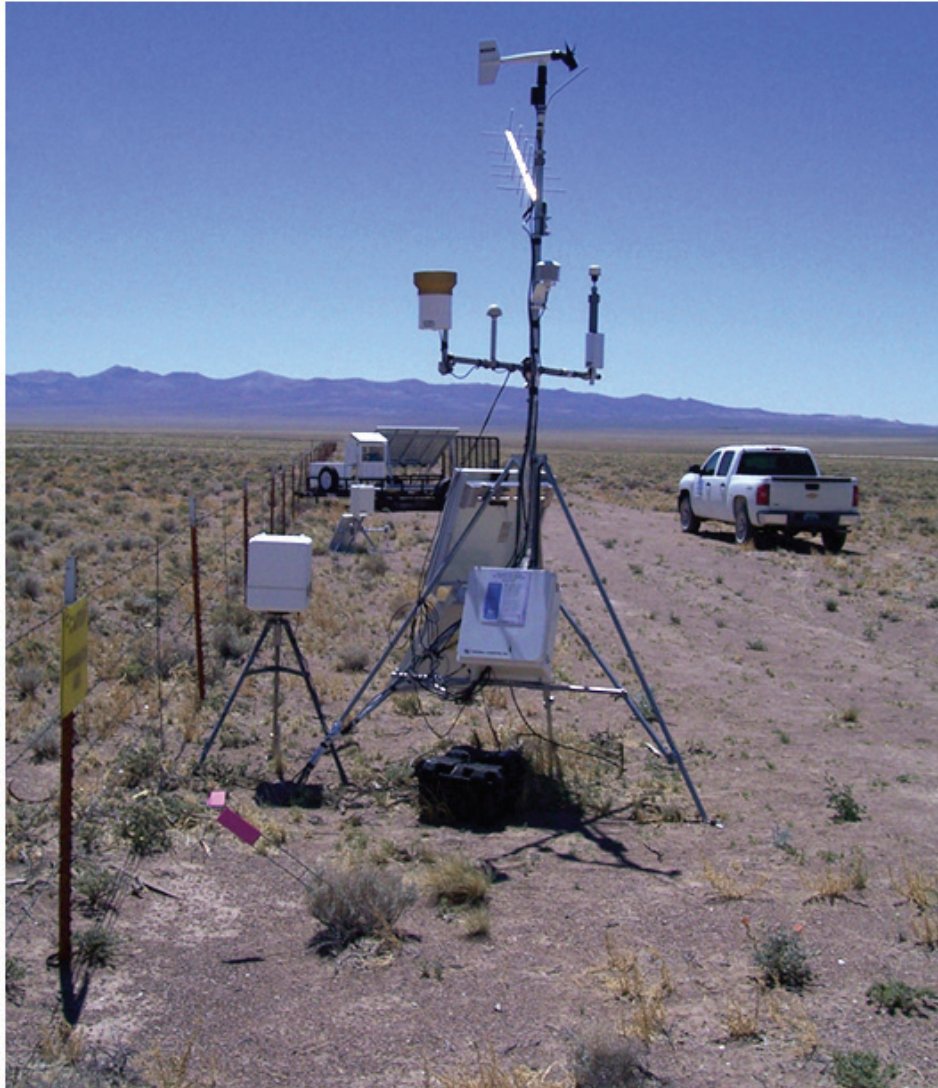


Figure 1-7. SNL/TTR solar-powered air sampler, saltation sensor, and meteorological tower (background, center, and foreground, respectively) at Station 401, located along the north fence that bounds the Clean Slate 3 contamination area

Station 401: Air Sampling Results

Station 401 is equipped with a continuous air particulate sampler from which a 4-inch glass-fiber air filter sample is collected every two weeks and then delivered to the Radiological Services Laboratory at the University of Nevada, Las Vegas, on a monthly basis for batch processing. Between December 23, 2013, and December 23, 2014, 25 air particulate filter samples were collected and then analyzed by gamma spectroscopy and for gross alpha and beta activity. Only naturally occurring radionuclides were identified and measured on these samples; beryllium-7 (23 samples) and lead-210 (five samples) were the most commonly identified radionuclides, with minor detections of potassium-40 (four samples). No anthropogenic gamma-emitting radionuclides such as cesium-137, cobalt-60, or americium-241 have been detected. The mean annual gross alpha activity ([Table 1-2](#)) from all samples was $1.41 \times 10^{-15} \mu\text{Ci/mL}$, with a maximum of $2.59 \times 10^{-15} \mu\text{Ci/mL}$, a minimum of $0.22 \times 10^{-15} \mu\text{Ci/mL}$, and a standard deviation of $0.67 \times 10^{-15} \mu\text{Ci/mL}$. The mean annual gross beta activity ([Table 1-3](#)) from all samples was $1.46 \times 10^{-14} \mu\text{Ci/mL}$, with a maximum of $1.92 \times 10^{-14} \mu\text{Ci/mL}$, a minimum of $0.95 \times 10^{-14} \mu\text{Ci/mL}$, and a standard deviation of $0.28 \times 10^{-14} \mu\text{Ci/mL}$.

Station 402: Clean Slate 1

In May 2011, DRI established Station 402 and installed a portable meteorological tower with an anemometer, a temperature and relative humidity probe, and a Met-One ambient air particulate size profiler, as well as a GOES satellite transmitter. During August 2011, DRI installed a solar-powered air sampler (sampler and solar panels) mounted on a trailer, and a PIC was installed in September 2011. Internal airflow monitoring and self-adjustment capabilities allow the air sampler to maintain a near-constant flow rate. An internal totalizer computes the volume of air passed through the collection filter and the collector's run time. Data from the sensors are collected and stored on a Campbell Scientific data logger. DRI installed a saltation monitoring station at Station 402 in August 2011. This instrument measures sand and particle movement by aeolian transport close to the ground surface. Saltation is a wind-driven process and is an important mechanism for transport of soil material in desert environments. DRI monitors for frequency of saltation events as a function of wind speed and wind direction at Station 402. Solar panels, with battery assistance, provide power for the air sampler and the meteorological station. The configurations of the solar-powered air sampler and the portable meteorological station are shown in [Figure 1-8](#).



Figure 1-8. SNL/TTR solar-powered air sampler, saltation sensor, and meteorological tower (center right, foreground left, and center left, respectively) at Station 402, located along the north fence that bounds the Clean Slate 1 contamination area

Station 402: Air Sampling Results

Station 402 is equipped with a continuous air particulate sampler from which a 4-inch glass-fiber air filter sample is collected every two weeks and then delivered to the Radiological Services Laboratory at the University of Nevada, Las Vegas, on a monthly basis for batch processing. Between December 23, 2013, and December 23, 2014, a total of 25 air particulate samples were collected and then analyzed by gamma spectroscopy and for gross alpha and beta activity. Only naturally occurring radionuclides were identified and measured on these samplers; beryllium-7 (24 samples) and lead-210 (11 samples) were the most commonly identified radionuclides; potassium-40 was detected in one sample. No anthropogenic gamma-emitting radionuclides such as cesium-137, cobalt-60, or americium-241 have been detected. The mean gross alpha activity (Table 1-2) from all samples was 1.66×10^{-15} $\mu\text{Ci/mL}$, with a maximum of 2.90×10^{-15} $\mu\text{Ci/mL}$, a minimum of 0.62×10^{-15} $\mu\text{Ci/mL}$, and a standard deviation of 0.77×10^{-15} $\mu\text{Ci/mL}$. The mean gross beta activity (Table 1-3) from all samples was 1.94×10^{-14} $\mu\text{Ci/mL}$, with a maximum of 2.60×10^{-14} $\mu\text{Ci/mL}$, a minimum of 1.32×10^{-14} $\mu\text{Ci/mL}$, and a standard deviation of 0.37×10^{-14} $\mu\text{Ci/mL}$.

Station 400, Station 401, and Station 402: Air Particulate Migration

At Station 400 (ROC), wind speed of 15 mph or less was observed 92 percent of the time; wind speeds exceeded 30 mph for approximately 40 minutes in 2014 (sustained winds were less than 35 mph for the entire year). Slightly higher wind speeds were observed at Station 401 (Clean Slate 3), where winds of 15 mph or less were observed 91 percent of the time and wind speed exceeded 35 mph for approximately 10 minutes for the entire year. At Station 402 (Clean Slate 1), wind speed of 15 mph or less was observed approximately 92 percent of the time, and the wind speed exceeded 30 mph for approximately 2.7 hours of the year. Figure 1-9 shows the average respirable particulate matter (having a diameter equal to or less than 10μ [PM_{10}]) concentrations for 5 mph wind speed intervals at all three stations. The PM_{10} concentrations increased approximately exponentially as wind speed increased at all stations. PM_{10} concentrations at all three stations were less than approximately $10 \mu\text{g}/\text{m}^3$ for wind speeds below 15 mph. At Station 400, PM_{10} concentrations peaked ($415 \mu\text{g}/\text{m}^3$) at wind speeds in the range of 30 to 35 mph. At Station 401, PM_{10} concentrations rose to $405 \mu\text{g}/\text{m}^3$ for wind speeds between 30 and 35 mph. At Station 402, PM_{10} concentrations peaked at $592 \mu\text{g}/\text{m}^3$ for wind speeds over 35 mph. Generally, the dust concentrations were higher for sustained winds over 25 mph when compared to 2013.

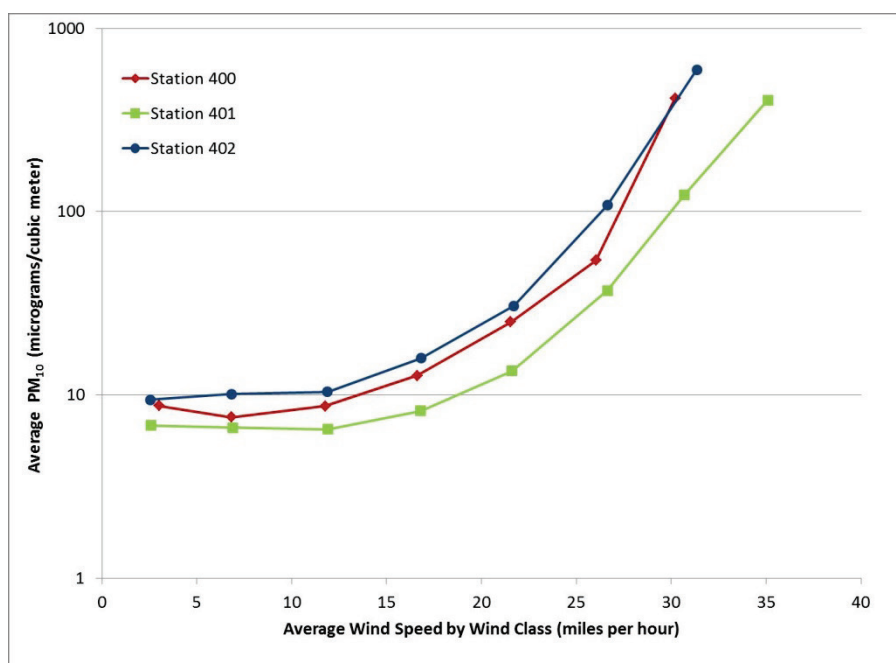


Figure 1-9. SNL/TTR wind speed and PM_{10} trends for stations 400, 401, and 402, January 1–December 31, 2014

Chapter 2. SNL/TTR Compliance Summary

Sandia Corporation (Sandia) conducts operations at Sandia National Laboratories, Tonopah Test Range (SNL/TTR) in compliance with federal, state, and local environmental requirements, including U.S. Department of Energy (DOE) directives and Presidential Executive Orders (EOs). As a part of this compliance, Sandia adheres to strict reporting and permitting requirements.

This chapter discusses Sandia's compliance status with major environmental regulations, statutes, and DOE directives that are applicable to operations conducted at SNL/TTR. Environmental audit summaries, occurrence reporting, and environmental permit status for 2014 are also presented here.

All operations and activities at SNL/TTR, including those in the environmental programs, are performed under the corporate Environment, Safety, and Health (ES&H) policy (ESH100), which states:

It is the policy of Sandia National Laboratories to perform work in a safe and environmentally responsible manner by committing to: maintain a safe workplace, prevent incidents, and protect the public; protect the environment, conserve resources, and prevent pollution; maintain compliance with legal and other requirements; and strive for continual improvement. DOE's Integrated Safety Management System (ISMS) is a key element of the Sandia Management Model. ISMS provides the framework for managing ES&H activities and functions while integrating them into all SNL operations.

2.1. Compliance Status with State Regulations

The State of Nevada administers most environmental regulations applicable to SNL/TTR ([Table 2-1](#)). Specific state regulations ([State of Nevada Environmental Regulations](#)) include those governing air quality, solid and hazardous waste management, wildlife, water quality, and radiation control. The U.S. Environmental Protection Agency (EPA) administers radionuclide air emissions directly.

Table 2-1. SNL/TTR applicable State of Nevada Administrative Code

Chapter and Provisions	Applicable Sources or Activities
NAC-444, Sanitation	
NAC 444.570 to 444.976, Solid Waste Disposal	<ul style="list-style-type: none">• Disposal of construction debris• Disposal of routine nonhazardous solid wastes• Disposal of septic sludge• Disposal of hazardous waste• PCB• Asbestos
NRS 444A.010 to 444A.120, Programs for Recycling	<ul style="list-style-type: none">• Recyclables (including waste tires)
Chapter 445A, Water Controls	
NAC 445A.9658 to 445A.9706, Septic Tanks	<ul style="list-style-type: none">• Septic tanks
NAC 445A.228 to 445A.272, Discharge Permits	<ul style="list-style-type: none">• Surface water runoff
NAC 445A.450 to 445A. 6731, Public Water Systems	<ul style="list-style-type: none">• Water wells• Operator certification• Treatment of water• Distribution of water• Storage structures• Water conservation plan
Chapter 445B, Air Controls	
NAC 445B.001 to 445B.3477, Air Pollution	<ul style="list-style-type: none">• Open burning• Hazardous air pollutants from stacks and vents• Disturbance of soils during construction (particulate matter)• Class II operating permit
NAC 445B.400 to 445B.774, Emissions From Engines	<ul style="list-style-type: none">• Generators• Mobile sources

See notes at end of table.

Table 2-1. SNL/TTR applicable State of Nevada Administrative Code (continued)

Chapter 459, Hazardous Materials	
NAC 459.9921 to 459.999, Storage Tanks	• Spill reporting
Chapter 477, State Fire Marshall	
•	
NAC 477.323, Permit to Store Hazardous Material	• Hazardous material storage
Chapter 534, Underground Water and Wells	
•	
NAC 534.010 to 534.500, Underground Water and Wells	• Drilling, construction, operation, and plugging (abandonment) of wells and boreholes

NOTES: The Nevada Administrative Code is accessed through <http://www.leg.state.nv.us/nac/>.

NAC = Nevada Administrative Code

PCB = polychlorinated biphenyl

NRS = Nevada Revised Statute

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

2.2. Compliance Status with Federal Regulations

This section summarizes DOE's and Sandia's compliance status with environmental regulations and DOE directives that pertain to the environment. The primary federal laws applicable to environmental compliance at TTR are presented on [Table 2-2](#).

Table 2-2. SNL/TTR applicable major environmental regulations and statutes

Regulation/Statute	Description
Atomic Energy Act	Directs DOE and the U.S. Nuclear Regulatory Commission in the management of nuclear materials and radioactive waste
Clean Air Act and Clean Air Act Amendments	Provides standards to protect the nation's air quality
Clean Water Act	Provides general water quality standards to protect the nation's water sources and byways
Comprehensive Environmental Response, Compensation, and Liability Act	Provides federal funding for cleanup of inactive waste sites on the National Priorities List and mandates requirements for reportable releases of hazardous substances
Cultural Resources Acts	Includes various acts that protect archeological, historical, and religious sites and resources
Endangered Species Act	Provides special protection status for federally listed endangered or threatened species
Executive Orders	Several Executive Orders provide specific protection for wetlands, floodplains, and environmental justice in minority and low-income populations, and encourages leadership in environmental management
Federal Facility Compliance Act	Directs federal agencies regarding environmental compliance
Federal Insecticide, Fungicide, and Rodenticide Act	Controls the distribution and use of various pesticides
Migratory Bird Treaty Act of 1918	Prevents the taking, killing, possessing, transporting, and importing of migratory birds, their eggs, parts, and nests
National Emission Standards for Hazardous Air Pollutants	Specifies standards for radionuclide air emissions and other hazardous air releases under the Clean Air Act
National Environmental Policy Act	Requires federal agencies to review all proposed activities so as to include environmental aspects in agency decision-making
Resource Conservation and Recovery Act	Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks
Safe Drinking Water Act	Enacts specific health standards for drinking water sources
Superfund Amendments and Reauthorization Act	The Superfund Amendments and Reauthorization Act, Title III, also known as the Emergency Planning and Community-Right-to-Know Act, mandates communication standards for hazardous materials over a threshold amount that are stored or used in a community
Toxic Substances Control Act	Specifies rules for the manufacture, processing, distribution, use, and disposal of specific chemical substances and mixtures such as asbestos and polychlorinated biphenyls

NOTES: This is a partial listing of all applicable environmental regulations and statutes.

DOE = U.S. Department of Energy

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

2.2.1 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) defines assessment activities and reporting requirements for inactive waste sites at federal facilities. As required by CERCLA, a Preliminary Assessment was submitted in 1988 for all facilities listed on the federal agency hazardous waste compliance docket. Sites with significant contamination were put on the National Priorities List for cleanup (EPA 2013). There are no National Priorities List, or “Superfund,” sites located at SNL/TTR. The Superfund Amendments and Reauthorization Act (SARA) Title III amended CERCLA requirements for reportable quantity releases and chemical inventory reporting. DOE at SNL/TTR was in full compliance with CERCLA/SARA in 2014.

2.2.2 Emergency Planning and Community Right-to-Know Act

SARA Title III (also known as the Emergency Planning and Community Right-to-Know Act) requires the submittal of a Toxic Release Inventory report for chemical releases over a given threshold quantity. Table 2-3 lists SARA Title III reporting requirements.

Table 2-3. SNL/TTR applicable EPCRA reporting requirements, 2014

Section	EPCRA Section Title	Requires Reporting?		Description
		Yes	No	
302-303	Emergency Planning	✓		Sandia personnel prepare an annual report that lists chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 (Appendix B), including the location of the chemicals and emergency contacts. The DOE/NNSA/SFO distributes the report to the required entities.
304	Emergency Notification		✓	No reportable quantity releases of an EHS, as defined by CERCLA, were reported in 2014.
311-312	Hazardous Chemical Storage Reporting Requirements	✓		There are two “Community Right-to-Know” reporting requirements: (1) Sandia personnel complete the EPA Tier II forms for all hazardous chemicals present at the SNL/TTR facility at any one time in amounts equal to or greater than 10,000 lb and for all EHSs present at the facility in an amount greater than or equal to 500 lb or the Threshold Planning Quantity, whichever is lower, and provide the report to DOE/NNSA/SFO for distribution to the required entities; and (2) Sandia personnel provide Safety Data Sheets for each chemical entry on a Tier II form and provide the report to DOE/NNSA/SFO for distribution to the required entities.
313	Toxic Chemical Release Forms		✓	Section 313 of EPCRA requires that facilities that release toxic chemicals listed in SARA Title III over a threshold value must submit a TRI report. In 2014, releases resulting from SNL/TTR operations were below the reporting threshold requiring a TRI report.

NOTES: CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
 CFR = Code of Federal Regulations
 DOE = U.S. Department of Energy
 EHS = extremely hazardous substance
 EPA = U.S. Environmental Protection Agency
 EPCRA = Emergency Planning and Community Right-to-Know Act
 NNSA = National Nuclear Security Administration
 Sandia = Sandia Corporation
 SARA = Superfund Amendments and Reauthorization Act
 SFO = Sandia Field Office
 SNL/TTR = Sandia National Laboratories, Tonopah Test Range
 TRI = Toxic Release Inventory

2.2.3 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) and the Nevada Revised Statutes regulate the generation, transportation, treatment, storage, and disposal of hazardous chemical waste and nonhazardous solid wastes. Applicable regulations are listed in [References \(Federal Acts and Statutes\)](#).

Some hazardous waste is generated through normal operations at SNL/TTR. SNL/TTR is classified as a small-quantity generator, and is subject to the applicable requirements (see [Chapter 3](#), which summarizes hazardous waste management activities during 2014, and specifically Section [3.1.2](#)).

Under this designation, hazardous waste can only be stored on-site for 180 days before it must be shipped off-site for treatment and disposal at an EPA-permitted facility. SNL/TTR hazardous waste shipments are scheduled to occur at least two to three times a year (as needed).

Sanitary solid waste, which is also regulated under RCRA, is disposed of at the SNL/TTR Class II sanitary landfill operated by the U.S. Air Force (USAF) operations and maintenance contractor. The landfill is used cooperatively by all organizations at SNL/TTR. SNL/TTR had two recycling contracts in 2014, one for tires and one for scrap metal. In January 2014, Sandia contracted with Lunas Recycling in Las Vegas, Nevada, to recycle tires generated at SNL/TTR. Lunas Recycling accepts all tire sizes that SNL/TTR is currently using (including loader tires). Scrap metals were recycled during 2014 through a contract with Silver Dollar Recycling, also located in Las Vegas.

Aboveground Storage Tanks

Aboveground storage tanks (ASTs) are subject to EPA regulations 40 CFR 112, *Oil Pollution Prevention*, and 40 CFR 110, *Discharge of Oil*. There are no ASTs at SNL/TTR that require registration with the State of Nevada. SNL/TTR completed replacement of all AST systems in 2014. The last of the underground storage tanks at SNL/TTR were removed in 1995. There were seven ASTs at SNL/TTR in 2014.

2.2.4 Federal Facility Compliance Act

The Federal Facility Compliance Act requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste, including full compliance with the restrictions and prohibitions on extended storage of wastes that do not meet the applicable hazardous waste treatment standards. Extended storage at DOE facilities is typically associated with mixed wastes (wastes that have hazardous and radioactive components) that have been generated on-site. Since SNL/TTR operations do not generate mixed waste and there is currently no mixed waste stored on-site, these requirements are not applicable to operations at SNL/TTR.

2.2.5 Clean Air Act and Clean Air Act Amendments of 1990

The Clean Air Act (CAA) and CAA Amendments of 1990 requirements are regulated by State of Nevada air quality regulations. Air emissions from nonradionuclide sources, such as a portable screen or maintenance shop activities, are permitted under a Class II Air Quality Permit. Emissions are tracked, and Sandia pays a standard \$500 permit fee to the State of Nevada annually. SNL/TTR met all air quality permit conditions in 2014.

National Emission Standards for Hazardous Air Pollutants Compliance

The EPA retains compliance authority for all radionuclide air releases, which are regulated by National Emission Standards for Hazardous Air Pollutants (NESHAP) and implemented under 40 CFR 61, Subpart H. The Clean Slate sites, as discussed in [Chapter 1](#), have been the only source of radionuclide air emissions at SNL/TTR. Continuous air monitoring was conducted from February 22, 1996, to February 25, 1997 ([SNL/NM 1997a](#)). It was determined that the SNL/TTR airport was the location of the maximally exposed individual. The result of 0.024 mrem/yr was below the threshold of 0.1 mrem/yr,

for which continuous air monitoring would be required, and approximately 400 times less than the EPA standard of 10 mrem/yr. The *NESHAP Annual Report for CY 2014, Sandia National Laboratories, Tonopah Test Range* (SNL/NM 2015b) and [Chapter 3](#) of this report discuss these monitoring results.

2.2.6 Wastewater

SNL/TTR wastewater discharges are controlled by the Nevada Division of Environmental Protection (NDEP), which administers regulations relevant to water pollution and sanitary waste systems. Wastewater that enters the sanitary sewer system is treated in the SNL/TTR sewage lagoons. The USAF operates these lagoons under a National Pollution Discharge Elimination System (NPDES) permit issued by NDEP. Sandia also maintains five septic tank systems (the newest of which is inactive) in remote areas at SNL/TTR, which are used only for domestic sanitary sewage collection. Additional information can be found in [Section 3.4.3](#) of this report.

Stormwater

The issuance of an NPDES stormwater permit is generally based on whether or not stormwater runoff is discharged to “Waters of the U.S.” The SNL/TTR site is primarily a closed basin, with runoff evaporating or infiltrating to the ground. The USAF has permitted its airfield and Area 10 for stormwater runoff and has cognizance over all stormwater issues at the site. The State of Nevada has determined that there are no industrial activities at SNL/TTR that require permitting. New construction activities that exceed one acre of soil disturbance require permitting under the Construction General Permit. On October 9, 2014, SNL/TTR submitted a Notice of Intent to operate under the Nevada Stormwater Construction Permit NVR100000 for a project titled “Tonopah Test Range Fiber Optic Cable Installation.” A Stormwater Pollution Prevention Plan for Construction Activities was developed for this project and will be maintained until a Notice of Termination is submitted to NDEP. The permit fee of \$200 must be submitted no later than July 1 of each year that SNL/TTR is covered under this permit.

2.2.7 Safe Drinking Water Act

Sandia meets standards for drinking water as defined in the Safe Drinking Water Act and NDEP public water supply and public water system regulations. Production Well 6 normally provides all drinking water for the Area 3 compound. SNL/TTR operates under permits issued by NDEP (one for the public water system and one for the arsenic treatment system). The USAF public water system and the Sandia public water system are designed such that they can, on an as-needed basis, provide backup drinking water to each other. [Chapter 3](#) of this report discusses monitoring activities. The NDEP Bureau of Safe Drinking Water characterizes this public water system as a Non-Transient Non-Community system.

2.2.8 Toxic Substances Control Act

Compliance with the Toxic Substances Control Act (TSCA) at SNL/TTR primarily concerns management of asbestos and polychlorinated biphenyls (PCBs). As defined by TSCA, any material containing PCB with a concentration greater than or equal to 500 ppm is considered a PCB; materials with greater than or equal to 50 ppm but less than 500 ppm are considered PCB contaminated.

In 1993, sampling was performed on SNL/TTR transformers to determine whether PCBs were present ([IT 1993](#)). All samples contained less than 50 ppm of PCBs. Asbestos-containing materials at SNL/TTR were identified in a comprehensive 1993 Asbestos Site Survey, which is available on the SNL/TTR server. The survey is updated periodically when new information (such as sample results or abatement activities) is available.

Three asbestos abatement activities were conducted at SNL/TTR during 2014. The first activity was conducted in Building 03-57, Room 304, to remove asbestos-containing mastic from the subfloor prior

to remodeling the room. The second and third activities were to abate any asbestos in buildings 100 and 101 prior to decontamination and demolition of these facilities. All asbestos-related activities are conducted in accordance with applicable regulatory requirements.

2.2.9 Federal Insecticide, Fungicide, and Rodenticide Act

Chemical pesticides used at SNL/TTR include herbicides, rodenticides, and insecticides, as needed. All chemicals used are EPA approved and are applied in accordance with applicable label guidelines and regulations. Sandia retains records of the quantities and types of pesticides that are used as well as Safety Data Sheets for each pesticide. There were no violations of the Federal Insecticide, Fungicide, and Rodenticide Act in 2014.

2.2.10 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires federal agencies (and other organizations that perform federally sponsored projects) to consider environmental issues associated with proposed actions, be aware of the potential environmental impacts associated with these issues, and include this information in early project planning and decision making. Proposed actions that would not significantly impact the human environment are categorically excludable from additional NEPA documentation (as identified in DOE 10 CFR Part 1021, *National Environmental Policy Act Implementing Procedures*). Other proposed actions may fit within a class of actions that have environmentally significant impacts associated with them. For this class of proposed actions, the agency must prepare an environmental assessment or an environmental impact statement before making an irrevocable commitment of resources or funding. Although a major objective of NEPA is to preserve the environment for future generations, the law does not require an agency to choose a course of action with the least environmental impacts. The DOE/National Nuclear Security Administration (NNSA)/Sandia Field Office (SFO) coordinates NEPA compliance at SNL/TTR with personnel from SNL, New Mexico (SNL/NM). NEPA activities are discussed in Section 3.1.4.

2.2.11 Endangered Species Act

The Endangered Species Act applies to both private individuals and federal agencies. Federal agencies must ensure that any action authorized, funded, or carried out by them will not jeopardize the continued existence of a threatened or endangered species, or result in adverse modifications of its habitat. At SNL/TTR, the Endangered Species Act is addressed under the NEPA Program and the Ecology Program. If potentially significant impacts to sensitive species or habitats are found as a result of a proposed action, an environmental assessment or an environmental impact statement must be prepared.

Table 2-4 lists all federal- and state-protected species occurring within Nye County, Nevada, and having the potential to occur at SNL/TTR.

Table 2-4. SNL/TTR protected species potentially occurring in Nye County, Nevada

Common Name	Scientific Name	Federal Status	State of Nevada Protected Status
Plants			
Sodaville milkvetch	<i>Astragalus lentiginosus</i> var. <i>sesquimetralis</i>	—	Endangered
Ash Meadows milkvetch	<i>Astragalus phoenix</i>	Threatened	Endangered
Spring-loving centaury	<i>Centaurium namophilum</i>	Threatened	Endangered
Ash Meadows sunray	<i>Enceliopsis nudicaulis</i> var. <i>corrugata</i>	Threatened	Endangered
Ash Meadows gumplant	<i>Grindelia fraxinopratensis</i>	Threatened	Endangered
Ash Meadows ivesia	<i>Ivesia kingii</i> var. <i>eremica</i>	Threatened	Endangered
Ash Meadows blazingstar	<i>Mentzelia leucophylla</i>	Threatened	Endangered
Amargosa niterwort	<i>Nitrophila mohavensis</i>	Endangered	Endangered
Williams combleaf	<i>Polyctenium williamsiae</i>	—	Endangered
Invertebrates			
Ash Meadows naucorid	<i>Ambrysus amargosus</i>	Threatened	—
Fishes			
Railroad Valley springfish	<i>Crenichthys nevadae</i>	Threatened	Threatened
Devils Hole pupfish	<i>Cyprinodon diabolis</i>	Endangered	Endangered
Ash Meadows Amargosa pupfish	<i>Cyprinodon nevadensis mionectes</i>	Endangered	Threatened
Warm Springs Amargosa pupfish	<i>Cyprinodon nevadensis pectoralis</i>	Endangered	Endangered
Pahrump poolfish	<i>Empetrichthys latos latos</i>	—	Endangered
White River spinedace	<i>Lepidomeda albivallis</i>	Endangered	Endangered
Moapa dace	<i>Moapa coriacea</i>	Endangered	Endangered
Lahontan cutthroat trout	<i>Oncorhynchus clarkii henshawi</i>	Threatened	—
Ash Meadows speckled dace	<i>Rhinichthys osculus nevadensis</i>	Endangered	Endangered
Amphibians			
Columbia spotted frog (Great Basin pop)	<i>Rana luteiventris</i> pop. 3	Candidate	State Protected
Reptiles			
Desert tortoise (Mojave Desert pop.)	<i>Gopherus agassizii</i>	Threatened	Threatened
Mammals			
Spotted bat	<i>Euderma maculatum</i>	—	Threatened
Birds			
Greater sage grouse	<i>Centrocercus urophasianus</i>	Candidate	—
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Threatened	Sensitive
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	Endangered
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	Endangered	Endangered

NOTE: — = not available

2.2.12 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 implemented the 1916 Convention for the Protection of Migratory Birds. The original statute implemented the agreement between the 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 taking, killing, possessing, transporting, and importing migratory birds, their eggs, parts, or nests. Federal institutions are not exempt from the MBTA. At SNL/TTR, the MBTA is coordinated through NEPA reviews and the Ecology Program.

2.2.13 Federal Facility Agreement and Consent Order Compliance for Environmental Restoration Activities

The Federal Facility Agreement and Consent Order (FFACO) is an ongoing action with the State of Nevada that started in 1996. This agreement was implemented in May 1996 between the State of Nevada, DOE, and the U.S. Department of Defense (DOD) ([DOD, DOE, and State of Nevada 1996](#)). All DOE cleanup activities at certain specified facilities in the State of Nevada must be conducted in conformance with the requirements of this agreement. The FFACO is an enforceable agreement with stipulated penalties for violations. The Environmental Restoration (ER) sites subject to the FFACO for which DOE has assumed responsibility are:

- Nevada National Security Site
- Areas within SNL/TTR
- Areas within the Nevada Test and Training Range
- Central Nevada Test Area
- Project Shoal Area (east of Carson City in Churchill County)

A summary of DOE/NNSA's ER sites in Nevada can be found in the FFACO document ([DOD, DOE, and State of Nevada 1996](#)). The list of sites has been modified for consistency with NDEP requirements and grouped into Corrective Action Units (CAUs), which are listed by Corrective Action Site (CAS) numbers. Each CAU/CAS is listed in the FFACO in the following appendices:

- Appendix II, "Corrective Action Sites/Units" (this section includes inactive CAUs/CASs)
- Appendix III, "Corrective Action Investigations/Corrective Actions" (this section includes active CAUs/CASs)
- Appendix IV, "Closed Corrective Action Units" (this section lists CAUs/CASs where corrective actions are complete)

The FFACO is updated every six months. A listing of ER sites located at TTR is shown in [Table 3-1](#).

2.2.14 Cultural Resources Acts

Federal cultural resources management responsibilities are applicable to activities at SNL/TTR. These include, but are not limited to, compliance with the following laws and their associated regulations:

- National Historic Preservation Act
- Archaeological Resources Protection Act
- American Indian Religious Freedom Act

The DOE/NNSA/SFO is responsible for determining the level of applicability of cultural resources requirements. In 2014, Sandia's operations generated no impact on cultural resources at SNL/TTR.

Historic Building Assessment

In 2011, DOE/NNSA/SFO completed consultation with the Nevada State Historic Preservation Office (SHPO), reaching an agreement on the proposed SNL/TTR Historic District. In 2012, DOE/NNSA/SFO provided samples of the documentation created to mitigate the effect of future demolition of properties within the SNL/TTR Historic District. The Nevada SHPO reviewed the sample documentation and agreed with its suitability. Negotiation is ongoing between the DOE/NNSA/SFO and the Nevada SHPO regarding a memorandum of agreement covering the historic district and future mitigative efforts at the site.

Once the memorandum of agreement is signed, the Historic American Buildings Survey/Historic American Engineering Record Western Region office will provide instructions on the format for the final report on the SNL/TTR Historic District prior to the report being finalized.

Archaeological Survey

In 2014, preparatory to the proposed installation of a fiber optic cable line to improve communications at the site, an archaeological survey of the affected area was undertaken. The DOE/NNSA/SFO is currently engaged in consultation with the Nevada SHPO regarding the results of the survey and any necessary actions to avoid or mitigate the impact on archaeological sites within SNL/TTR.

2.2.15 Atomic Energy Act

In 1946, the Atomic Energy Act (AEA) was enacted 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 control of nuclear energy and nuclear materials primarily to DOE, the U.S. Nuclear Regulatory Commission, and the EPA. Federal regulations control radioactive emissions and the transportation of nuclear materials. The DOE/NNSA/SFO, as governed by DOE directives, retains authority for radioactive waste. Operations at SNL/TTR are subject to the requirements established in [DOE O 435.1, Change 1](#), *Radioactive Waste Management*, and [DOE O 458.1, Change 3](#), *Radiation Protection of the Public and the Environment*.

DOE O 435.1 establishes requirements for managing radioactive waste in a manner that protects the environment and worker and public health and safety. Under this order, DOE contractor-operated facilities are required to plan, document, execute, and evaluate the management of radioactive waste (see [Chapter 3](#) for details).

DOE O 458.1 sets radiation protection standards for DOE operations so that radiation exposures to members of the public and the environment are as low as reasonably achievable and are maintained within established limits of the order.

The control and release of property with residual radioactivity is specified in DOE O 458.1. Sandia does not release property (e.g., vehicles, equipment, or other materials) to the public with residual radioactivity above the limits specified in DOE O 458.1. Pursuant to written procedures, items that are potentially contaminated or activated are either surveyed prior to release to the public, or a process knowledge evaluation is conducted to verify that the property has not been exposed to radioactive material or to energy capable of inducing radioactivity in the material. In some cases, both a radiological survey and a process knowledge evaluation are performed. In 2014, Sandia's Radiation Protection Department processed two equipment clearance surveys. Using a graded approach, Sandia only keeps track of high-value released items (e.g., those items worth greater than \$100,000). In 2014, no such high-value items were released.

DOE issued a moratorium in January 2000 that prohibited the release of volume-contaminated metals, and subsequently suspended the release of metals for recycling purposes from DOE radiological areas in July 2000. No metals subject to the moratorium or the suspension were released from SNL/TTR in 2014.

Excess property with residual radioactivity above the limits in DOE O 458.1 is either retained for continued use within DOE facilities or transferred to the SNL/NM Radioactive and Mixed Waste Management Facility for disposal as radioactive waste. There were no releases of real property to the public in 2014.

2.2.16 Environmental Compliance Executive Orders

The following environmental compliance EOs are applicable at SNL/TTR.

Executive Order (EO) 11988, Floodplain Management, and EO 11990, Protection of Wetlands

As amended, these orders require evaluation of the potential effects of actions taken in these environmentally sensitive areas. There are no floodplains or significant wetlands at SNL/TTR; however, some very limited wetlands exist in the vicinity of several springs. These provide an important source of drinking water for wildlife in the area. Sandia complies with all applicable mandates stated in these EOs.

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

As amended, EO 12898 requires that, 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. A periodic analysis is performed to assess whether existing or proposed operations cause any disproportionate impacts on minority or low-income populations within the area of influence of Sandia operations.

EO 13423, Strengthening Federal Environmental, Energy, and Transportation Management

Issued in January 2007, EO 13423 sets goals in the areas of energy efficiency, acquisition, renewable energy, toxics reductions, recycling, sustainable buildings, electronics stewardship, fleets, and water conservation. EO 13423 also requires more widespread use of Environmental Management Systems (EMSs) as the framework in which to manage and continually improve these sustainable practices.

EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance

Issued in October 2009, EO 13514 establishes an integrated strategy toward sustainability to safeguard the health of our environment and make the reduction of greenhouse gas emissions a priority for all federal agencies. EO 13514 sets goals in the areas of promoting electronics stewardship, preventing pollution, increasing renewable energy, reducing waste, recycling, and reducing fossil fuel usage.

2.2.17 Department of Energy Directives

DOE directives on the Management and Operating Contract between Sandia and the DOE define the primary contractual obligations for operating SNL/TTR (Section [1.1.1](#)). In 2014, Sandia met all the requirements stated in these DOE directives.

2.2.18 Quality Assurance

Sandia takes responsibility and accountability for implementing quality assurance for all its operations as specified in International Organization for Standardization (ISO) 9001-2000 ([ISO 2008](#)), the Contractor Requirements Document of [DOE O 414.1D](#), *Quality Assurance*, and 10 CFR 830, Subpart A, “Quality Assurance.” Quality assurance is implemented via policy statements, processes, and procedures, and by executing the actions specified in those processes and procedures ([10 CFR 830](#)).

2.3. Audits in 2014

NDEP conducted two on-site audits at SNL/TTR during 2014, an RCRA Hazardous Waste Compliance Inspection and a Sanitary Survey of the Public Water System. No findings or discrepancies were noted during either inspection.

The SNL Independent Audit and Advisory Services performed an audit of SNL/TTR during 2014. One purpose of the audit was to evaluate Environment, Safety, and Health (ES&H) management. Three ES&H findings were identified during the assessment along with four noteworthy practices. All findings have been corrected.

A summary of 2014 environmental audits is presented in [Table 2-5](#).

Table 2-5. SNL/TTR environmental audits, 2014

Type/ Subject	Date	Audit Organization	Findings Summary
RCRA Hazardous Waste Compliance Inspection	April 15	NDEP	No findings or discrepancies were noted during the inspection.
Public Water System Sanitary Survey	July 8	NDEP	No findings or discrepancies were noted during the inspection.
Integrated Remote Operations (SNL/TTR)	August 15	SNL Independent Audit and Advisory Services	<p>Three ES&H findings were associated with this audit along with four noteworthy practices; all findings have been corrected.</p> <p>Findings:</p> <ol style="list-style-type: none"> 1. ES&H: The emergency services memorandum of understanding between Sandia and the TTR/FD has not been signed by the Air Force, which operates TTR/FD. 2. ES&H: SNL/TTR's ASTs do not have required National Fire Protection Association hazard identification placards. 3. ES&H: SNL/TTR's Spill Prevention Control and Countermeasure Plan is not being maintained. <p>Noteworthy Practices:</p> <ol style="list-style-type: none"> 1. ES&H: Center 02900 had reduced its on-site inventory of aging, high-hazard chemicals by nearly 60 percent as of March 2014, significantly exceeding its fiscal year 2014 EMS objective and target of a 15 percent reduction. 2. ES&H: SNL/TTR has established a SharePoint site for managing environmental program documentation and records that makes these documents readily available to SNL/TTR personnel and corporate environmental program subject matter experts. 3. ES&H: SNL/TTR uses easily closed drum lids to ensure the "closed container" requirement is met for the 30 gal and 55 gal open-head metal drums used for hazardous waste. 4. ES&H: Prior to putting rented generators into service, and between fueling cycles, SNL/TTR inspects the generators to ensure they are not leaking fuel or oil and are in safe working order.

NOTES: AST = aboveground storage tank
 EMS = Environmental Management System
 ES&H = Environment, Safety, and Health
 NDEP = Nevada Division of Environmental Protection

RCRA = Resource Conservation and Recovery Act
 SNL = Sandia National Laboratories
 SNL/TTR = Sandia National Laboratories, Tonopah Test Range
 TTR/FD = Tonopah Test Range Fire Department

2.4. Environmental Permits

Environmental compliance permits for SNL/TTR include those for hazardous materials storage, public water supply, stormwater, RCRA, and air quality. The State of Nevada issues permits for these SNL/TTR activities directly to DOE/NNSA/SFO, and Navarro Research and Engineering (Navarro) administers them on behalf of Sandia. Sandia and Navarro ensure that all permit conditions are met. Table 2-6 lists all permits and registrations in effect in 2014.

Table 2-6. SNL/TTR permits, 2014

Permit Type and Location	Permit Number	Issue Date	Expiration Date	Comments
Air Quality				
Class II Air Quality Operation Permit	AP 8733-0680.03, FIN A0025	08/05/2011 (amended with corrections 10/03/2011) also (administratively amended to update Surface Area Disturbance Conditions/Fugitive Dust Control Plan 11/14/2014)	07/23/2016	<ul style="list-style-type: none"> • Portable screen • Welding operation • Carpenter area • Paint booth • Generators (9 systems) • Surface area disturbance • (> 5 acres)
Hazardous Waste (RCRA)				
Hazardous Waste Generator	NV1890011991 ^a	January 7, 1993	Indefinite	State of Nevada
Hazardous Waste (Nevada State Fire Marshal)				
Hazardous Materials Permit	20965 FDID Number (13007)	February 2013 February 2014	February 28, 2014 February 28, 2015	State of Nevada
Stormwater Construction (SWPPP)				
Fiber-Optic Cable Installation	Site Number CSW-39893	October 16, 2014	Renew by July 1, 2015, until Notice of Termination submitted	State of Nevada
Production Well (Drinking Water)				
Production Well 6	NV-3014-12NTNC ^b	August 29, 2013 August 28, 2014	September 30, 2014 September 30, 2015	State of Nevada
Permit to Operate a Treatment Plant	NV-3014-TP11-12NTNC	August 29, 2013 August 28, 2014	September 30, 2014 September 30, 2015	State of Nevada

NOTES: ^aGenerator identification number (not a permit number).

^bThe State of Nevada Bureau of Health Protection Services renews the permit for Production Well 6 (NV-3014-12NTNC) annually.

> = greater than

AP = air permit

FDID = Fire Department Identification

FIN = facility identification number

NTNC = Non-Transient Non-Community

NV = Nevada

RCRA = Resource Conservation and Recovery Act

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

SWPPP = Stormwater Pollution Prevention Plan

2.5. Occurrence Reporting

Under DOE O 232.2 Admin. Change 1, the current order for occurrence reporting, 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 O 232.2, or determined to be recurring through performance analysis, are considered occurrences.” There are environmental releases that may not meet DOE O 232.2 reporting thresholds; however, they are still reportable to outside agencies. There were no reportable occurrences in 2014.



Chapter 3. SNL/TTR Environmental Programs

Sandia Corporation (Sandia) personnel conduct environmental, terrestrial, water, and air monitoring programs at Sandia National Laboratories, Tonopah Test Range (SNL/TTR), Nevada. Sandia complies with federal, state, and local regulations. The 2014 activities and results of Sandia's environmental programs at SNL/TTR are detailed in this chapter.

3.1. Environmental Programs

Sandia Corporation (Sandia) collects environmental data at Tonopah Test Range (TTR), Nevada, to determine and report the impact of existing Sandia operations on the environment. Sandia's environmental programs include monitoring and surveilling air, water, and soil. The environmental program activities at Sandia National Laboratories, Tonopah Test Range (SNL/TTR) meet or exceed the requirements of federal, state, and local environmental regulations, as well as U.S. Department of Energy (DOE) directives in the Prime Contract between Sandia and DOE. Presidential Executive Orders and DOE guidance documents are also used to establish program criteria.

The following environmental programs and focus areas are presented in this chapter:

- Environmental Restoration (ER) Project
- Waste Management Program
- Spill Prevention Control and Countermeasures (SPCC) Plan
- National Environmental Policy Act (NEPA) Program
- Environmental Monitoring
- Release reporting
- Terrestrial Surveillance Program
- Air Quality Compliance Program
- Water Quality Programs

3.1.1 Environmental Restoration Project Activities

ER Project activities at SNL/TTR and the Nevada Test and Training Range (NTTR) were initiated in 1980 to address contamination resulting primarily from nuclear weapons testing and related support activities. Responsibility for all SNL/TTR and NTTR ER sites resides with the DOE/National Nuclear Security Administration (NNSA)/Nevada Field Office (NFO).

Since 1996, cleanup activities for selected sites located in the State of Nevada have been regulated by the Federal Facility Agreement and Consent Order (FFACO) of 1996, as amended. (See also Section 2.2.13.) The FFACO was negotiated between the State of Nevada, DOE Environmental Management, the U.S. Department of Defense (DOD), and DOE Legacy Management ([DOD, DOE, and State of Nevada 1996](#)).

The FFACO took effect on May 10, 1996, and accomplished the following:

- Established a framework for identifying Corrective Action Sites (CASs)
- Grouped CASs into Corrective Action Units (CAUs)
- Prioritized CAUs
- Implemented corrective action activities

Two ER activities are addressed by CAUs located at SNL/TTR and NTTR:

- **Industrial sites activity.** Sites historically used to support nuclear testing and SNL activities. Industrial sites include historical septic tank systems, landfills, sewage lagoons, depleted uranium sites, and ordnance testing sites.
- **Soil activity.** Areas where nuclear testing has resulted in surface and/or shallow subsurface soil contamination. Soil sites include large area soil contamination from plutonium dispersal testing.

ER site contamination includes radiological constituents (e.g., depleted uranium and plutonium) and nonradiological constituents (e.g., munitions, solvents, pesticides, septic sludge, and heavy metals).

Corrective Action Site Identification

The initial identification, description, and listing of CASs at SNL/TTR and NTTR was derived from the Preliminary Assessment and the Federal Facility Preliminary Assessment Review (E&E 1989). Twelve additional potential CASs, not included in the Preliminary Assessment, were identified using the following methods: ER site inventory processes, ordnance removal activities, geophysical surveys, former worker interviews, archive reviews, site visits, and aerial radiological and multispectral surveys (1993–1996).

The remediation activities at the Clean Slate and Double Tracks sites (Operation Roller Coaster) located at SNL/TTR are discussed in Chapter 1. These sites are listed under soil CAUs/CASs in Table 3-1 as CAUs 411, 412, 413, and 414. Two additional sites still subject to further activities, Project 57 (located on Nellis Range 13) and Small Boy (located on NTTR), are listed under soil CAUs in Table 3-1 as CAU 415 and CAU 541, respectively. A listing of closed CAUs/CASs is available in appendices II, III, and IV of the FFACO (DOD, DOE, and State of Nevada 1996).

Table 3-1. SNL/TTR status of CAU remediation activities, 2014

Soil Site CAUs/CASs		
CAS Number	CAS Description	General Location
CAU 411—Final Closure is in process. Double Tracks plutonium dispersion (Nellis)		
NAFR-23-01	Pu contaminated soil	Nellis Range 71
CAU 412—Final Closure is in process. Clean Slate I plutonium dispersion (SNL/TTR)		
TA-23-01CS	Pu contaminated soil	Tonopah Test Range
CAU 413—Investigation phase. Clean Slate II plutonium dispersion (SNL/TTR)		
TA-23-02CS	Pu contaminated soil	Tonopah Test Range
CAU 414—Not started. Clean Slate III plutonium dispersion (SNL/TTR)		
TA-23-03CS	Pu contaminated soil	Tonopah Test Range
CAU 415—Remediation phase. Project 57 No. 1 plutonium dispersion (NTTR)		
NAFR-23-02	Pu contaminated soil	Nellis Range 13
CAU 541—Investigation phase. Small Boy		
05-23-04	Atmospheric tests (6), Bfa ^a site	BFa, NTTR
05-45-03	Atmospheric test site, Small Boy	Frenchman Flat, Area 5, NTTR

NOTES: A listing of closed CAU/CASs is available in Appendices II, III, and IV of the FFACO (DOD, DOE, and State of Nevada 1996).

^aBfa is the site name and not an acronym.

CAS = Corrective Action Site

CAU = Corrective Action Unit

DOD = U.S. Department of Defense

DOE = U. S. Department of Energy

FFACO = Federal Facility Agreement and Consent Order

NAFR = Nellis Air Force Range

NTTR = Nevada Test and Training Range

Pu = plutonium

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

Environmental Restoration Project Activities in 2014

ER activities in 2014 included characterizing, packaging, and transporting 6,000 cubic feet of low-level waste from Clean Slate II to the Nevada National Security Site (NNSS). This waste was generated during the 1996 and 1997 remediation effort at the Double Tracks and Clean Slate I sites.

Other ER activities conducted on the SNL/TTR and NTTR sites in 2014 consisted of the annual post-closure inspections of closed and use-restricted industrial sites and the inspections of radiological postings at the Clean Slate and Double Tracks sites. The inspections were conducted in May 2014, and minor erosion and subsidence repairs were completed in July 2014. A post-closure visual inspection of vegetation was conducted at CAU 407 in June 2014.

Air samples were also collected throughout the year at various locations on SNL/TTR and NTTR. (Details of air sample collection activities are provided in [Chapter 1](#).)

3.1.2 Waste Management Program

All waste generated at SNL/TTR, which excludes any waste generated by ER activities, is managed by Navarro Research and Engineering (Navarro) under the Waste Management Program. Waste categories include radioactive waste, Resource Conservation and Recovery Act hazardous waste, other chemical waste, and nonhazardous solid waste. Waste minimization and recycling efforts are integrated into Waste Management Program activities.

Waste generated and shipped from SNL/TTR to approved facilities in 2014 is presented in [Table 3-2](#) and [Table 3-3](#). All regulated waste was shipped off-site to permitted treatment, storage, and disposal facilities.

Table 3-2. SNL/TTR waste generated

Waste Type	Weight (kg)	Weight (lb)
RCRA hazardous waste	570 ^a	1,254
Non-RCRA regulated waste	1,246	2,741
Non-salvage yard recycled material	749	1,647.8
Salvage yard metals recycling	6,302	13,865
Toxic Substances Control Act waste (asbestos)	1,136	2,504
Radioactive waste	0	0

NOTES: ^a215 kg of this total was recycled and is also included in the “non-salvage yard recycled material” total.

RCRA = Resource Conservation and Recovery Act

Table 3-3. SNL/TTR waste shipped

Waste Type	Weight (kg)	Weight (lb)
Sanitary Landfill		
USAF Sanitary Landfill	25,342	55,870
Construction Debris		
USAF Construction Landfill	204,144	450,060
Tires		
Lunas Tire Recycling	9,091	20,000
Battery Recycling		
National Automotive Parts Association and Veolia	281 ^a	618.2
Hydrocarbon Contaminated Waste		
U.S. Ecology Landfill, Beatty	0	0

NOTES: ^aThis total is also included in the “non-salvage yard recycled material” total.

USAF = U.S. Air Force

Waste Minimization Program

SNL/TTR is committed to achieving significant reductions in the amount of chemical and hazardous wastes generated on-site. Waste minimization includes recycling and recovering the following materials:

- Solvents
- E-waste, including computers, monitors, radios, and electronics
- Fuels and oil
- Tires
- Antifreeze (on-site recycling unit)
- Lead acid batteries
- Freon (on-site recovery unit)
- Fluorescent and sodium bulbs
- Mercury-containing equipment

Recyclables and used oil are sent for recycling or are disposed of through a waste disposal contractor. Recycled or energy-recovered quantities shipped off-site in 2014 are presented in [Table 3-4](#).

Table 3-4. SNL/TTR material recycled or energy-recovered and shipped off-site, 2014

Recycled or Energy-Recovered Waste	Shipped (lb)	Shipped (kg)
Batteries, wet, filled with acid (lead acid)	525	238
Lithium batteries	38	17
Nickel-cadmium batteries	57	26
Fluorescent lights	173	79
Incandescent lights	135	61
Mercury containing articles	50	23
Non-PCB light ballasts	673	305
Salvage yard metals recycling	13,865	6,302
Tires	20,000	9,091
Total	35,516	16,142

NOTE: PCB = polychlorinated biphenyl

Radioactive Waste Management

There were no shipments of radioactive waste in 2014.

3.1.3 Spill Prevention Control and Countermeasures Plan

The *Spill Prevention Control and Countermeasures (SPCC) Plan for SNL Tonopah Test Range (SNL/NM 2014d)* pertains to oil storage equipment and secondary containments subject to Code of Federal Regulations (CFR) [40 CFR 112](#), *Oil Pollution Prevention*, and [40 CFR 110](#), *Discharge of Oil*. The SPCC Plan must be updated at least every five years.

Two mobile refuelers (a truck and a trailer), seven aboveground storage tanks ([Figure 3-1](#)), a bulk storage area for 55 gal drums, and a transformer storage area are covered by the SPCC Plan at SNL/TTR. Inspections are conducted monthly. Any issues identified during the inspections are promptly corrected or are tracked via the work request process.

In May 2014, the Area 9 backup generator located in Building 09-58 was removed from service. The 1,000 gal diesel fuel tank supplying the generator was drained and removed from service. This reduced the number of aboveground storage tanks (ASTs) from eight in 2013 to seven in 2014. SNL/TTR completed replacement of all AST systems in 2014.



Figure 3-1. SNL/TTR diesel fuel tank (1,000 gal) at Building 24-51

3.1.4 National Environmental Policy Act Program

At SNL/TTR, NEPA compliance is coordinated between personnel from SNL/TTR, Sandia National Laboratories, New Mexico (SNL/NM), and the DOE/NNSA/Sandia Field Office (SFO).

Personnel from SNL/TTR and the SNL/NM NEPA team supported preliminary analyses for potential upcoming projects at SNL/TTR, including an upgrade of the fiber-optic cable communications loop and a series of liquid natural gas burn and dispersal experiments. This support included participation in the development of an archaeological survey for a proposed 50-mile loop needed to install fiber-optic cable communication. The survey is documented in *Mapping Archaeological Surveys at Tonopah Test Range 1974–2014* (SNL/NM 2015a). In 2014, the SNL/NM NEPA team completed ten NEPA checklists for SNL/TTR, five of which were transmitted to the DOE/NNSA/SFO for review and determination.

3.1.5 Additional Environmental Monitoring Activities at SNL/TTR

In addition to Sandia, other entities perform environmental monitoring activities at SNL/TTR, as described in the following sections.

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, monitored background radiation in the area of SNL/TTR as part of its Off-Site Radiation Monitoring Reports Program (EPA 1999), which is now being conducted by Desert Research Institute (DRI).

Desert Research Institute of the Nevada System of Higher Education

DRI personnel train and provide monitoring station managers through the Community Environmental Monitoring Program (CEMP) to collect samples from off-site air-monitoring equipment set up at 23 locations within communities surrounding the NNSS. These include the towns of Tonopah and Goldfield, which are near SNL/TTR. DRI, the environmental research arm of the Nevada System of Higher Education, maintains the equipment and sends collected samples to Test America Laboratories in St. Louis, Missouri, for analysis and reporting of gross alpha and gross beta activity of individual filters, and for gamma spectroscopy on quarterly composite samples from each station. Stations also record real-

time gamma readings measured by a pressurized ion chamber, and an environmental thermoluminescent dosimeter is used to confirm gamma readings.

DRI also provides external quality assurance on samples taken by CEMP personnel through duplicate sampling of 10 percent of the station samples. Duplicate samples are analyzed by personnel at the University of Nevada, Las Vegas's radioanalytical laboratory. Data collected from DRI's CEMP personnel are reported in the NNSS Annual Site Environmental Report.

Three DRI portable monitoring stations are in use at SNL/TTR, and they are modeled in part after the CEMP stations previously mentioned. Station 400 is located near the SNL/TTR Range Operations Center, Station 401 is located near Clean Slate 3, and the newest station (Station 402) is located near Clean Slate 1 (see [Chapter 1](#) for details on these monitoring stations).

DRI also performs other monitoring as requested by the DOE, such as archeological surveys. No cultural resource surveys were performed at SNL/TTR at the request of DOE or Sandia in 2014.

Navarro

As part of Navarro's support activities for SNL/TTR, Navarro personnel perform environmental monitoring activities for DOE and/or Sandia when necessary. This can include the following:

- Drinking water and wastewater sampling
- National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR 61, Subpart H (radionuclides), air quality monitoring
- Soil sampling and site characterization of spill sites
- Waste sampling and characterization
- ER support activities

3.1.6 Summary of Release Reporting

NESHAP Annual Report for CY 2014, Sandia National Laboratories, Tonopah Test Range (SNL/NM 2015b) requires that an annual report be submitted from each DOE/NSA site where facility sources contribute a public radiological dose of over 0.1 mrem/yr. The NESHAP report must be submitted to the EPA by June 30 each year following the reporting year. The report includes the calculated effective dose equivalent in millirems per year for the maximally exposed individual. SNL/TTR personnel comply with this requirement annually.

3.2. Terrestrial Surveillance Program

The Terrestrial Surveillance (TS) Program at SNL/TTR collects and analyzes environmental media samples annually to determine whether there has been a radiological or nonradiological release to the environment due to SNL/TTR operations. In addition to collecting environmental media (soil), ambient external gamma radiation levels are measured quarterly using environmental thermoluminescent dosimeters (TLDs). Samples are collected from and TLDs are placed at designated on-site, perimeter, and off-site locations. Personnel from Sandia National Laboratories, New Mexico (SNL/NM) and from SNL/TTR conduct the sampling.

Terrestrial surveillance began at SNL/TTR in 1992. A large-scale baseline sampling was conducted from 1994 through 2005 and reported in *Chemical Analyses of Soil Samples Collected from the Sandia National Laboratories, Tonopah Test Range Environs, 1994–2005 (SNL/NM 2006)*. In 2000, Sandia contracted with a single analytical laboratory with lower detection capabilities for many of the metals. The same database has been used for statistical analysis from 2000 to the present.

3.2.1 Regulatory Criteria

The TS Program is designed and conducted to address the requirements of [DOE O 458.1, Change 3](#), *Radiation Protection of the Public and the Environment*, which establishes standards and requirements to protect the public and the environment from undue risk from radiation. The TS Program is also conducted to satisfy Sandia Corporation's (Sandia's) Environmental Management System, which is certified to the International Organization for Standardization 14001 standard. Reporting is done in accordance with [DOE O 231.1B, Change 1](#), *Environment, Safety, and Health Reporting*.

3.2.2 Sample Locations and Media

The TS Program uses three sample location classifications: on-site, perimeter, and off-site (the latter previously referred to as community locations). Sampling locations have been selected based on several factors. Environmental TLDs are used to measure the cumulative ambient external radiation dose and to closely approximate the dose potentially received from natural and nonnatural sources.

The on-site sample locations ([Table 3-5](#), [Figure 3-2](#)) are in areas of known contamination (Corrective Action Sites [CASs]) and areas of potential release (sites with current outdoor testing activities).

Table 3-5. SNL/TTR on-site terrestrial surveillance locations, sample media, and parameters

Surveillance Location	Location Number	Sample Location	Soil ^a	TLD ^b
Range Operations Center	S-40	Wastewater monitoring station	X ^c	
	S-41	"Danger Powerline Crossing" sign	X ^c	
	S-42	Main Road/Edward's Freeway	X ^c	
	S-43	Range Operation Center (southwest corner)	X ^c	
	S-44	Range Operation Center (northeast corner)	X ^c	
	S-45	Storage shelters 03-38 and 03-39	X ^c	
	S-46	Sand Building	X ^c	
South Plume Area	S-47	Generator storage area	X ^c	
	S-48	North/south Mellan Airstrip–Antelope Tuff	X ^d	
	S-49	North/south Mellan Airstrip–southwest of S-48	X ^d	
	S-50	North/south Mellan Airstrip–signpost	X ^d	
	S-51	North/south Mellan Airstrip–northeast of S-50	X ^d	
Various on-site	S-52	Northeast of northwest/southeast Mellan Airstrip	X ^d	
	S-01	Antelope Lake area fence, cultural area sign	X ^d	X
	S-02	North/south Mellan Airstrip (TLD at south fencepost)	X ^d	X
	S-03	TLD at Clean Slate 2	X ^d	X
	S-04	TLD at Clean Slate 3	X ^d	X
	S-09	Roller Coaster Decontamination Area	X ^d	X
	S-10	Brownes Road/Denton Freeway	X ^d	X
	S-13	Area 3 between Building 100 and "Caution" sign		X
	S-14	Area 3 control point southwest side of fence		X
	S-15	Moody Avenue by cattle guard and entrance to chow hall and airport		X
	S-16	Area 9, near Well 7		X
	S-17	Main Lake south, near Neutron Bunkers		X
	S-38	Mellan Hill–Rock Mound/Orange Block	X ^d	
	S-39	Mellan Hill–north	X ^d	
	S-53	Main Road/Lake Road southeast	X ^d	

NOTES: ^aSoil samples analyzed for radionuclides by gamma spectroscopy annually.

^bTLDs are analyzed for gamma radiation.

^cSoil samples are analyzed for Target Analyte List (TAL) metals every five years.

^dSoil samples are analyzed for Target Analyte List (TAL) metals annually.

TLD = thermoluminescent dosimeter

Perimeter sample locations (Table 3-6, Figure 3-3) are located around the boundaries of SNL/TTR. Off-site sample locations (Table 3-7, Figure 3-4) are located in remote areas and areas near local population and along major roadways. Off-site sample results are used for comparison to the on-site and the perimeter sample results. Off-site and perimeter locations are sampled every five years and were not sampled in 2014 (the next sampling will be in 2018).

Table 3-6. SNL/TTR perimeter terrestrial surveillance locations, sample media, and parameters

Surveillance Location	Location Number	Sample Location	Soil ^{a,b}	TLD ^c
Perimeter	P-05	O&M Complex–Site 4 entrance gate		X
	P-06	Cedar Pass Road guard station	X	X
	P-07	On-base housing–south of power pole 55-11		X
	P-08	On-base housing (main guard gate/power pole CP17)	X	X
	P-11	Cactus Springs (TLD south of P-35)	X	X
	P-12	TLD at “U.S. Government Property” sign	X	X
	P-34	O&M Complex–Owan Drive post	X	
	P-35	Cactus Springs (north fencepost)	X	
	P-36	On-base housing (northeast fence line)	X	
	P-37	On-base housing (guard station)	X	

NOTES: ^aSoil samples are analyzed for radionuclides by gamma spectroscopy annually.

^bSoil samples are analyzed for Target Analyte List (TAL) metals every five years.

^cTLDs are analyzed for gamma radiation.

O&M = Operation and Maintenance

TLD = thermoluminescent dosimeter

Table 3-7. SNL/TTR off-site terrestrial surveillance locations, sample media, and parameters

Surveillance Location	Location Number ^a	Sample Location	Soil ^{b,c}	TLD ^d
Off-Site	C-19	Mining Museum, north Goldfield		X
	C-20	State Road 6 rest area	X	
	C-21	State roads 6 and 95 Ely rest area	X	X
	C-22	Rocket	X	X
	C-23	Alkali and Silver Peak turnoff	X	
	C-24	Cattle guard	X	
	C-25	Tonopah Rangers Station	X	
	C-26	Gabbs Pole Line Road	X	
	C-27	State roads 6 and 376 junction	X	
	C-28	Stone Cabin and Willow Creek on State Road 6	X	
	C-29	State roads 6 and 375 junction	X	
	C-30	State Road 375 ranch cattle gate	X	
	C-31	Golden Arrow and Silver Bow on State Road 6	X	
	C-32	Mile marker 6 on Sandia Drive	X	
	C-33	Mile marker 10 on Sandia Drive	X	

NOTES: ^aOff-site samples were previously called community samples, thus the C label in the location number (maintained for the database).

^bSoil samples are analyzed for radionuclides by gamma spectroscopy annually.

^cSoil samples are analyzed for Target Analyte List (TAL) metals every five years.

^dTLDs are analyzed for gamma radiation.

TLD = thermoluminescent dosimeter

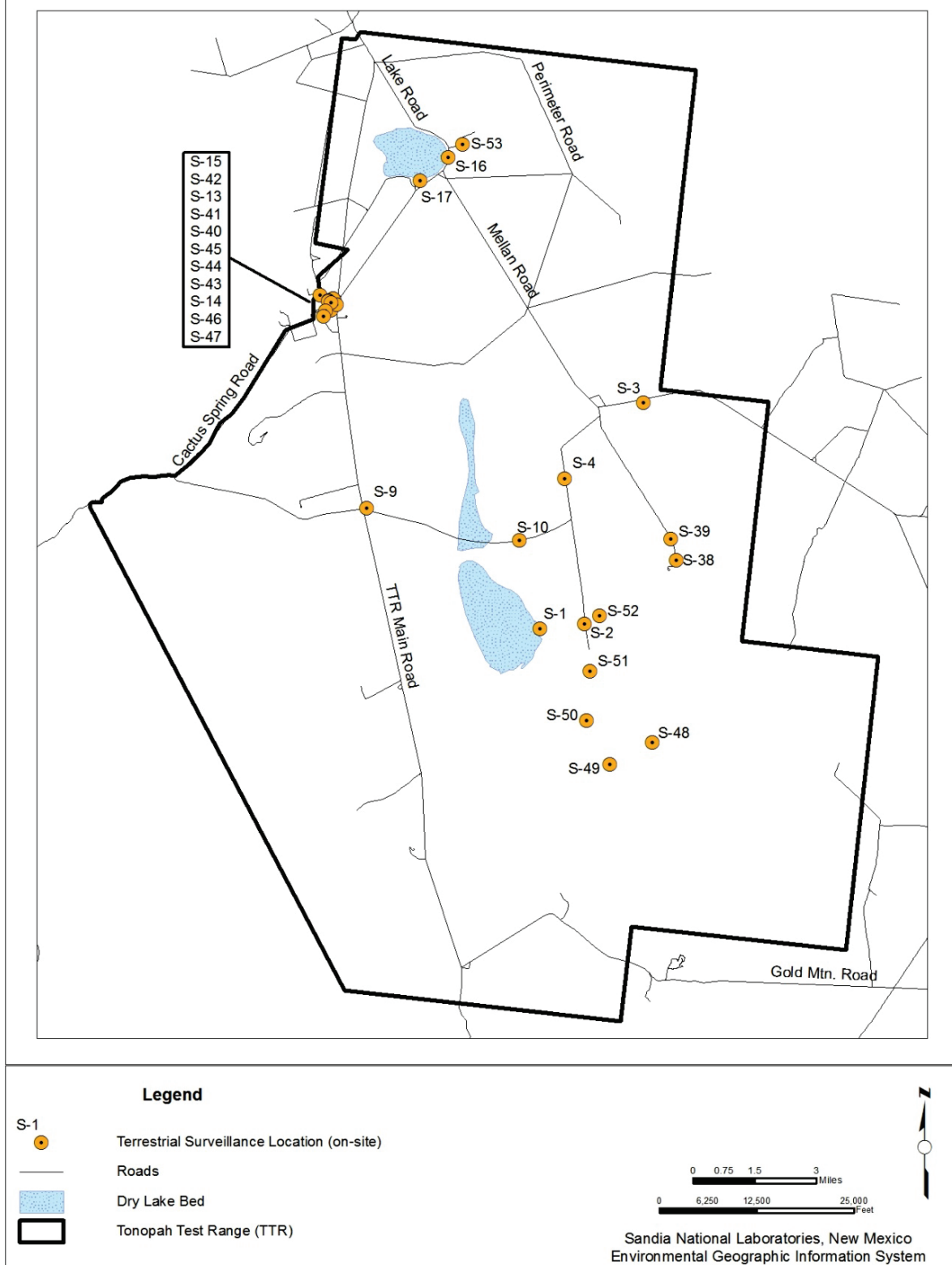


Figure 3-2. SNL/TTR on-site terrestrial surveillance locations

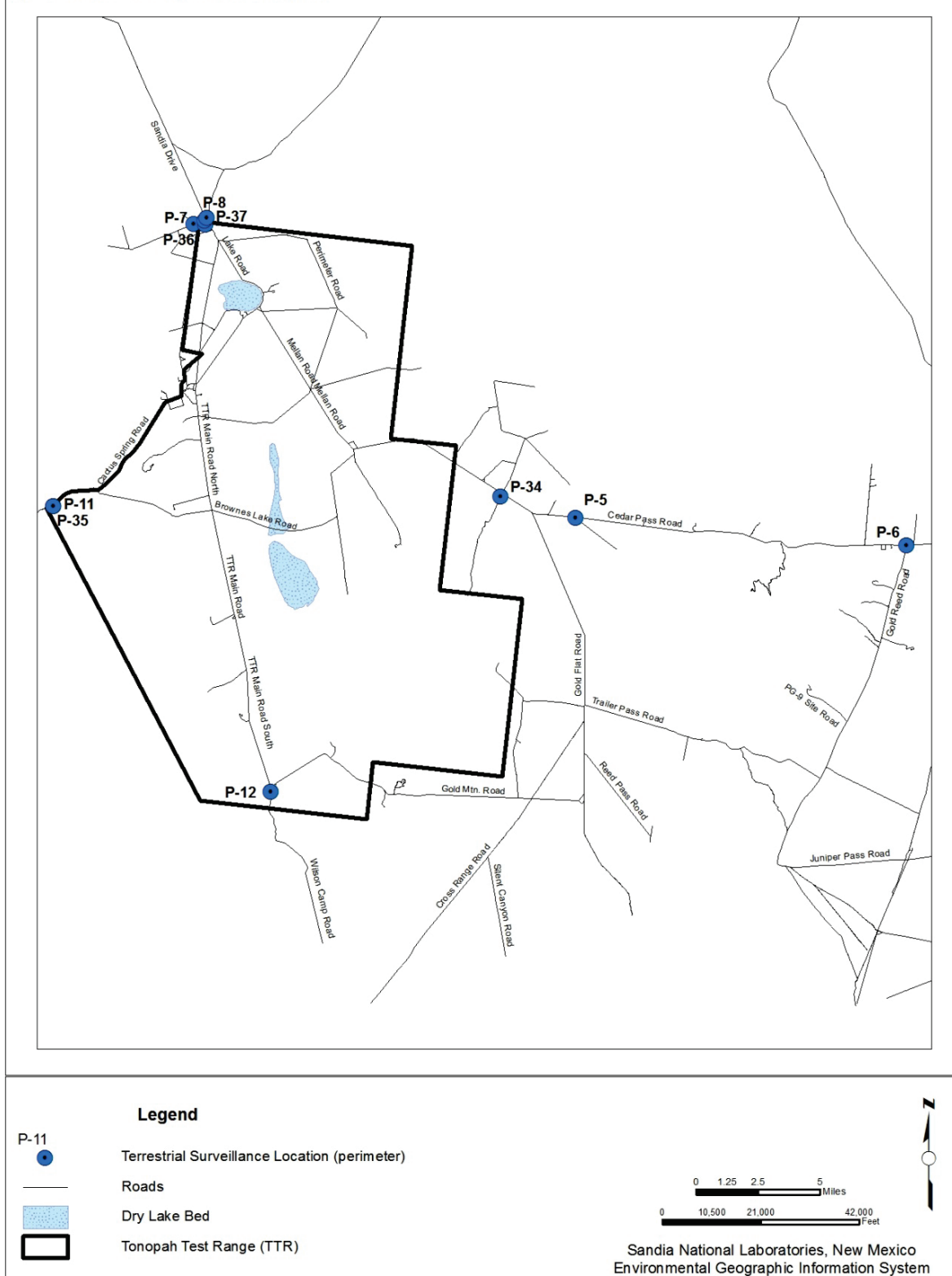


Figure 3-3. SNL/TTR perimeter terrestrial surveillance locations

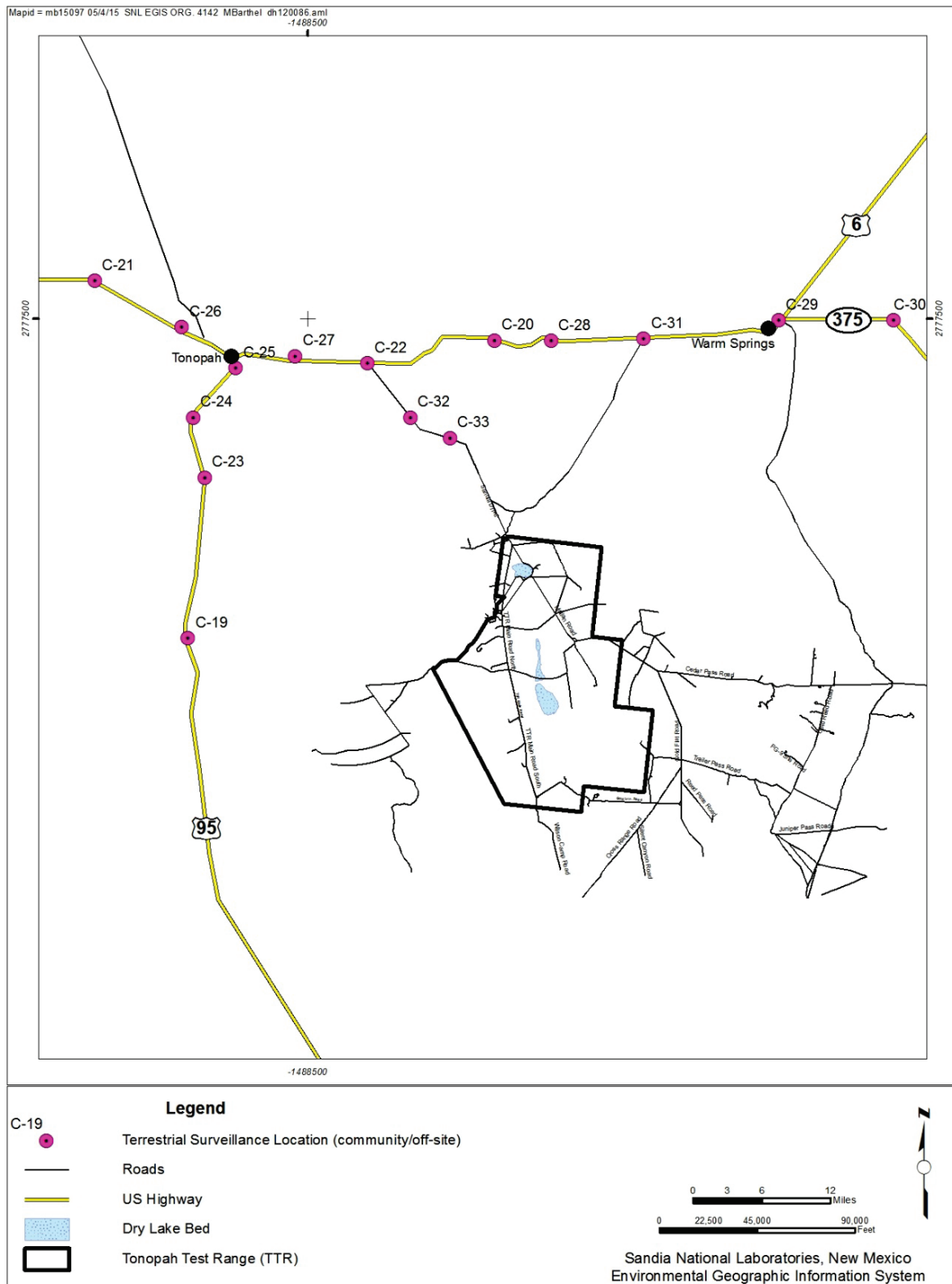


Figure 3-4. SNL/TTR off-site terrestrial surveillance locations

3.2.3 Field Methods, Analytical Parameters, and Quality Control Procedures

All SNL/TTR samples were collected in accordance with applicable SNL/NM field operating procedures for soil sampling activities.

Off-site laboratories analyzed all samples in accordance with applicable U.S. Environmental Protection Agency (EPA) analytical methods. All chemical data was reviewed and qualified in accordance with Administrative Operation Procedure 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL/NM 2011).

Soil samples were analyzed for Target Analyte List (TAL) metals and radiological parameters, including gamma-emitting radionuclides, plutonium, and uranium. Details of the radiological parameters pertinent to SNL/TTR are as follows:

- **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 is an example of a long-lived gamma emitter that is prevalent in the environment at SNL/TTR (as fallout from historical nuclear weapons testing in that area). Other gamma emitters of interest at SNL/TTR are americium-241 and depleted uranium from past explosives testing.
- **Plutonium.** Due to past explosives testing, plutonium is present in some limited areas of SNL/TTR. One indicator of the presence of weapons-grade plutonium is the radionuclide americium-241. Isotopic plutonium analysis is performed on any sample for which gamma spectroscopy identified americium-241 in concentrations greater than its minimum detectable activity (MDA).
- **Uranium.** Uranium occurs naturally in soils and may also be present as a pollutant in the environment at SNL/TTR due to past testing conducted there. Total uranium analysis is used to measure all uranium isotopes present in a sample. An isotope-specific analysis may be performed to determine the possible source of uranium (i.e., natural, man-made, enriched, or depleted).

The Radiation Protection Dosimetry Program (RPDP) at SNL/NM owns, issues, and processes environmental TLDs. The technical basis for the environmental TLD monitoring program is provided in *Description and Procedures of the Environmental Radiation Dosimetry Program* (SNL/NM 1987). Dosimeters are issued and processed quarterly following established RPDP protocols.

Field quality control samples at SNL/TTR included duplicate and equipment blank samples. These samples were prepared in accordance with applicable field operating procedures. Laboratory quality control samples are prepared and analyzed as specified in accordance with established methods.

3.2.4 Sample Result Analysis and Methodology

No regulatory limits are available to directly compare concentrations of some radiological or nonradiological constituents in surface soils. Sandia personnel conduct statistical analyses to compare the results from on-site and perimeter samples to off-site results, and to establish trends that may indicate the possible release of contaminants.

Statistical Analysis and Methodology

Samples are collected from specified locations to effectively enable statistical comparisons with results from previous years. Statistical analyses are performed to determine whether a specific on-site or perimeter sample result differs from off-site sample results and to identify trends at a specific sampling location.

The results of the statistical analyses are used to prioritize sample results for possible follow-up actions, such as resampling, additional investigation, and/or notifications to applicable entities. A decision-making tool is used to help determine the appropriate level of concern for each sample result. The statistical analysis prioritization methodology (Shyr, Herrera, and Haakqer 1998) is based on a matrix of four priority levels. The decision matrix is shown in Table 3-8.

Table 3-8. SNL/TTR priority decision matrix and actions

Priority ^a	Are Results Higher Than the Off-Site?	Is There an Increasing Trend?	Action
1	Yes	Yes	Immediate attention needed. Specific investigation planned and/or notifications made to applicable entities.
2	Yes	No	Some concern is warranted. Further investigation and/or notifications may be necessary.
3	No	Yes	A minor concern. Further investigation and/or notifications may be necessary.
4	No	No	No concern. No investigation required.

NOTE: ^aBased on a statistical analysis prioritization methodology (Shyr, Herrera, and Haakqer 1998).

Other Standards for Comparison

In addition to the statistical analysis, sample results for metals in soil and sediment may be compared to values in the following references (presented in Table 3-9):

- Local and regional soil concentrations (Dragun and Chekiri 2005)
- EPA Region 9 regional soil screening levels (EPA 2014)
- U.S. surface soil surface concentrations (Kabata-Pendias 2000)

In some instances, a qualitative inspection of the data may be augmented by the graphical evaluation methodology described and documented in *Chemical Analyses of Soil Samples Collected from the Sandia National Laboratories, Tonopah Test Range Environs, 1994–2005* (SNL/NM 2006).

Environmental TLD data is compared to the annual radiation dose from natural background sources estimated equivalent of 70 mrem (NCRP 2009).

Table 3-9. SNL/TTR various reference values for metals in soil (all units in mg/kg)

Analyte	Nevada Background Soil Concentrations ^a		EPA Region 9 Regional Screening Levels (Soil Screening Levels ^b)		U.S. Background Soil Concentrations ^c	
	Lower Limit	Upper Limit	Residential	Industrial	Lower Limit	Upper Limit
Aluminum	5,000	100,000	77,000	1,100,000	4,500	100,000
Antimony	< 1.0	1.0	31	470	0.25	0.6
Arsenic	2.9	24	0.67	3.0	1	93
Barium	150	3,000	15,000	220,000	20	1,500
Beryllium	ND	5.0	160	2,300	0.04	2.54
Cadmium	ND	11	70	980	0.41	0.57
Calcium	600	320,000	—	—	—	—
Chromium (III)	7.0	150	120,000	1,800,000	7	1,500
Cobalt	ND	20	23	350	3	50
Copper	7	150	3,100	47,000	3	300
Iron	1,000	100,000	55,000	820,000	5,000	50,000
Lead	ND	70	400	800	10	70
Magnesium	300	100,000	—	—	—	—
Manganese	30	5,000	1,800	26,000	20	3,000
Mercury	0.01	0.82	9.4	40	0.02	1.5
Molybdenum	ND	7.0	390	5,800	0.8	3.3
Nickel	5	50	1,500	22,000	5	150
Potassium	1,900	63,000	—	—	—	—
Selenium	< 0.1	1.1	390	5,800	0.1	4
Silica (silicon)	150,000	440,000	—	—	24,000	368,000
Silver	0.5	5	390	5,800	0.2	3.2
Sodium	500	100,000	—	—	—	—
Strontium	100	1,500	47,000	700,000	7	1,000
Thallium	—	—	0.78	12	0.02	2.8
Titanium	700	5,000	140,000	600,000	20	1,000
Vanadium	30	150	390	5,800	0.7	98
Zinc	25	128	23,000	350,000	13	300

NOTES: ^aDragun, J., and K. Chekiri. 2005. *Elements in North American Soils*. Amherst, MA: The Association for Environmental Health and Sciences.

^bEPA Region 9 Preliminary Regional Screening Levels, EPA, updated May 2014.

^cKabata-Pendias, A. 2000. *Trace Elements in Soils and Plants*, 3rd ed. Boca Raton, FL: CRC Press, Inc.

— = not available

EPA = U.S. Environmental Protection Agency

ND = not detectable

U.S. = United States

3.2.5 Summary of Terrestrial Surveillance Program Activities and Results in 2014

The following TS Program activities occurred in 2014:

- The annual sampling of soil at on-site locations occurred in June 2014 at designated locations.
- Environmental TLDs were exchanged and analyzed at designated locations quarterly.

The analytical results for radiological (including environmental TLDs) and nonradiological parameters for the 2014 sampling event are summarized in the following section, and the data are provided in Appendix A.

Radiological Results

The summary statistics for radiological results for 2000 through 2014 are presented in [Table 3-10](#). The respective radiological analytes are discussed in the following sections, which list the locations identified as Priority-1 and Priority-2. (See the decision matrix in [Table 3-8](#).)

Table 3-10. SNL/TTR radiological summary statistics, 2000–2014

Analyte	Location Classification	Number of Samples	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
Americium-241	Perimeter	121	0.02	0.023	0.058	-0.237	0.15
	On-site	314	0.295	0.052	1.05	-0.231	11.2
	Off-site	212	0.022	0.025	0.045	-0.202	0.13
Cesium-137	Perimeter	121	0.198	0.158	0.152	0.012	0.89
	On-site	325	0.242	0.222	0.185	0.0219	1.49
	Off-site	212	0.209	0.165	0.156	-0.002	0.93
Plutonium-238	Perimeter	17	0.0042	0.003	0.008	-0.006	0.03
	On-site	107	0.138	0.017	0.835	-0.0102	8.43
	Off-site	34	0.003	0.0009	0.005	-0.004	0.02
Plutonium-239/240	Perimeter	17	0.021	0.0164	0.017	0.0014	0.07
	On-site	107	14.8	0.378	117	-0.0082	1200
	Off-site	34	0.0142	0.011	0.013	-0.0011	0.05
Plutonium-242	On-site	5	3.51	3.49	0.032	3.49	3.56
Uranium-235	Perimeter	121	0.075	0.072	0.054	-0.059	0.25
	On-site	325	0.087	0.079	0.061	-0.071	0.39
	Off-site	212	0.084	0.075	0.059	-0.1	0.29
Uranium-238	Perimeter	121	1.23	1.26	0.519	0.003	2.65
	On-site	324	1.3	1.24	0.505	0.032	3.13
	Off-site	208	1.27	1.21	0.525	0.136	3.09
Analyte	Location Classification	Number of Samples	Mean (mg/kg)	Median (mg/kg)	Standard Deviation (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)
Uranium	Perimeter	72	0.709	0.692	0.18	0.427	1.49
	On-site	249	0.721	0.71	0.149	0.426	1.51
	Off-site	126	0.75	0.691	0.197	0.463	1.55

Americium-241

The results of the statistical analysis for americium-241 identified one Priority-1 on-site location (S-51 soil) with a value of 3.9 pCi/g, and one Priority-2 on-site location (S-09 soil) with a value of 1.1 pCi/g ([Table 3-11](#)).

Americium-241 at location S-51 continues to be identified as Priority-1. This location is at the edge of South Plume Area and is expected to have elevated readings. This is consistent with the hot particle theory, where the presence of americium-241 or plutonium-239/240 in a heterogeneous sample skews the apparent average concentration, making it appear greater than it is. Sampling and trend analyses will continue for americium-241 (and plutonium-239/240) at this location. Historical results for americium-241 at S-51 are presented in [Figure 3-5](#).

No locations were identified as Priority-3 for americium-241.

Plutonium-239/240

The results of the statistical analysis for plutonium-239/240 identified two Priority-2 on-site locations (S-09 soil and S-51 soil) with values of 5.0 pCi/g and 9.5 pCi/g, respectively (Table 3-11). The results for S-51 and S-09 are consistent with historical values. This is related to the elevated americium-241 results discussed previously. Sampling and trend analysis will continue for plutonium-239/240 (and americium-241) at these locations. Historical results for plutonium-239/240 at S-51 are presented in Figure 3-5.

No locations were identified as Priority-3 for plutonium-239/240.

Table 3-11. SNL/TTR radiological summary statistics for Priority-1 and Priority-2 sample locations, 2014

Priority	Analyte	Location	Average (pCi/g)	Median (pCi/g)	SD (pCi/g)	Min. (pCi/g)	Max. (pCi/g)	2014 Result (pCi/g)
Priority-1	Americium-241	S-51	3.3	3.9	3.2	-0.0095	11	3.9
Priority-2	Plutonium-239/240	S-51	20	6.2	39	0.15	130	9.5
Priority-2	Americium-241	S-09	1.7	1.2	1.1	0.47	3.6	1.1
Priority-2	Plutonium-239/240	S-09	96	4.3	320	1.98	1,200	5.0

NOTES: Max. = maximum
Min. = minimum
SD = standard deviation

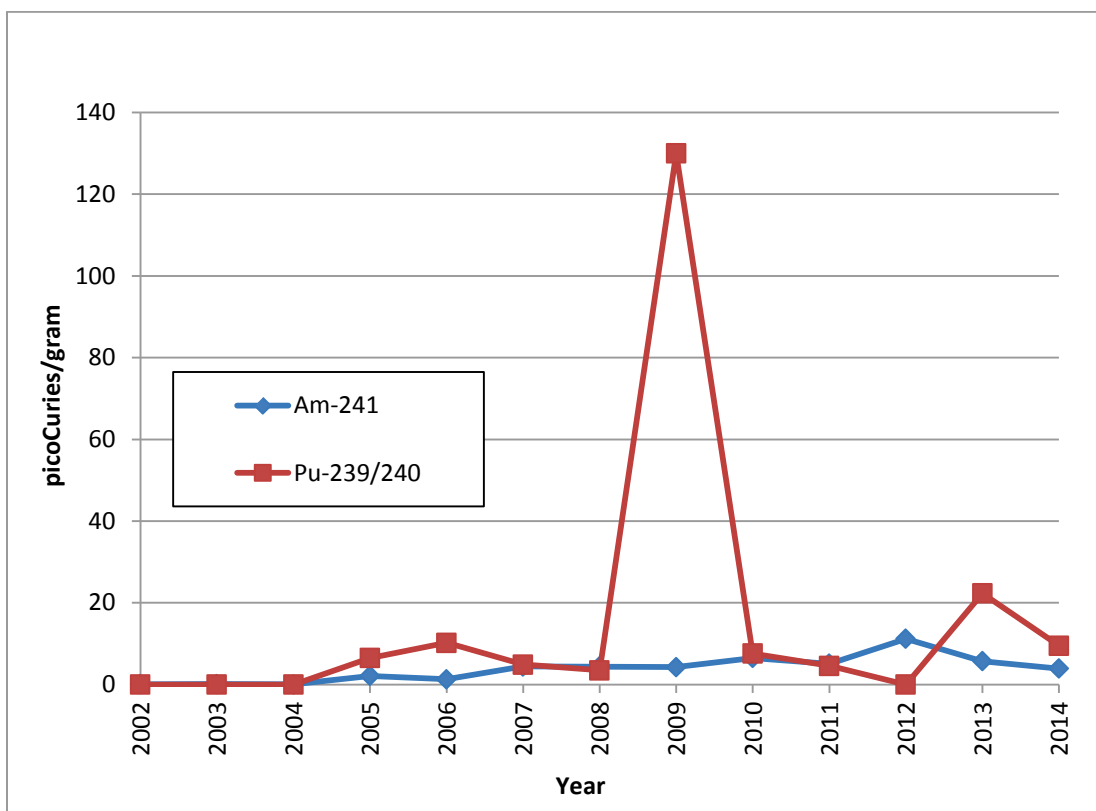


Figure 3-5. SNL/TTR historical plutonium-239/240 and americium-241 at sampling location S-51

Thermoluminescent Dosimeter Statistical Results

TLDs were deployed, collected, and analyzed at SNL/TTR on a quarterly basis in 2014. TLD summary statistics for 2000–2014 are provided in [Figure 3-6](#) and [Table 3-12](#). The results for on-site and perimeter locations were statistically different with higher values than the off-site locations.

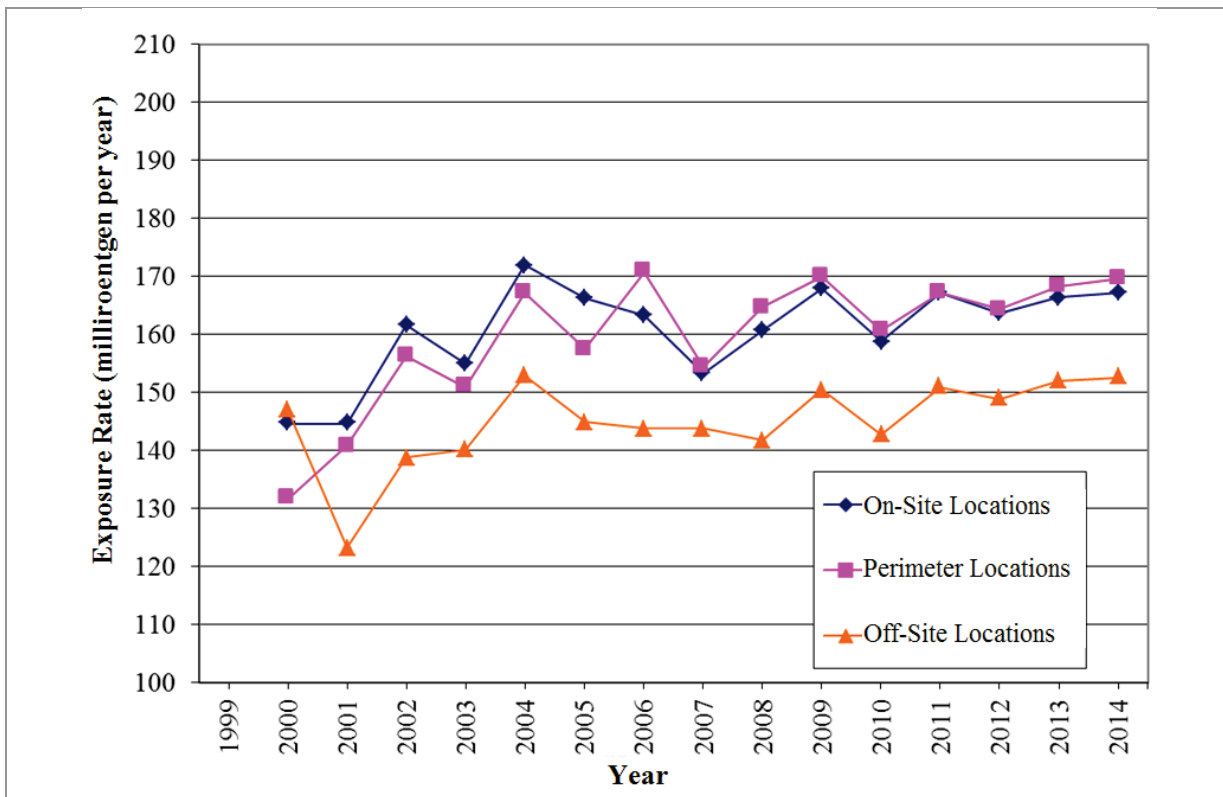


Figure 3-6. SNL/TTR TLD exposure rates by year and location classification

Table 3-12. SNL/TTR TLD exposure rate summary statistics by location classification, 2000–2014

Location Classification	Number of Observations	Mean mR/yr	Median mR/yr	Standard Deviation mR/yr	Minimum mR/yr	Maximum mR/yr	2014 Result mR/yr
On-site	153	160.7	160.5	12.7	132	229	167.2
Perimeter	83	159.6	158.5	17	100	216	169.7
Off-site	46	144.5	149.1	15.4	105	166	152.6

NOTE: TLD = thermoluminescent dosimeter

Nonradiological Parameters and Results

Nonradiological parameters include TAL metals. In addition to the statistical analysis, all results may also be compared to values from the references listed in Section 3.2.4 and provided in Table 3-9.

In 2014, soil samples were collected at the locations listed in Table 3-5, Table 3-6, and Table 3-7. Thirteen locations were sampled for metals analysis; other locations are only sampled for metals every five years and were not sampled in 2014 (the next sampling will be in 2018). The results of the statistical analyses for metals are provided in Table 3-13.

Table 3-13. SNL/TTR metals summary statistics for Priority-3 sample locations

Priority	Analyte	Loc.	Sample Matrix	Mean (mg/kg)	Median (mg/kg)	SD (mg/kg)	Min. (mg/kg)	Max. (mg/kg)	2014 Result (mg/kg)
Priority-3	Cadmium	S-03	Soil	0.167	0.181	0.063	0.038	0.223	0.18

NOTES: Loc. = location Min. = minimum
Max. = maximum SD = standard deviation

Cadmium

One on-site location (S-03 soil) was identified as Priority-3 for cadmium, with a value of 0.18 mg/kg. All values were below the EPA Region 9 Soil Screening Levels (for residential use) shown in Table 3-13, and are assumed to represent a natural background.

No other locations were identified as Priority-1, Priority-2, or Priority-3 for any of the TAL metals.

Additional Activities and Variances

There were no other TS Program activities in 2014 at SNL/TTR. There were no variances from the planned activities.

3.3. Air Quality Compliance Program

Sandia operations at SNL/TTR do not involve activities that release radioactive emissions from either point sources (stacks and vents) or diffuse sources, such as outdoor testing. However, diffuse radiological emissions are produced from the resuspension of americium and plutonium present at the Clean Slate ER sites. Other ER sites with minor radiological contamination, such as depleted uranium, do not produce significant air emission sources from resuspension.

3.3.1 National Emission Standards for Hazardous Air Pollutants

National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 Code of Federal Regulations 61, Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities,” has set a maximum of 10 mrem/yr for all combined air emission pathway sources from any U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) facility. Although the dose calculated from the Clean Slate sites is many times less than this standard, there was a question as to whether the sites would require continuous radiological air monitoring.

The 1996 NESHAP report for SNL/TTR described a calculated effective dose equivalent (EDE) to the maximally exposed individual (MEI) of 1.1 mrem/yr as a result of diffuse emissions from the Clean Slate sites (SNL/NM 1997a). Because the EPA requires continuous air monitoring for any radionuclide source that contributes a dose in excess of 0.1 mrem/yr to the MEI, Sandia instituted continuous air monitoring at a site for one year from February 22, 1996, to February 25, 1997. The monitoring site was chosen at the SNL/TTR airport, the location of the highest calculated dose for a member of the public. This site selection is discussed in the 1996 NESHAP report (SNL/NM 1997b). The dose assessment result

from the continuous monitoring was 0.024 mrem/yr. This was approximately four times less than the 0.1 mrem/yr threshold cutoff for which continuous monitoring would be required by the EPA. The average air concentrations are provided in [Table 3-14](#).

Although an annual calculated dose assessment is not required for the site, Sandia continues to produce an annual NESHAP report for SNL/TTR ([SNL/NM 2015b](#)). The results from the 1996 to 1997 monitoring will continue to be used for as long as there is no change in the status of the Clean Slate sites. [Table 3-15](#) summarizes these dose assessment results. Future SNL/TTR activities are not expected to change; however, if new sources or modifications to the existing sources are anticipated, they will be evaluated for NESHAP applicability.

Table 3-14. SNL/TTR average air concentration

Radionuclide	Average (Ci/m ³)
Americium-241	4.1×10^{-18}
Plutonium-238	1.6×10^{-18}
Plutonium-239/240	9.5×10^{-18}

NOTE: SNL/TTR = Sandia National Laboratories, Tonopah Test Range

Table 3-15. SNL/TTR calculated dose assessment results for on-site receptor, 1996–1997

Dose to Receptor	Location	1997 Measured Dose ^a	NESHAP Standard	Natural Background
On-site receptor (EDE to the MEI)	Airport area	0.024 mrem/yr (0.00024 mSv/yr)	10 mrem/yr (0.1 mSv/yr)	350 mrem/yr ^b

NOTES: ^aDose calculated from continuous monitoring from February 1996 to February 1997.

^bNatural background is estimated at 350 mrem/yr nationwide.

EDE = effective dose equivalent

MEI = maximally exposed individual

NESHAP = National Emission Standards for Hazardous Air Pollutants

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

3.3.2 Nonradiological Air Emissions

The Class II Air Quality Operating Permit requires emission reports from significant nonradionuclide sources. At SNL/TTR, these sources include a portable screen, various generators, and maintenance shop activities. Maintenance shop activities at SNL/TTR included painting, welding, and carpentry. In 2014, there were emissions from the portable screen, the generators, and activities at the maintenance shop. The portable screen was operated for 40.3 hours during 2014, and contributed 0.001 tons of particulate matter emissions. Three generators operated in 2014 are part of the Class II Air Quality Operating Permit. The first generator is 670 hp, was operated for 118 hours, and contributed 1.2 tons of emissions (NO_x [nitrogen oxide], CO, SO_x [sulphur oxide], PM₁₀, VOCs [volatile organic compounds], and hazardous air pollutants [HAPs]). The second generator is 268 hp, was operated for 56 hours, and contributed 0.4 tons of emissions (NO_x, CO, SO_x, PM₁₀, VOCs, and HAPs). The third generator is 268 hp, was operated for 44 hours, and contributed 0.3 tons of emissions (NO_x, CO, SO_x, PM₁₀, VOCs, and HAPs). The maintenance shop activities (painting, welding, and woodworking) operated for a combined 706 hours or less during 2014 and contributed 0.01 tons of emissions (particulate matter, VOCs, and HAPs). The actual emissions were well within the permit limits to assure compliance with the permit.

3.4. Water Quality Programs

This section discusses the results for potable water monitoring, water conservation, wastewater effluent sampling, and stormwater sampling.

3.4.1 Production Well Monitoring

SNL/TTR uses three active wells: Production Well 6 (Figure 3-7), Well 7, and the Roller Coaster Well. The most active are Production Well 6 and the Roller Coaster Well. Production Well 6 is a public water system (PWS) well that supplies drinking water to the SNL/TTR Main Compound in Area 3. Production Well 6 is the only well at SNL/TTR that has been sampled for contaminants. Outlying areas and buildings without water service use bottled water. The other wells are not used for potable purposes (construction and dust suppression only), and there are no regulatory sampling requirements for them.



Figure 3-7. SNL/TTR Production Well 6 pump house, provides Area 3 drinking water

All PWS drinking water sampling is conducted in accordance with requirements set by the State of Nevada (Nevada Division of Environmental Protection [NDEP]). Analytes are sampled at different intervals, as shown in Table 3-16. The NDEP currently provides public monitoring and reporting requirements for each PWS around March of each year. The PWS at SNL/TTR is permitted by the NDEP as a nontransient, noncommunity water system under identification number NV003014. Production Well 6 supplies potable water for the SNL/TTR Area 3 Drinking Water Distribution System and the Area 3 Fire Protection Water Distribution System. The well water is routinely sampled and analyzed per the NDEP requirements to demonstrate conformance with primary drinking water standards.

The State of Nevada maintains information on the SNL/TTR PWS, including water system details, sample schedules, sample results, and any violation or enforcement actions at the following location:

https://ndwis.ndep.nv.gov/DWW/JSP/WaterSystemDetail.jsp?tinmsys_is_number=296666&tinmsys_st_code=NV&wmsnumber=NV0003014

Sampling parameters include (but are not limited to) total coliform, arsenic, nitrates, total trihalomethanes and haloacetic acids, copper and lead, phthalate, and secondary inorganic compounds (aluminum, color, copper [free], iron, magnesium, manganese, methylene blue active substances [MBAS] foaming agent [surfactant], odor, potential of hydrogen [pH], silver, total dissolved solids, and zinc).

SNL/TTR also has an NDEP-permitted treatment system for arsenic removal (permit number NV-3014 TP-11-12NTNC). The arsenic removal system has performed well since the installation of a carbon dioxide (pH adjustment) system in June 2008. The untreated water is required to be between 6.5 and 7.0 on the pH scale for efficient and effective operation of the arsenic removal system.

Table 3-16. SNL/TTR routine production well monitoring

Analyte	Reporting Frequency
Coliform, total	Quarterly
Arsenic	Quarterly
Disinfectant, residual	Quarterly (checked daily)
Total trihalomethanes and haloacetic acids (5)	Annually
Di(2-ethylhexyl) phthalate (DEHP) <i>also known as Bis(2-ethylhexyl) phthalate</i>	As required by NDEP, usually every 3 years
Nitrate	Annually
IOCs Phase II, IOCs Phase V, nitrite, nitrate and nitrite (total) SOCs Phase II, SOCs Phase V, VOCs Phase I and II, VOCs Phase V	As required by NDEP, usually every 3 years
Lead and copper	As required by NDEP, usually every 3 years
Dioxin	As required by NDEP, usually every 3 years
Secondary (13) drinking water standards	As required by NDEP, usually every 3 years

NOTES: IOC = inorganic compound

NDEP = Nevada Division of Environmental Protection

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

SOC = synthetic organic compound

VOC = volatile organic compound

Summary of Production Well Monitoring Activities and Results in 2014

A loss of pressure event occurred in 2014 within the SNL/TTR PWS when flushing the hotbox connection to the U.S. Air Force (USAF) PWS while the arsenic removal system began a flush cycle. A Drinking Water Public Notice was issued to Area 3 personnel to drink bottled water until bacteriological sampling results were received. The system was returned to normal status after bacteriological sampling indicated no contamination occurred as a result of the loss of pressure event.

In 2014, all sample results were below the maximum contaminant levels (MCLs) established for the substances monitored.

Four compliance arsenic samples were collected in 2014. All samples contained less than 1 ppb arsenic. The MCL for arsenic in drinking water is 10 ppb as a running annual average. The running annual average for arsenic in the drinking water at SNL/TTR during 2014 was 1 ppb.

During 2014, Production Well 6 produced 491,200 gal of water that was chlorinated and sent to the elevated water storage tower. This equals an average monthly production of approximately 41,000 gal during 2014. Daily production during 2014 averaged approximately 1,350 gal.

Also during 2014, approximately 153,500 gal of water was treated in the PWS Treatment Plant (identification number NV003014-TP11) to remove arsenic (Figure 3-8) before being sent to the drinking water distribution system. This equates to a monthly average of approximately 12,800 gal and a daily consumption rate of 420 gal.



Figure 3-8. SNL/TTR water treatment facility arsenic removal system

A total of 237 lb of carbon dioxide (Figure 3-9) was used during 2014 for pH adjustment (20 lb per month, or 0.65 lb per day on average).



Figure 3-9. SNL/TTR water treatment facility CO₂ pH adjustment system

3.4.2 Water Conservation

The State Water Resources Division regulations require a water conservation plan for permitted water systems and major water users in Nevada (DOE/NV 1992). The SNL/TTR Water Conservation Plan provides education, conservation measures, and an estimate of the amount of water that may be

conserved each year as a result of the adoption of this plan. To date, the amount of water estimated to be conserved has been met. The plan must be updated every five years (the next revision is due in 2015).

3.4.3 Sewage System and Septic Tank Monitoring

Wastewater discharges from SNL/TTR activities conducted at facilities in the Main Compound at Area 3 go to the USAF facultative sewage lagoon for treatment. As a best management practice (BMP), either Sandia or Navarro Research and Engineering personnel take annual wastewater samples from Area 3 at the point where wastewater leaves SNL/TTR property and enters the USAF system.

The USAF is responsible for the National Pollutant Discharge Elimination System (NPDES) permit for wastewater discharges. The USAF takes samples from the headwater end of the lagoon. In the past, Sandia personnel provided quarterly sampling results to the USAF for inclusion into their USAF Discharge Monitoring Report; however, the NPDES permit was modified in 1997 and no longer stipulates the requirement of quarterly data from Sandia. Therefore, Sandia now only provides annual wastewater sampling results to the USAF in the ASER as Appendix B, “2014 SNL/TTR Wastewater Sampling Results.” These systems are sampled as a BMP and do not require sampling by the NDEP. During 2014, there were no excursions or violations of concentration limits. Twenty-four-hour composite wastewater samples are collected on an annual basis, and the following parameters are analyzed:

- Total cyanide (cyanide-containing compounds are not used at SNL/TTR)
- pH
- Total suspended solids
- Phenolic compounds (phenol-containing compounds are not used at SNL/TTR)
- Chemical oxygen demand
- VOCs
- Semivolatile organic compounds
- Metals (arsenic, cadmium, chromium, copper, nickel, silver, zinc, lead, selenium, and mercury)
- Total petroleum hydrocarbons
- Oil and grease
- Tritium, gamma spectroscopy, and gross alpha and gross beta

The analytical results for wastewater sampled at Area 3 are provided in Appendix B.

Septic tank systems are sampled as needed. DOE/NNSA owns five septic tank systems located on-site at SNL/TTR: 36-01, 09-52 (inactive/never used), 24-01, Firing Range, and SNL/TTR Main Gate (Point Able Guard Station). These septic tank systems are used in remote locations and are maintained by the SNL/TTR Facilities group. The sewage from these locations flows into septic tank systems and associated drain fields. None of these systems required maintenance, sampling, or pumping in 2014. All other remaining septic tank systems have been closed or are undergoing closure and are being addressed by the ER Project.

3.4.4 Stormwater Sampling

Currently, Sandia has no requirement to perform stormwater sampling at SNL/TTR.

This page intentionally left blank.



PART TWO

Sandia National Laboratories, Kauai Test Facility, Hawaii

This page intentionally left blank.



Chapter 4. SNL/KTF Introduction

This Annual Site Environmental Report (ASER) is prepared in accordance with and as required by U.S. Department of Energy (DOE) Order 231.1B, *Environment, Safety, and Health Reporting* (DOE O 231.1B, [Change 1](#)). Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates Sandia National Laboratories, Kauai Test Facility (SNL/KTF) for the DOE/National Nuclear Security Administration (NNSA). The DOE/NNSA/Sandia Field Office (SFO) in Albuquerque, New Mexico, administers the contract and oversees contractor operations at the site.

Part Two of this ASER summarizes the environmental protection and monitoring programs in place at SNL/KTF during calendar year 2014 unless otherwise noted. Sandia makes this report available to the general public in printed and electronic form.

4.1. Mission

Sandia's enduring core mission is to provide science and engineering support for the nation's nuclear weapons stockpile. Today, the mission encompasses additional critical aspects of national security, including developing technologies and strategies for responding to emerging threats, protecting and preventing the disruption of critical infrastructures, and supporting the nonproliferation of weapons of mass destruction. Sandia also collaborates with representatives from other government agencies, the industrial sector, and universities to develop and commercialize new technologies. Information about recent technologies developed at Sandia can be found at:

<http://www.sandia.gov/news/index.html>

4.1.1 Operating Contract

DOE O 436.1, *Departmental Sustainability*, was established to ensure that Environmental Management Systems (EMSs) and site sustainability are at the forefront of environmental excellence. At Sandia, the intent of the order is implemented for an International Organization for Standardization (ISO) 14001-certified EMS. SNL/NM and SNL, California received their initial ISO 14001 certifications in June 2009 and September 2006, respectively, with recertification occurring every three years. These independent certifications will be combined in 2015 to streamline Sandia's processes and maximize the efficient use of corporate resources. Although it is not part of the scope of the certification, Sandia implements EMS at SNL/KTF consistent with the ISO 14001 standard (ISO 2004). Conformance to the standard is verified through internal EMS assessments. SNL/KTF assessments were conducted in 2011 and 2014.

The Prime Contract states that Sandia must comply with DOE directives that establish specific requirements for environmental programs. The four primary DOE directives currently on the contract that pertain to environmental protection and management are as follows:

- DOE O 231.1B, [Change 1](#), *Environment, Safety, and Health Reporting*, ensures that the DOE receives information about the events that have affected or could adversely affect the health, safety, and security of the public or workers, the environment, the operations of DOE facilities, or DOE's credibility. This ASER is prepared in accordance with and as required by this order.
- DOE O 435.1, [Change 1](#), *Radioactive Waste Management*, establishes requirements to manage radioactive waste in a manner that protects the environment and worker and public health and safety.

Under this order, DOE contractor-operated facilities are required to plan, document, execute, and evaluate the management of radioactive waste.

- [DOE O 458.1, Change 3, *Radiation Protection of the Public and the Environment*](#), sets radiation protection standards for DOE operations so that radiation exposures to members of the public and the environment are as low as reasonably achievable and maintained within established limits of the order.
- [DOE O 232.2 Admin. Change 1, *Occurrence Reporting and Processing of Operations Information*](#), provides timely notification to the DOE complex of events that could adversely affect: public or DOE worker health and safety, the environment, national security, or DOE's reputation.

4.2. Location Description

SNL/KTF exists as a facility within the boundaries of the U.S. Department of Defense (DOD) Pacific Missile Range Facility (PMRF). SNL/KTF is located on the island of Kauai at the north end of the PMRF ([Figure 4-1](#)). Remote facilities used in support of SNL/KTF operations include Mount Haleakala (Maui) and Kahili Point (Kauai).

4.3. Facilities and Operations

SNL/KTF has been an active rocket launching facility since 1962. The Remote Range Department, under Sandia, manages and conducts rocket launching activities at SNL/KTF. The site has been used for testing rocket systems with scientific and technological payloads, advanced development of maneuvering reentry vehicles, and scientific studies of atmospheric and exoatmospheric phenomena, and currently supports Missile Defense Agency programs. Nuclear devices have never been launched from SNL/KTF, only monitoring rockets associated with atmospheric testing.

The first facilities at SNL/KTF were constructed in the early 1960s to support the National Readiness Program. The most recent construction, completed in March 2005, extended the Missile Service Tower to support DOE and the Missile Defense Agency. From 1992 to 2014, SNL/KTF personnel have supported the 58 launches from SNL/KTF, 1 launch from the Kokole Point site, and 30 launches from PMRF.

The SNL/KTF launch field was originally designed to accommodate 40 launchpads, but only 15 pads were constructed. Of these, 11 have had their launchers removed. Beyond the original plan, two additional launchpads were constructed: one at Pad 41 (Kokole Point) and one at Pad 42 (Missile Service Tower launchpad). In addition to rocket launchpad sites, SNL/KTF facilities include missile and payload assembly buildings, launch operations and data acquisition facilities, maintenance shops, and a trailer dock compound for administration and other office processing.

The administrative area of SNL/KTF, known as the Main Compound, and the Launch Field are located within fenced areas near the North Nohili access road in PMRF. Inside the compound, a number of trailers and structures are connected together with a network of concrete docks and covered walkways. The majority of these facilities are used during mission operations to support customer and defense contractor personnel and technical staff from SNL/NM. During noncampaign operations, general maintenance activities are performed. Environment controls using dehumidifiers remain in operation (to protect equipment). Additionally, there are a number of permanent buildings and shelters in the Main Compound and Launch Field, some of which are in use year-round to support and maintain SNL/KTF facilities. Remote facilities include Mount Haleakala (Maui) and Kahili Point (Kauai), but Sandia has not used them for several years. The land permit for the Mount Haleakala facility on Maui has been retained to support future SNL/KTF test operations. New diversification efforts are being explored for these sites. The Kokole Point launch complex and associated facilities was transferred to the U.S. Navy in 2013.

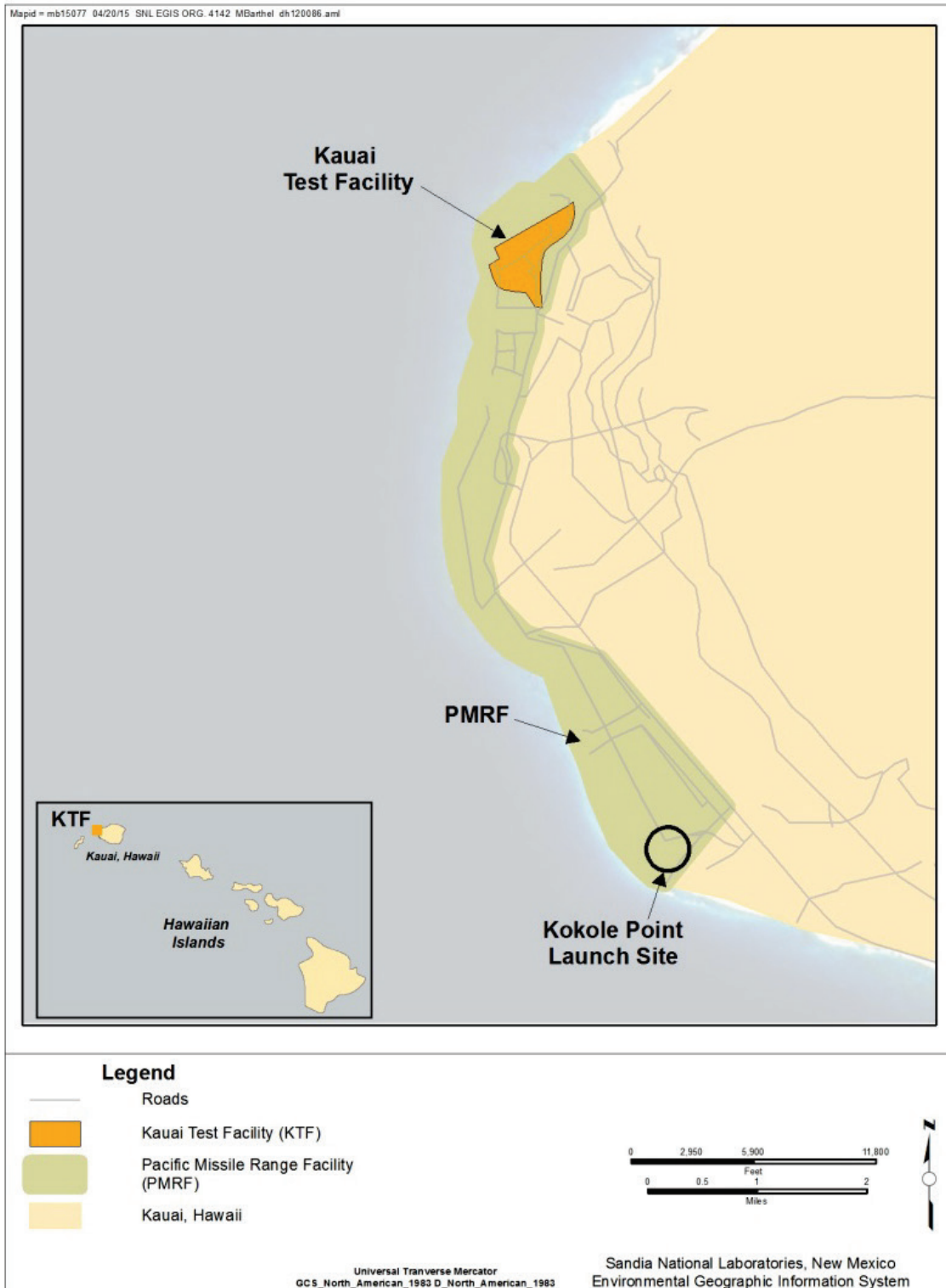


Figure 4-1. SNL/KTF location on Kauai, Hawaii

4.4. Rocket Launches in 2014

SNL/KTF supported four rocket launches in 2014. The launches, as follows were covered by the SNL/KTF Environmental Assessment, published in July 1992 ([DOE/AL 1992](#)), and the U.S. Navy Hawaii Range Complex Environmental Impact Statement ([U.S. Navy 2008](#)):

- PEO-IWS, Polar Bear, May 26, 2014 (launched from PMRF)
- AEGIS BMD, FTX-20, October 16, 2014 (launched from SNL/KTF)
- AEGIS BMD, FTM-25, November 3, 2014 (launched from SNL/KTF)
- AEGIS BMD, FTM-25, November 6, 2014 (launched from SNL/KTF)

4.5. Demographics

There were 14 permanent on-site personnel at SNL/KTF in 2014. During campaign operations when rocket launches occurred, approximately 150 additional people worked at SNL/KTF. The closest population center to SNL/KTF are the towns of Kekaha and Waimea (Census 2010 population 5,561), which are eight and ten miles southeast from the site, respectively.

Chapter 5. SNL/KTF Compliance Summary

Sandia Corporation (Sandia) conducts operations at Sandia National Laboratories, Kauai Test Facility (SNL/KTF) in compliance with federal, state, and local environmental requirements, including U.S. Department of Energy (DOE) directives and Presidential Executive Orders (EOs). As a part of this compliance, Sandia adheres to strict reporting and permitting requirements.

This chapter discusses Sandia's compliance status with major environmental regulations, statutes, EOs, and DOE directives that are applicable to operations conducted at SNL/KTF. Environmental audit summaries, occurrence reporting, and environmental permit status for 2014 are also presented here.

All operations and activities at SNL/NM, including those in the environmental programs, are performed under the corporate ES&H policy (ESH100), which states:

It is the policy of Sandia National Laboratories to perform work in a safe and environmentally responsible manner by committing to: maintain a safe workplace, prevent incidents, and protect the public; protect the environment, conserve resources, and prevent pollution; maintain compliance with legal and other requirements; and strive for continual improvement. DOE's Integrated Safety Management System (ISMS) is a key element of the Sandia Management Model. ISMS provides the framework for managing ES&H activities and functions while integrating them into all SNL operations.

5.1. Compliance Status with Federal Regulations

[Table 5-1](#) summarizes Sandia's compliance with environmental regulations and statutes for operations at SNL/KTF in 2014. [Table 5-2](#) lists the applicable permits in place at SNL/KTF.

Table 5-1. SNL/KTF applicable major environmental regulations and statutes

Regulation/Statute	Description
Clean Air Act and Clean Air Act Amendments	Provides standards to protect the nation's air quality
Clean Water Act	Provides general water quality standards to protect the nation's water sources and byways
Comprehensive Environmental Response, Compensation, and Liability Act	Provides federal funding for cleanup of inactive waste sites on the National Priorities List and mandates requirements for reportable releases of hazardous substances
Cultural Resources Acts	Includes various acts that protect archeological, historical, and religious sites and resources
Endangered Species Act	Provides special protection status for federally listed endangered or threatened species
Executive Orders	Several Executive Orders provide specific protection for wetlands, floodplains, and environmental justice in minority and low-income populations, and encourages greening the government through leadership in environmental management
Federal Facility Compliance Act	Directs federal agencies regarding environmental compliance
Federal Insecticide, Fungicide, and Rodenticide Act	Controls the distribution and use of various pesticides

See notes at end of table.

Table 5-1. SNL/KTF applicable major environmental regulations and statutes (continued)

Regulation/Statute	Description
Migratory Bird Treaty Act of 1918	Prevents the taking, killing, possessing, transporting, and importing of migratory birds, their eggs, parts, and nests
National Environmental Policy Act	Requires federal agencies to review all proposed activities so as to include environmental aspects in agency decision making
Resource Conservation and Recovery Act	Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks
Safe Drinking Water Act	Enacts specific health standards for drinking water sources
Superfund Amendments and Reauthorization Act	The Superfund Amendments and Reauthorization Act, Title III, also known as the Emergency Planning and Community-Right-to-Know Act, mandates communication standards for hazardous materials over a threshold amount that are stored or used in a community
Toxic Substances Control Act	Specifies rules for the manufacture, processing, distribution, use, and disposal of specific chemical substances and mixtures such as asbestos and polychlorinated biphenyls

NOTES: This is a partial listing of all the applicable environmental regulations and statutes.
 SNL/KTF = Sandia National Laboratories, Kauai Test Facility

Table 5-2. SNL/KTF permits in place

Type	Permit Number	Date Issued	Expiration Date	Regulatory Agency
Noncovered Source Permit (two stand-by diesel generators)	NSP 0429-01-N	March 3, 2009	March 2, 2014 (at State of Hawaii office for review)	State of Hawaii
Underground storage tank (2,500 gal)	666C	September 13, 1991	Indefinite	EPA Region IX and Hawaii Department of Health

NOTES: EPA = U.S. Environmental Protection Agency
 SNL/KTF = Sandia National Laboratories, Kauai Test Facility

5.1.1 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as the “Superfund,” addresses areas of past spills and releases. SNL/KTF has no current Environmental Restoration areas located on-site.

The U.S. Environmental Protection Agency (EPA) designated ongoing oversight of SNL/KTF to the Hawaii Department of Health Hazard Evaluation and Emergency Response Office. The EPA recommended continued reevaluation for environmental contamination due to the rocket launching facility. Rocket exhaust continues to be the main source of metals and other nonreportable air emission releases.

5.1.2 Superfund Amendments and Reauthorization Act

The Superfund Amendments and Reauthorization Act (SARA) Title III amended CERCLA requirements for releases to the environment and chemical inventory reporting as directed by the Emergency Planning and Community Right-to-Know Act (EPCRA), sections 304, 311, and 312. All required information has been submitted to the State of Hawaii. There were no reportable releases at SNL/KTF under EPCRA in 2014. [Table 5-3](#) lists EPCRA reporting requirements.

Table 5-3. SNL/KTF applicable EPCRA reporting requirements, 2014

Section	EPCRA Section Title	Requires Reporting?		Description
		Yes	No	
302-303	Emergency Planning	✓		Sandia personnel prepare an annual report that lists chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 (Appendix B), including the location of the chemicals and emergency contacts. The DOE/NNSA/SFO distributes the report to the required entities.
304	Emergency Notification		✓	No reportable quantity releases of an EHS, as defined by CERCLA, were reported in 2014.
311-312	SDS/MSDSs Chemical Purchase Inventory Report	✓		There are two “Community Right-to-Know” reporting requirements: (1) Sandia personnel complete the EPA Tier II forms for all hazardous chemicals present at the SNL/KTF facility at any one time in amounts equal to or greater than 10,000 lb, and for all EHSs present at the facility in an amount greater than or equal to 500 lb or the Threshold Planning Quantity, whichever is lower, and provide the report to DOE/NNSA/SFO for distribution to the required entities; and (2) Sandia personnel provide Safety Data Sheets for each chemical entry on a Tier II form and provides the report to DOE/NNSA/SFO for distribution to the required entities.
313	Toxic Chemical Release Forms		✓	Section 313 of EPCRA requires that facilities that release toxic chemicals listed in SARA Title III over a threshold value must submit a TRI report. In 2014 releases resulting from SNL/KTF operations were below the reporting threshold requiring a TRI Report.

NOTES: CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

CFR = Code of Federal Regulations

DOE/NNSA/SFO = U.S. Department of Energy/National Nuclear Security Administration/Sandia Field Office

EHS = extremely hazardous substance

EPA = U.S. Environmental Protection Agency

EPCRA = Emergency Planning and Community Right-to-Know Act

SARA = Superfund Amendments and Reauthorization Act

SNL/KTF = Sandia National Laboratories, Kauai Test Facility

TRI = Toxic Release Inventory

5.1.3 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act and the Hawaii Revised Statutes regulate the generation, transportation, treatment, storage, and disposal of hazardous chemical waste and nonhazardous solid wastes. Applicable regulations are listed in the reference section ([State of Hawaii Environmental Regulations](#)). Some hazardous waste is generated through normal operations at SNL/KTF. SNL/KTF is classified as a conditionally exempt small-quantity generator and is subject to the applicable requirements.

5.1.4 Federal Facility Compliance Act

The Federal Facility Compliance Act requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste, including full compliance with the restrictions and prohibitions on extended storage of wastes that do not meet the applicable hazardous waste treatment standards. Extended storage at DOE facilities is typically associated with mixed wastes (wastes that have hazardous and radioactive components) that have been generated on-site. Sandia operations at SNL/KTF do not generate mixed waste and Sandia currently has no mixed waste stored on-site; therefore, these requirements are not applicable at SNL/KTF.

5.1.5 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires federal agencies (and other organizations that perform federally sponsored projects) to consider environmental issues associated with proposed actions, be aware of the potential environmental impacts associated with these issues, and include this information in early project planning and decision making. Proposed actions that would not significantly impact the human environment are categorically excludable from additional NEPA documentation (as identified in DOE 10 Code of Federal Regulations [CFR] Part 1021, *National Environmental Policy Act Implementing Procedures*). Other proposed actions may fit within a class of actions that have environmentally significant impacts associated with them. For this class of proposed actions, the agency must prepare an environmental assessment or an environmental impact statement before making an irretrievable commitment of resources or funding. Although a major objective of NEPA is to preserve the environment for future generations, the law does not require an agency to choose a course of action with the least environmental impacts. At SNL/KTF, NEPA compliance is coordinated between personnel from SNL/KTF, SNL, New Mexico (SNL/NM), and the U.S. Department of Energy/National Nuclear Security Administration/Sandia Field Office (DOE/NNSA/SFO).

5.1.6 Endangered Species Act

The Endangered Species Act (ESA) applies to both private individuals and federal agencies. Federal agencies must ensure that any action they authorize, fund, or carry out will not jeopardize the continued existence of a threatened or endangered species, or result in adverse modifications of its habitat. At SNL/KTF, ESA compliance is addressed under the NEPA Program and the Ecology Program. If potentially significant impacts to sensitive species or habitats are found as a result of a proposed action, an environmental assessment or an environmental impact statement must be prepared.

Table 5-4 lists the threatened and endangered state and federal listed species potentially occurring on the island of Kauai.

Table 5-4. SNL/KTF threatened and endangered species potentially occurring on Kauai, Hawaii

Common Name	Scientific Name	Federal Status	State Status
Plants			
Ferns and Allies			
Pendant kihi fern	<i>Adenophorus periens</i>	Endangered	Endangered
No common name	<i>Asplenium diellaciniatum</i>	Candidate	Candidate
Pauoa	<i>Ctenitis squamigera</i>	Endangered	Endangered
Asplenium-leaved diellia	<i>Diellia erecta</i>	Endangered	Endangered
No common name	<i>Diellia mannii</i>	Endangered	Endangered
No common name	<i>Diellia pallida</i>	Endangered	Endangered
No common name	<i>Diplazium molokaiense</i>	Endangered	Endangered
No common name	<i>Doryopteris angelica</i>	Endangered	Endangered
Palapalai aumakua	<i>Dryopteris crinalis</i> var. <i>podosorus</i>	Endangered	Endangered
Kilau	<i>Dryopteris glabra</i> var. <i>pusilla</i>	Candidate	Candidate
Wawae`iole	<i>Huperzia mannii</i>	Endangered	Endangered
Wawae`iole	<i>Huperzia nutans</i>	Endangered	Endangered
Flowering Plants			
Liliwai	<i>Acaena exigua</i>	Endangered	Endangered
No common name	<i>Achyranthes mutica</i>	Endangered	Endangered
Mahoe	<i>Alectryon macrococcus</i>	Endangered	Endangered
Kuawawaenohu	<i>Alsinidendron lychnoides</i>	Endangered	Endangered
No common name	<i>Alsinidendron viscosum</i>	Endangered	Endangered
Pa`iniu	<i>Astelia waialealae</i>	Endangered	Endangered
No common name	<i>Bonamia menziesii</i>	Endangered	Endangered
Olulu	<i>Brighamia insignis</i>	Endangered	Endangered
Uhiuhi	<i>Caesalpinia kavaiaense</i>	Endangered	Endangered

See notes at end of table.

Table 5-4. SNL/KTF potentially threatened and endangered species (continued)

Common Name	Scientific Name	Federal Status	State Status
Plants (continued)			
Flowering Plants (continued)			
`Awikiwiki	<i>Canavalia napaliensis</i>	Endangered	Endangered
`Awikiwiki	<i>Canavalia pubescens</i>	Endangered	Endangered
Awiwi	<i>Centaurium sebaeoides</i>	Endangered	Endangered
`Akoko	<i>Chamaesyce eleanoriae</i>	Endangered	Endangered
No common name	<i>Chamaesyce halemanui</i>	Endangered	Endangered
`Akoko	<i>Chamaesyce remyi</i> var. <i>kauaiensis</i>	Endangered	Endangered
`Akoko	<i>Chamaesyce remyi</i> var. <i>remyi</i>	Endangered	Endangered
Papala	<i>Charpentiera densiflora</i>	Endangered	Endangered
Haha	<i>Cyanea asarifolia</i>	Endangered	Endangered
Haha	<i>Cyanea dolichopoda</i>	Endangered	Endangered
Haha	<i>Cyanea eleeleensis</i>	Endangered	Endangered
Haha	<i>Cyanea kolekoleensis</i>	Endangered	Endangered
Haha	<i>Cyanea kuhlhewa</i>	Endangered	Endangered
Haha	<i>Cyanea recta</i>	Threatened	Threatened
Haha	<i>Cyanea remyi</i>	Endangered	Endangered
Haha	<i>Cyanea undulata</i>	Endangered	Endangered
No common name	<i>Cyperus pennatifolius</i>	Endangered	Endangered
Pu`uka`a	<i>Cyperus trachysanthos</i>	Endangered	Endangered
Mapele	<i>Cyrtandra cyaneoides</i>	Endangered	Endangered
Ha`iwale	<i>Cyrtandra limahuliensis</i>	Threatened	Threatened
Ha`iwale	<i>Cyrtandra oenobarba</i>	Endangered	Endangered
`Akoko	<i>Euphorbia haeleleana</i>	Endangered	Endangered
Heau	<i>Exocarpos luteolus</i>	Endangered	Endangered
Mehamehame	<i>Flueggea neowawraea</i>	Endangered	Endangered
Nanu	<i>Gardenia remyi</i>	Candidate	Candidate
Nohoanu	<i>Geranium kauaiense</i>	Endangered	Endangered
No common name	<i>Gouania meyenii</i>	Endangered	Endangered
Honohono	<i>Haplostachys haplostachya</i>	Endangered	Endangered
Awiwi	<i>Hedyotis cookiana</i>	Endangered	Endangered
Na Pali beach hedyotis	<i>Hedyotis st.-johnii</i>	Endangered	Endangered
No common name	<i>Hesperomannia lydgatei</i>	Endangered	Endangered
Kauai hau kuahiwi	<i>Hibiscadelphus distans</i>	Endangered	Endangered
Hau kuahiwi	<i>Hibiscadelphus woodii</i>	Endangered	Endangered
Clay's hibiscus	<i>Hibiscus clayi</i>	Endangered	Endangered
Koki`o ke`oke`o	<i>Hibiscus waimeae</i> ssp. <i>hannerae</i>	Endangered	Endangered
Hilo ischaemum	<i>Ischaemum byrone</i>	Endangered	Endangered
Aupaka	<i>Isodendron laurifolium</i>	Endangered	Endangered
Aupaka	<i>Isodendron longifolium</i>	Threatened	Threatened
`Ohe	<i>Joinvillea ascendens ascendens</i>	Candidate	Candidate
Kampua`a	<i>Kadua</i> (=Hedyotis) <i>fluviatilis</i>	Candidate	Candidate
No common name	<i>Kadua haupuensis</i>	Candidate	Candidate
No common name	<i>Keyseria</i> (=Lagenifera) <i>erici</i>	Endangered	Endangered
No common name	<i>Keyseria</i> (=Lagenifera) <i>helenae</i>	Endangered	Endangered
Koki`o	<i>Kokia kauaiensis</i>	Endangered	Endangered
Kamakahala	<i>Labordia helleri</i>	Endangered	Endangered
Kamakahala	<i>Labordia lydgatei</i>	Endangered	Endangered
Kamakahala	<i>Labordia pumila</i>	Endangered	Endangered
Kamakahala	<i>Labordia tinifolia</i> var. <i>wahiawaensis</i>	Endangered	Endangered
No common name	<i>Lepidium orbiculare</i>	Candidate	Candidate
Nehe	<i>Lipochaeta fauriei</i>	Endangered	Endangered
Nehe	<i>Lipochaeta micrantha</i>	Endangered	Endangered
No common name	<i>Lobelia niihauensis</i>	Endangered	Endangered
Iehua makanoe	<i>Lysimachia daphnoides</i>	Endangered	Endangered
No common name	<i>Lysimachia filifolia</i>	Endangered	Endangered
No common name	<i>Lysimachia iniki</i>	Endangered	Endangered
No common name	<i>Lysimachia pendens</i>	Endangered	Endangered

See notes at end of table.

Table 5-4. SNL/KTF potentially threatened and endangered species (continued)

Common Name	Scientific Name	Federal Status	State Status
Plants (continued)			
Flowering Plants (continued)			
No common name	<i>Lysimachia scopulensis</i>	Endangered	Endangered
No common name	<i>Lysimachia venosa</i>	Endangered	Endangered
Alani	<i>Melicope degeneri</i>	Endangered	Endangered
Alani	<i>Melicope haupuensis</i>	Endangered	Endangered
Alani	<i>Melicope knudsenii</i>	Endangered	Endangered
Alani	<i>Melicope pallida</i>	Endangered	Endangered
Alani	<i>Melicope paniculata</i>	Endangered	Endangered
Alani	<i>Melicope puberula</i>	Endangered	Endangered
Alani	<i>Melicope quadrangularis</i>	Endangered	Endangered
No common name	<i>Munroidendron racemosum</i>	Endangered	Endangered
Kolea	<i>Myrsine fosbergii</i>	Candidate	Candidate
Kolea	<i>Myrsine knudsenii</i>	Endangered	Endangered
Kolea	<i>Myrsine linearifolia</i>	Threatened	Threatened
Kolea	<i>Myrsine mezii</i>	Endangered	Endangered
`Aiea	<i>Nothoctrum latifolium</i>	Candidate	Candidate
`Aiea	<i>Nothoctrum peltatum</i>	Endangered	Endangered
Lau `ehu	<i>Panicum niihauense</i>	Endangered	Endangered
Makou	<i>Peucedanum sandwicense</i>	Threatened	Threatened
No common name	<i>Phyllostegia helleri</i>	Candidate	Candidate
No common name	<i>Phyllostegia knudsenii</i>	Endangered	Endangered
No common name	<i>Phyllostegia renovans</i>	Endangered	Endangered
No common name	<i>Phyllostegia waimeae</i>	Endangered	Endangered
No common name	<i>Phyllostegia wawrana</i>	Endangered	Endangered
Ho`awa	<i>Pittosporum napaliense</i>	Endangered	Endangered
No common name	<i>Platanthera holochila</i>	Endangered	Endangered
Pilo kea lau li'i	<i>Platydesma rostrata</i>	Endangered	Endangered
Mann's bluegrass	<i>Poa mannii</i>	Endangered	Endangered
Hawaiian bluegrass	<i>Poa sandwicensis</i>	Endangered	Endangered
No common name	<i>Poa siphonoglossa</i>	Endangered	Endangered
(=Na`ena`e) lo`ulu	<i>Pritchardia hardyi</i>	Endangered	Endangered
Lo`ulu	<i>Pritchardia napaliensis</i>	Endangered	Endangered
Lo`ulu	<i>Pritchardia viscosa</i>	Endangered	Endangered
Kopiko	<i>Psychotria grandiflora</i>	Endangered	Endangered
Kopiko	<i>Psychotria hobbii</i>	Endangered	Endangered
Kaulu	<i>Pteralyxia kauaiensis</i>	Endangered	Endangered
Makou	<i>Ranunculus mauiensis</i>	Candidate	Candidate
No common name	<i>Remya kauaiensis</i>	Endangered	Endangered
No common name	<i>Remya montgomeryi</i>	Endangered	Endangered
No common name	<i>Santalum involutum</i>	Candidate	Candidate
Dwarf naupaka	<i>Scaevola coriacea</i>	Endangered	Endangered
Ma`oli`oli	<i>Schiedea apokremnos</i>	Endangered	Endangered
No common name	<i>Schiedea attenuata</i>	Endangered	Endangered
No common name	<i>Schiedea helleri</i>	Endangered	Endangered
No common name	<i>Schiedea kauaiensis</i>	Endangered	Endangered
No common name	<i>Schiedea membranacea</i>	Endangered	Endangered
No common name	<i>Schiedea nuttallii</i>	Endangered	Endangered
No common name	<i>Schiedea spergulina</i> var. <i>leiopoda</i>	Endangered	Endangered
No common name	<i>Schiedea spergulina</i> var. <i>spergulina</i>	Threatened	Threatened
Lauhilihi	<i>Schiedea stellarioides</i>	Endangered	Endangered
Ohai	<i>Sesbania tomentosa</i>	Endangered	Endangered
No common name	<i>Sicyos lanceoloideus</i>	Candidate	Candidate
No common name	<i>Silene lanceolata</i>	Endangered	Endangered
Popolo ku mai	<i>Solanum incompletum</i>	Endangered	Endangered
Popolo	<i>Solanum nelsonii</i>	Candidate	Candidate
`Aiakeakua, popolo	<i>Solanum sandwicense</i>	Endangered	Endangered
No common name	<i>Spermolepis hawaiiensis</i>	Endangered	Endangered

See notes at end of table.

Table 5-4. SNL/KTF potentially threatened and endangered species (continued)

Common Name	Scientific Name	Federal Status	State Status
Plants			
Flowering Plants (continued)			
No common name	<i>Stenogyne campanulata</i>	Endangered	Endangered
No common name	<i>Stenogyne kealiae</i>	Endangered	Endangered
No common name	<i>Tetraplasandra bisattenuata</i>	Endangered	Endangered
No common name	<i>Tetraplasandra flynnii</i>	Endangered	Endangered
No common name	<i>Viola helenae</i>	Endangered	Endangered
Nani wai'ale'ale	<i>Viola kauaiensis</i> var. <i>wahiawaensis</i>	Endangered	Endangered
No common name	<i>Wikstroemia skottsbergiana</i>	Candidate	Candidate
Dwarf iliau	<i>Wilkesia hobdyi</i>	Endangered	Endangered
No common name	<i>Xylosma crenatum</i>	Endangered	Endangered
A'e	<i>Zanthoxylum hawaiiense</i>	Endangered	Endangered
Animals			
Mammals			
Hawaiian hoary bat	<i>Lasiurus cinereus semotus</i>	Endangered	Endangered
Birds			
Hawaiian (=koloa) duck	<i>Anas wyvilliana</i>	Endangered	Endangered
Hawaiian goose	<i>Branta (=Nesochen) sandvicensis</i>	Endangered	Endangered
Hawaiian coot	<i>Fulica americana alai</i>	Endangered	Endangered
Hawaiian common moorhen	<i>Gallinula chloropus sandvicensis</i>	Endangered	Endangered
Nukupu`u (honeycreeper)	<i>Hemignathus lucidus</i>	Endangered	Endangered
Kauai akialoa (honeycreeper)	<i>Hemignathus procerus</i>	Endangered	Endangered
Hawaiian stilt	<i>Himantopus mexicanus knudseni</i>	Endangered	Endangered
Akekee	<i>Loxops caeruleirostris</i>	Endangered	Endangered
Kauai `o'o (honeyeater)	<i>Moho braccatus</i>	Endangered	Endangered
Large Kauai (=kamao) thrush	<i>Myadestes myadestinus</i>	Endangered	Endangered
Small Kauai (=puaiohi) thrush	<i>Myadestes palmeri</i>	Endangered	Endangered
Band-rumped storm-petrel	<i>Oceanodroma castro</i>	Candidate	Candidate
Akikiki	<i>Oreomystis bairdi</i>	Endangered	Endangered
`O'u (honeycreeper)	<i>Psittirostra psittacea</i>	Endangered	Endangered
Hawaiian dark-rumped petrel	<i>Pterodroma phaeopygia sandwichensis</i>	Endangered	Endangered
Newell's Townsend's shearwater	<i>Puffinus auricularis newelli</i>	Threatened	Threatened
Reptiles			
Green sea turtle	<i>Chelonia mydas</i>	Threatened	Threatened
Leatherback sea turtle	<i>Dermochelys coriacea</i>	Endangered	Endangered
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	Endangered	Endangered
Olive ridley sea turtle	<i>Lepidochelys olivacea</i>	Threatened	Threatened
Snails			
Newcomb's snail	<i>Erinna newcombi</i>	Threatened	Threatened
Arachnids			
Kauai cave wolf or pe'e pe'e maka 'ole spider	<i>Adelocosa anops</i>	Endangered	Endangered
Insects			
Pomace fly (no common name)	<i>Drosophila musaphilia</i>	Endangered	Endangered
Hawaiian picture-wing fly	<i>Drosophila sharpi</i>	Endangered	Endangered
Pacific Hawaiian damselfly	<i>Megalagrion pacificum</i>	Endangered	Endangered
Orangeblack Hawaiian damselfly	<i>Megalagrion xanthomelas</i>	Candidate	Candidate
Crustaceans			
Kauai cave amphipod	<i>Spelaeorchestia koloana</i>	Endangered	Endangered

NOTE: SNL/KTF = Sandia National Laboratories, Kauai Test Facility

5.1.7 Cultural Resources Acts

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

- National Historic Preservation Act
- Archaeological Resources Protection Act
- American Indian Religious Freedom Act

At SNL/KTF, cultural resources compliance is coordinated through the NEPA Program. Actions that could adversely affect cultural resources are initially analyzed in a NEPA checklist review. It is a DOE/NNSA/SFO responsibility to ensure that impacts to cultural resources are assessed and appropriate actions taken to mitigate any impact. In 2014, no historic properties were threatened; no buildings previously unassessed were modified or demolished. SFO did not have occasion to consult with the Hawaii State Historic Preservation Officer.

5.1.8 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act (MBTA) of 1918 implemented the 1916 Convention for the Protection of Migratory Birds. The original statute implemented the agreement between the 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. In addition to the special consideration afforded to species listed as threatened and endangered, most birds are protected under the MBTA of 1918, as amended. At SNL/KTF, the MBTA is coordinated through NEPA reviews and the Ecology Program.

5.1.9 Environmental Compliance Executive Orders

The primary EOs related to environmental compliance at SNL/KTF are as follows (for additional information on these EOs, see Section 2.2.16):

- EO 11988, *Floodplain Management*, as amended
- EO 11990, *Protection of Wetlands*, as amended
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, as amended
- EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, as amended
- EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*

5.1.10 Department of Energy Directives

DOE directives on the Management and Operating Contract between Sandia and DOE define the primary contractual obligations for operating SNL/KTF. Sandia met all the requirements stated in these DOE directives. DOE directives applicable to SNL/KTF can be found in the reference section.

5.1.11 Clean Air Act and Clean Air Act Amendments of 1990

Ambient air quality at SNL/KTF is regulated by Hawaii Administrative Rules, Title 11, Chapter 59 under the jurisdiction of the Hawaii Department of Health, Clean Air Branch. Currently, no facilities at SNL/KTF require federal air permits. Within the boundaries of the Pacific Missile Range Facility, the DOE holds no federal air emission permits for SNL/KTF. Rocket launches are mobile sources and do not require any reporting of reportable quantity releases.

The two electrical generators at SNL/KTF are permitted for operation by the State of Hawaii under a Noncovered Source Permit ([Hawaii DOH 2009](#)). These generators are subject to the provisions of the

following federal regulations (the specific requirements of these standards are detailed in special conditions within the permit):

- 40 CFR Part 60, *Standards of Performance for New Stationary Sources*, Subpart A, “General Provisions”
- 40 CFR Part 60, *Standards of Performance for New Stationary Sources*, Subpart IIII, “Standards of Performance for Stationary Compression Ignition Internal Combustion Engines”

5.1.12 Clean Water Act

The Clean Water Act establishes guidelines to protect the “Waters of the U.S.” by regulating the discharge of pollutants. There were no compliance issues at SNL/KTF with respect to any state or federal water pollution regulations in 2014.

5.1.13 Oil Storage Guidelines

There are four DOE-owned storage tanks at SNL/KTF: one 2,500 gal underground storage tank, one 10,000 gal aboveground storage tank, and two 300 gal generator day-use tanks inside the Main Compound. Only the underground storage tank requires an EPA permit. Sandia cooperates with the U.S. Navy’s spill control guidelines contained in the *Spill Prevention, Control, and Countermeasure Plan, Pacific Missile Range Facility, Kana‘i, Hawai‘i* (NAVFAC Hawaii 2012).

5.1.14 Safe Drinking Water Act

The Safe Drinking Water Act does not apply directly to activities at SNL/KTF because all drinking water is either supplied by the Pacific Missile Range Facility drinking water system or purchased from commercial suppliers.

5.1.15 Toxic Substances Control Act

The Toxic Substances Control Act regulates polychlorinated biphenyls (PCBs) and asbestos. The transformers on the SNL/KTF site have been tested and are free of PCBs. A comprehensive asbestos survey was conducted by the SNL/NM Asbestos Management Team in July 2008. A total of 110 lb of asbestos-containing materials were identified at SNL/KTF, and 91 lb were identified at the Mount Haleakala site on Maui.

5.1.16 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act controls the distribution and application of pesticides including herbicides, insecticides, and rodenticides. All pesticide use at SNL/KTF follows EPA requirements.

5.2. Releases and Occurrences

There were no reportable occurrences at SNL/KTF in 2014.

This page intentionally left blank.



Chapter 6. SNL/KTF Environmental Programs

Sandia Corporation (Sandia) personnel conduct environmental, terrestrial, water, and air monitoring programs at Sandia National Laboratories, Kauai Test Facility (SNL/KTF), Hawaii. Sandia complies with federal, state, and local regulations. The 2014 activities and results of Sandia's environmental programs at SNL/KTF are detailed in this chapter.

6.1. Environmental Programs

The following environmental programs and focus areas are presented in this chapter:

- National Environmental Policy Act (NEPA) Program
- Environmental Restoration (ER) Project
- Water Quality programs
- Air Quality Compliance Program
- Meteorological Monitoring
- Noise Monitoring
- Terrestrial Surveillance Program

6.1.1 National Environmental Policy Act Program

In 2014, the SNL, New Mexico (SNL/NM) NEPA Program provided support to several Sandia customers for their associated programmatic activities performed at either SNL/KTF or the Pacific Missile Range Facility (PMRF).

The NEPA team completed four NEPA checklists for SNL/KTF, three of which were transmitted to the U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office (DOE/NNSA/SFO) for review and determination in 2014.

6.1.2 Environmental Restoration Project

There are no ER sites at SNL/KTF. The three ER sites identified in 1995 were given a Site Evaluation Accomplished determination by EPA on September 30, 1996. This confirmed that SNL/KTF met all Comprehensive Environmental Response, Compensation, and Liability Act requirements and no additional sampling or remediation would be necessary in the three areas. However, this does not preclude that other environmental sampling activities will take place at SNL/KTF.

6.2. Environmental Surveillance and Monitoring Programs

Environmental surveillance and monitoring activities at SNL/KTF included wastewater, air emission, meteorological, and noise monitoring.

6.2.1 Water Quality Program

Activities at SNL/KTF produce only sanitary sewage, which is directed into three DOE/NNSA-owned septic tanks, and stormwater runoff is directed into two French drains and four area drains with pumping systems in accordance with Hawaii Underground Injection Control regulations (Hawaii Administrative Rules Title 11, Chapter 23). Two of the septic tanks are older, used for the Launch Operations Building and the Missile Assembly Building, and were registered with the State of Hawaii in 1988. A newer septic tank for the main office compound was registered in 2004. The septic tank systems are periodically pumped by licensed, state-certified contractors and inspected by state officials. The last inspection, pumping, and sampling occurred in 2013. The limited quantity of sewage released does not impact any protected waters and, as noted earlier, there are no drinking water wells in the area of SNL/KTF. Historically, no contaminants have been identified above the reporting limits from past sampling events. During 2014, no septic tank systems were sampled at SNL/KTF.

6.2.2 Air Quality Compliance Program

Based on air monitoring results of the Strategic Target System (STARS) Flight Test Unit 1 (FTU-1) in February 1993 (SNL/NM 1993) and the Countermeasures Demonstration Experiment (CDX) rocket launch in the summer of 1992 (NDEP 2011; SNL/NM 1992), it was determined that rocket launches at SNL/KTF were not a significant source of air pollutants. Launches are infrequent, and recorded emissions did not exceed federal or state standards. Because the STARS-type rocket produces the greatest air emissions and remained within acceptable limits, it can be assumed that future launches of this type will also be within acceptable limits. Therefore, no further air emission monitoring is planned at this time. If a new rocket type is launched from SNL/KTF that differs in emission substance from the STARS rocket or air emission requirements change, then future monitoring may be considered.

As required by the State of Hawaii, the 2014 Annual Emissions Report for air emissions was submitted to the State of Hawaii in February 2015 (SNL/NM 2014a). The required \$500 annual fee was submitted for 2014 as required. Sandia was in compliance with all air quality regulations at SNL/KTF in 2014.

The semiannual report on air emissions for the first half of 2014 was submitted to the State of Hawaii in August 2014 (SNL/NM 2014b).

For the period of January 1, 2014, through December 31, 2014, the highest total combined operating hours for a rolling 12-month period was 1,757.5 hours, which occurred in the period from December 2013 through November 2014 (DOE/NNSA/SFO 2015). This shows compliance with the permit operating conditions.

In accordance with the SNL/KTF permit conditions, beginning October 1, 2010, each diesel engine generator shall be fired only on Fuel Oil No. 2, with maximum sulfur content not to exceed 0.15 percent by weight and a minimum cetane index of 40. According to testing data provided by the vendor, the cetane index for fuel purchased in 2014 was at least 56.1, and sulfur content was a maximum of 0.0008 percent. These conditions show compliance with permitted operating limits.

6.2.3 Meteorological Monitoring

Due to the infrequency of launches, no formal meteorological monitoring equipment is in place for SNL/KTF. On-site meteorological instruments are used during test periods only to characterize ground-level and atmospheric wind conditions that will affect a rocket's flight. Climatic information representative of SNL/KTF is obtained from PMRF, and severe weather notifications are automatically issued by the PMRF Emergency Operations Center to all SNL/KTF resident personnel.

6.2.4 Noise Monitoring

In accordance with the Quiet Communities Act of 1978 (42 U.S.C. 4901 et seq.), noise monitoring was conducted in February 1993 during the STARS FTU-1 launch to confirm the determination made in the STARS Environmental Impact Statement that noise produced from the largest launch at SNL/KTF would be below maximum acceptable levels (SNL/NM 1993). Data collected in the nearest town of Kekaha indicated that levels were no louder than noise generated from passing vehicles on a nearby highway.

6.3. Terrestrial Surveillance Program

The Terrestrial Surveillance Program at SNL/KTF collects and analyzes surface soil samples every five years for Target Analyte List (TAL) metals to determine whether there has been release to the environment due to SNL/KTF operations. The last sampling event was conducted in 2012, confirming that operations made no detectable environmental impact (from metals) to the soil. The next sampling event will be conducted in 2017.

6.3.1 Statistical Analysis

A statistical analysis was performed on samples collected in 2002, 2007, and 2012 for TAL metals. The results and the baseline concentrations at the SNL/KTF site were presented in the *Calendar Year 2012 Annual Site Environmental Report for Tonopah Test Range, Nevada and Kauai Test Facility, Hawaii* (SNL/NM 2013). Summary statistics for the 2012 sampling event are presented in Table 6-1. On-site and off-site locations were compared to determine whether any analyte showed differences between the two location types (there are no perimeter sampling locations at SNL/KTF).

Table 6-1. SNL/KTF summary statistics for metals in soil, 2012 (all units in mg/kg)

Analyte	Mean	Median	SD	Minimum	Maximum
Aluminum	6,496	6,400	2,811	2,270	13,100
Antimony	0.80	0.42	0.75	0.31	3.27
Arsenic	18.72	10.70	16.98	5.96	62.80
Barium	25.79	12.10	36.17	6.86	151.00
Beryllium	0.12	0.11	0.07	0.05	0.27
Cadmium	0.27	0.24	0.13	0.11	0.51
Calcium	259,529	261,000	52,847	185,000	343,000
Chromium	50.48	47.10	21.51	22.20	93.70
Cobalt	18.58	16.30	10.85	4.04	40.08
Copper	37.73	12.30	97.13	5.40	413.00
Iron	19,875	19,400	9,209	7,670	39,600
Lead	4.78	1.63	7.50	0.49	30.70
Magnesium	34,906	28,500	14,462	23,000	66,400
Manganese	381	390	190	118	878
Nickel	221	174	156	42	556
Potassium	325	216	278	100	1,020
Selenium	0.32	0.32	0.01	0.30	0.33
Silver	1.48	1.49	0.69	0.10	2.82
Sodium	2,170	2,010	674	1,650	4,450
Thallium	0.06	0.06	0.00	0.06	0.06
Uranium	1.26	1.29	0.20	0.95	1.68
Vanadium	26.11	29.90	9.70	9.21	40.00
Zinc	335	63	749	21	3,140

NOTES: SD = standard deviation
SNL/KTF = Sandia National Laboratories, Kauai Test Facility

6.3.2 Sampling Locations

Terrestrial surveillance began at SNL/KTF in 1994. Sampling occurred in 1999, 2002, 2007, and 2012. Routine terrestrial surveillance is conducted at on-site and off-site locations that remain essentially the same from sampling period to sampling period (Appendix C). Sample locations may be modified as necessary to reflect current operations or to supplement data from existing locations.

The sampling locations, number of samples, and analyses performed are prioritized based on the following criteria:

- On-site sampling locations are near areas of known contamination, potential sources of contamination, or in areas where contamination, if present, would be expected to accumulate. On-site sampling locations are listed in [Table 6-2](#). Figure C-1 (Appendix C) shows the 17 on-site locations.
- Off-site sampling locations are selected in remote natural settings, in areas near local population centers, and along highways. These locations provide a measurement of environmental conditions unaffected by Sandia activities at SNL/KTF. Data collected from off-site locations serve as a reference point to compare with data collected at on-site locations. [Table 6-3](#) lists the off-site sample locations. Figure C-2 (Appendix C) shows the 11 off-site locations.

Table 6-2. SNL/KTF on-site terrestrial surveillance locations

Surveillance Location	Location Number	Sample Location
Various on-site	S-12	Near Wind Radar Road
	S-13	SNL/KTF sign, DOE Trail Road
	S-14	Building 638
	S-15	Between Building 638 and Building 639
	S-16	Building 639 (east)
	S-17	Building 640 (east)
	S-18	Building 640 (west)
	S-19	Building 685 (west)
	S-20	Missile Assembly Building Parking Lot
	S-21	Building 645 and Building 645A (south)
	S-22	Missile Service Tower Hill
	S-23	Pad 1 (west corner)
Main Compound	S-24	Main Compound, northeast corner fence
	S-25	Main Compound, southeast corner fence
	S-26	Main Compound, north fence
	S-27	Main Compound, northwest of Launch Operations Building
	S-28	Diesel fuel tank (southeast corner), DOE Trail

NOTES: DOE = U.S. Department of Energy
SNL/KTF = Sandia National Laboratories, Kauai Test Facility

Table 6-3. SNL/KTF off-site terrestrial surveillance locations

Location Number	Sample Location
C-01	"Recreational Area I Beach Access" sign, North Nohili Road
C-02	"No Trespassing" sign, west of Location C-01
C-03	North Nohili Road and Hoku Road
C-04	Hoku Road, west of Building 515
C-05	Polihale State Park, Monkey Pod Tree
C-06	Polihale State Park, "Camping" sign
C-07	Polihale State Park, "Caution Road Narrows" sign
C-08	North Nohili Road and Palai Olani Road
C-09	Kokole Point Launch Area, Building H10
C-10	Kokole Point Launch Area (west)
C-11	Kokole Point Launch Area (south)

NOTES: Off-site samples were previously called community samples, thus the C label in the location number (maintained for the database).

SNL/KTF = Sandia National Laboratories, Kauai Test Facility

6.4. Waste Management Program

Some hazardous waste is generated through normal operations at SNL/KTF. Sandia is classified as a conditionally exempt small-quantity generator, and follows applicable requirements. EPA Region IX and the Hawaii Department of Health issued a generator identification (HI-0000-363309) to Sandia on September 23, 1994 (the expiration date was not specified).

This page intentionally left blank.

Glossary

A

audit (1) An examination of records or financial accounts to check their accuracy. (2) An adjustment or correction of accounts. (3) An examined and verified account.

B

background radiation Relatively constant low-level radiation from environmental sources such as building materials, cosmic rays, and ingested radionuclides in the body.

D

dosimeter A device used to measure the dose of ionizing radiation received by an individual.

E

ecology The relationship of living things to one another and their environment, or the study of such relationships.

ephemeral stream A stream that flows only briefly during and following a period of rainfall in the immediate locality.

F

fault A fracture in the continuity of a rock formation caused by the earth's crust shifting or dislodging, after which adjacent surfaces are displaced relative to one another and parallel to the plane of fracture.

G

groundwater Water that is present beneath the earth's surface in soil pore spaces and in the fractures of rock formations.

H

hazardous substance (1) Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive.
(2) Any substance the EPA requires to be reported if a designated quantity of the substance is spilled in the waters of the United States or is otherwise released into the environment.

I

Integrated Safety Management System (ISMS) A set of guidelines that systematically integrate safety into management and work practices at all levels so missions are accomplished while protecting the worker, the public, and the environment.

L

lagoon (1) A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater; also used for storing wastewater. (2) A shallow body of water, often separated from the sea by coral reefs or sandbars.

M

mixed waste Radioactive waste that contains both source material, special nuclear material, or by-product material subject to the Atomic Energy Act of 1954, as amended; also a hazardous component subject to the Resource Conservation and Recovery Act, as amended.

N

nitrate A compound containing nitrogen that can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and domestic animals. A plant nutrient and inorganic fertilizer, nitrate is found in septic systems, animal feed lots, agricultural fertilizers, manure, industrial wastewaters, sanitary landfills, and garbage dumps.

O

outfall The place where effluent is discharged into receiving waters.

Q

quality control (QC) A system used to determine analytical accuracy, precision, and contamination when samples are collected and to assess the data's quality and usability.

R

radioactive waste Any waste that emits energy as rays, waves, streams, or energetic particles. Radioactive materials are often mixed with hazardous waste from nuclear reactors, research institutions, or hospitals.

S

Sandia Management Model (SMM) A web-based, interactive description of Sandia, describing activities, responsibilities, and success rates.. This model is a high-level depiction intended to be viewed by a broad audience for a comprehensible and dynamic experience in understanding how Sandia operates.

surface discharge Liquid that is spilled, leaked, pumped, poured, emitted, emptied, or dumped into water or in a location and manner where there is a reasonable probability that the discharged substance will reach surface or subsurface water.

T

tritium A radioactive hydrogen isotope with an atomic mass of 3 and a half-life of 12.5 years, prepared artificially for use as a tracer and as a constituent of hydrogen bombs.

U

U.S. Forest Service (USFS) withdrawal area A portion of land that has been withdrawn from public access for use by the U.S. Air Force and the DOE.

V

vadose zone The zone between land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone.

W

waste characterization The identification of a waste material's chemical and microbiological constituents.

This page intentionally left blank.

References

- BLM (U.S. Department of the Interior, Bureau of Land Management). 2011. “Herd Area (HA) and Herd Management Area (HMA) Data, FY 2011.” http://www.blm.gov/wo/st/en/prog/wild_horse_and_burro/wh_b_information_center/statistics_and_maps/ha_and_hma_data.html.
- DOD, DOE, and State of Nevada (U.S. Department of Defense, U.S. Department of Energy, and State of Nevada). 1996. *Federal Facility Agreement and Consent Order (FFACO)*. State of Nevada Department of Conservation and Natural Resources, Division of Environmental Protection and the U.S. DOE and the U.S. DOD in the Matter of Federal Facility Agreement and Consent Order. <http://ndep.nv.gov/boff/ffco.htm>.
- DOE/AL (U.S. Department of Energy, Albuquerque Operations Office). 1992. *Kauai Test Facility Environmental Assessment*, DOE/EA-0492. Albuquerque, NM: DOE/AL.
- DOE/NNSA/SFO (U.S. Department of Energy/National Nuclear Security Administration/Sandia Field Office). 2015. “Non-covered Source Permit No. 0429-01-N: Calendar Year 2014 Annual Emissions Report and Semi-Annual Monitoring Report for Kauai Test Facility.” Albuquerque, NM: DOE/NNSA/SFO.
- DOE/NV (U.S. Department of Energy, Nevada Operations Office). 1992. *Water Conservation Plan for the Tonopah Test Range*, Range 4809. Las Vegas, NV: DOE/NV.
- Dragun, J., and K. Chekiri. 2005. *Elements in North American Soils*. Amherst, MA: The Association for Environmental Health and Sciences.
- DRI (Desert Research Institute). 1991. *Special Nevada Report*, DOE/NV/10715-T1. Prepared by Science Applications International Corporation (SAIC) for the Department of the Air Force.
- . 1997. *Draft Analysis of Ambient Airborne Particulate Matter for Plutonium; Clean Slate 1 During Excavation and Truck Loading, Tonopah Test Range, May 1997–June 1997*, DRI Document Number 6357-683-7562.1D1. Prepared by DRI for the U.S. Department of Energy/Nevada Field Office, Las Vegas, NV.
- Ecology and Environment, Inc. (E&E). 1989. *Federal Facility Preliminary Assessment Review*, EPA Region IX, F9-8903-021, NV3570090016. San Francisco, CA: E&E.
- Edgerton, Germeshausen, & Grier, Inc. (EG&G). 1995. *Aerial Radiological Survey of the Tonopah Test Range Including Clean Slate 1, 2, 3, Roller Coaster, Decontamination Area, Cactus Springs Ranch Target Areas, Central Nevada*, EGG-11265-1145. Las Vegas, NV: EG&G Energy Measurements Group.
- Engelbrecht, J. P., I. G. Kavouras, D. Campbell, S. A. Campbell, S. Kohl, and D. Shafer. 2008. *Yucca Mountain Environmental Monitoring System Initiative, Air Quality Scoping Study for Tonopah Airport, Nye County, Nevada*, Letter Report DOE/NV/26383-LTR2008-04. Las Vegas, NV: Desert Research Institute.
- EPA (U.S. Environmental Protection Agency). 1999. *Off-Site Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas, Calendar Year 1997*, EPA/402-R-98-013. Las Vegas, NV: EPA.
- . 2013. “National Priorities List (NPL) Sites in the United States.” <http://www.epa.gov/superfund/sites/npl/>. Washington, D.C.: EPA.

- . 2014. “Regional Screening Levels for Chemical Contaminants at Superfund Sites.” http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/master_sl_table_run_MAY2014.pdf. Washington, D.C.: EPA.
- ERDA (U.S. Energy Research and Development Administration). 1975. *Environmental Assessment, Tonopah Test Range*, EIA/MA/76-2. Washington, D.C.: ERDA.
- Gore, A. 1993. *From Red Tape to Results: Creating a Government That Works Better and Costs Less*. Report of the National Performance Review. Washington, D.C.: U.S. Government Printing Office.
- Hawaii DOH (Hawaii Department of Health). 2009. “State of Hawaii Noncovered Source Permit No. 0429-01-N, Expiration Date March 2, 2014.” Honolulu, HI: Hawaii DOH.
- ISO (International Organization for Standardization). 2004. ISO 14001. *Environmental Management Systems—Requirements*. Geneva, Switzerland: ISO.
- . 2008. ISO 9001. *Quality Management Systems—Requirements*. Geneva, Switzerland: ISO.
- IT (IT Corporation). 1993. *Tonopah Test Range Polychlorinated Biphenyls Sample Results*. Albuquerque, NM: IT.
- . 1996. *Sampling and Analysis Plan for Clean Slate 1*. Albuquerque, NM: IT.
- Kabata-Pendias, A. 2000. *Trace Elements in Soils and Plants*, 3rd ed. Boca Raton, FL: CRC Press, Inc.
- NAVFAC (Naval Facilities Engineering Command) Hawaii. 2012. *Spill Prevention Control and Countermeasure (SPCC) Plan, Pacific Missile Range Facility, Kauai, Hawaii*. Prepared for the NAVFAC by Environet, Inc., Honolulu, HI.
- NCRP (National Council on Radiation Protection and Measurements). 2009. *Ionizing Radiation Exposure of the Population of the United States*, NCRP Report 160. Bethesda, MD: NCRP.
- NDEP (Nevada Department of Environmental Protection). 2011. Public Water System Monitoring Reminder. Las Vegas, NV: NDEP.
- Shyr, L., H. Herrera, and R. Haakqer. 1998. *The Role of Data Analysis in Sampling Design of Environmental Monitoring*, SAND98-0612. Albuquerque, NM: SNL/NM.
- Sinnock, S. 1982. *Geology of the Nevada Test Site and Nearby Areas—Southern Nevada*, SAND82-2207. Albuquerque, NM: SNL/NM.
- Sandia National Laboratories, New Mexico (SNL/NM). 1987. *Description and Procedures of the Environmental Radiation Dosimetry Program*, SAND87-1916. Albuquerque, NM: SNL/NM.
- . 1992. Memo from W. E. Stocum (7712) to R. G. Hay (2723). “CDX Rocket Motor Effluent Monitoring.” Albuquerque, NM: SNL/NM.
- . 1993. Memo to Linda Ninh from B. E. Swanson. “SNL Acoustic Monitoring Plan of the STARS Flight Test Unit 1.” Albuquerque, NM: SNL/NM.
- . 1997a. *NESHAP Annual Report for CY 1996 (EPA Summary)*. Albuquerque, NM: SNL/NM.
- . 1997b. *Radiological Dose Calculations and Supplemental Dose Assessment Data for NESHAP Compliance for Sandia National Laboratories, Nevada, CY 1996*. Albuquerque, NM: SNL/NM.
- . 2006. *Chemical Analyses of Soil Samples Collected from the Sandia National Laboratories, Tonopah Test Range Environs, 1994–2005*, SAND2006-2071 Albuquerque, NM: SNL/NM.
- . 2011. *Data Validation Procedure for Chemical and Radiochemical Data*. Administrative Operating Procedure (AOP) 00-03, Revision 3. Albuquerque, NM: SNL/NM Sample Management Office.
- . 2013. *Calendar Year 2012 Annual Site Environmental Report for Tonopah Test Range, Nevada and Kauai Test Facility, Hawaii*, SAND2013-6179P. Albuquerque, NM: SNL/NM.

- . 2014a. *Calendar Year 2013 Annual Emissions Monitoring Report for Kauai Test Facility*. Albuquerque, NM: SNL/NM.
- . 2014b. *Calendar Year 2013 Semi-Annual Monitoring Report Form for the Kauai Test Facility*. Albuquerque, NM: SNL/NM.
- . 2014c. *NESHAP Annual Report for CY 2013, Sandia National Laboratories, Tonopah Test Range*. Albuquerque, NM: SNL/NM.
- . 2014d. *Spill Prevention, Control, and Countermeasure (SPCC) Plan for Tonopah Test Range (TTR)*, PLA 90-12. Albuquerque, NM: SNL/NM.
- . 2015a. *Mapping Archeological Surveys at Tonopah Test Range 1979–2014*, SAND2015-0512. Albuquerque, NM: SNL/NM.
- . 2015b. *NESHAP Annual Report for CY 2014, Sandia National Laboratories, Tonopah Test Range*, SAND2014-3258P. Albuquerque, NM: SNL/NM.
- USAF (U.S. Air Force). 1999. *Renewal of the Nellis Air Force Range Land Withdrawal: Department of the Air Force Legislative Environmental Impact Statement*. Nellis Air Force Range, NV: USAF.
- USAF/DOE/NNSA (U.S. Air Force/Department of Energy /National Nuclear Security Administration). 2002. *Department of the Air Force Permit to the National Nuclear Security Administration to Use Property Located on the Nevada Test and Training Range, Nevada*. Tonopah, NV: USAF/DOE/NNSA.
- U.S. Navy (U.S. Department of the Navy). 2008. *Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for the Hawaii Range Complex*. Kauai, HI: U.S. Navy.

Executive Orders

- EO 11988. *Floodplain Management*, as amended (May 24, 1977).
- EO 11990. *Protection of Wetlands*, as amended (May 24, 1977).
- EO 12898. *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, as amended (February 11, 1994).
- EO 13423. *Strengthening Federal Environmental, Energy, and Transportation Management* (January 2007).
- EO 13514. *Federal Leadership in Environmental, Energy, and Economic Performance* (October 2009).

DOE Directives

- DOE O 231.1B, Change 1. *Environment, Safety, and Health Reporting*. 2012.
- DOE O 232.2, Admin. Change 1. *Occurrence Reporting and Processing of Operations Information*. 2014.
- DOE O 414.1D. *Quality Assurance*. 2011.
- DOE O 435.1, Change 1. *Radioactive Waste Management*. 2001.
- DOE O 436.1. *Departmental Sustainability*. 2011.
- DOE O 458.1, Change 3. *Radiation Protection of the Public and the Environment*. 2013.

Code of Federal Regulations

10 CFR 830. *Nuclear Safety Management.*

10 CFR 1021. *National Environmental Policy Act Implementing Procedures.*

40 CFR 60. *Standards of Performance for New Stationary Sources.*

40 CFR 61. *National Emission Standards for Hazardous Air Pollutants (NESHAP).*

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 280. *Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks.*

40 CFR 355. *Emergency Planning and Notification.*

40 CFR 370. *Hazardous Chemical Reporting: Community Right-to-Know.*

Federal Acts and Statutes

- American Indian Religious Freedom Act (AIRFA) of 1978 (42 U.S.C. §1996).
- Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. §470aa).
- Clean Air Act (CAA) and CAA Amendments of 1990 (42 U.S.C. §7401).
- Clean Water Act (CWA) of 1977 (The Federal Water Pollution Control Act) (33 U.S.C. §1251).
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. §9601) (Amended by SARA).
- Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 (42 U.S.C. §11001 et seq.). (Also known as SARA Title III.)
- Endangered Species Act (ESA) (16 U.S.C. §1531 et seq.).
- Federal Facility Compliance Act (FFCA) of 1992 (42 U.S.C. §6961).
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. §136).
- Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. §703 et seq.).
- National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. §4321).
- National Historic Preservation Act of 1966, as amended (16 U.S.C. §470 et seq.).
- Quiet Communities Act of 1978 (42 U.S.C. §4901 et seq.).
- Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S.C. §6901 et seq.).
- Safe Drinking Water Act (SDWA) (42 U.S.C. §300f).
- Superfund Amendments and Reauthorization Act (SARA) of 1986 (see CERCLA).
- Toxic Substances Control Act (TSCA) of 1976 (15 U.S.C. §2601 et seq.).

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

State of Hawaii Environmental Regulations

Hawaii Administrative Rules (HAR), Title 11, Chapter 23, “Underground Injection Control.”

Hawaii Administrative Rules (HAR), Title 11, Chapter 59, “Ambient Air Quality Standards.”

State of Nevada Environmental Regulations

Nevada regulatory information can be found at the Nevada State Legislature website:

<http://www.leg.state.nv.us/>.

A listing of the Nevada Administration Code (NAC) can be found at *<http://www.leg.state.nv.us/NAC>*.

This page intentionally left blank.

Distribution

UNLIMITED RELEASE DISTRIBUTION

U.S. Department of Energy

U.S. Department of Energy
Environmental Management Operations
Nevada Field Office (NFO) (EM-50.2)
Attn: Kevin Cabbie (1*/1**)
P.O. Box 98518
Las Vegas, NV 89193-8518

U.S. Department of Energy
Environmental Management Operations
Nevada Field Office (NFO) (EM-50.2)
Attn: Tiffany Lantow (1*/1**)
P.O. Box 98518
Las Vegas, NV 89193-8518

U.S. Department of Energy
National Nuclear Security Administration
Albuquerque Complex
NNSA/AC, NA-533
Attn: Steven R. Black (1*/1**)
P.O. Box 5400
Albuquerque, NM 87185-5400

U.S. Department of Energy
National Nuclear Security Administration
Sandia Field Office (SFO/ENG)
Attn: Karen Agogino (5*/12**)
P.O. Box 5400, MS 0184
Albuquerque, NM 87185-5400

U.S. Department of Energy
Office of Analysis
HQ/FORS, AU-23
Attn: Ross Natoli (1*/1**)
1000 Independence Ave. SW
Washington, DC 20585

Federal, State, and Other Agencies

Argonne National Laboratory
Attn: Theresa Davis (1*)
9700 South Cass Avenue
Building 200, Room B-11
Argonne, Illinois 60439

Commanding Officer (Code N47)
Pacific Missile Range Facility Environmental Biologist
Attn: Tom Savre (1*)
P.O. Box 128
Kekaha, HI 96752-8128
Building 395

DAF/Tonopah Test Range Ops Office
Attn: Matthew W. Birch (1*)
P.O. Box 93174
Las Vegas, NV 89191-3174

Division of Environmental Protection
Deputy Administrator
Attn: Dave Emme (1**)
901 South Stewart, Suite 4001
Carson City, NV 89701

Environmental Health Administration
Environmental Management Division
Attn: Thomas E. Arizumi (1**)
Room 300
919 Ala Moana Blvd.
Honolulu, HI 96814-4920

Kauai District Health Office
Attn: Adeline Sasaki (1**)
3040 Umi Street
P.O. Box 671
Lihue, HI 96766

UNLIMITED RELEASE DISTRIBUTION (continued)
Federal, State, and Other Agencies (continued)

Lockheed-Martin Corporation
 Corporate Energy, Environment, Safety & Health
 Attn: Jeff Thomas (2**)
 6801 Rockledge Drive
 Bethesda, MD 20817
 Office: Bldg Code: MD/1CC
 MailDrop: CCT-246, Room: 246-26

Nevada Division of Environmental Protection
 Attn: Chris Andres (1**)
 2030 E. Flamingo Road, Suite 230
 Las Vegas NV 89119

Pacific Missile Range Facility
 Public Works Office
 Attn: Leland Tottori (1*)
 P.O. Box 128
 Kekaha, HI 96752-0128

University of New Mexico
 Government Information Department
 Zimmerman Library-UNM
 Attn: Dan Barkley (1*)
 1 University of New Mexico, MSC05 3020
 Albuquerque, NM 87131-0001

U.S. Environmental Protection Agency
 Director, Air Division
 Attn: Ms. Deborah Jordan (1*)
 Mail Code A-1
 75 Hawthorne Street
 San Francisco, CA 94105

U.S. Environmental Protection Agency
 Region IX
 Attn: Scott Sysum (1*)
 Mail Code ENF-4-2
 75 Hawthorne Street
 San Francisco, CA 94105

Sandia National Laboratories Distribution

Address	Name	Quantity
MS 0101	J. Hruby, 00001	1**
MS 0141	A. Blumberg, 11100	1*
MS 0143	M. Hazen, 4000	1**
MS 0725	T. Lewandowski, 4140	1**
MS 0725	J. Moya, 4100	1*
MS 0729	C. Green, 4140	1*
MS 0730	S. Griffith, 4143	15**
MS 0730	A. Minitrez, 4143	1**
MS 0730	A. Salas, 4143	1**
MS 0730	N. White, 3654	1**
MS 0774	S. Coe, 3654	1**
MS 0899	Technical Library, 9536	email pdf
MS 1043	ES&H Library, 4135	2**
MS 1172	R. Martinez, 5419	1*/1**
MS 1392	W. Forston, 2915	1*/2**
MS 1392	R. Smith, 2915	1*

NOTES: *Requires a CD copy of this report.
 **Requires a published copy of this report.



Appendix A

2014 SNL/TTR Terrestrial Surveillance Results

Table A-1. Radiological results for off-site soil sampling locations at SNL/TTR, calendar year 2014.....	A-2
Table A-2. Radiological results for perimeter soil sampling locations at SNL/TTR, calendar year 2014	A-4
Table A-3. Radiological results for South Plume area soil sampling locations at SNL/TTR, calendar year 2014	A-6
Table A-4. Radiological results for Range Operations Center on-site soil sampling locations at SNL/TTR, calendar year 2014.....	A-7
Table A-5. Radiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014	A-8
Table A-6. TLD measurements by quarter and location class, calendar year 2014.....	A-10
Table A-7. Nonradiological results for South Plume Area soil sampling locations at SNL/TTR, calendar year 2014	A-11
Table A-8. Nonradiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014	A-15
NOTES	A-21

Appendix A presents the SNL/TTR terrestrial surveillance results for calendar year 2014.

Table A-1. Radiological results for off-site soil sampling locations at SNL/TTR, calendar year 2014

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
Community	Americium-241	C-20	0.0536 ± 0.0614	0.0991	U	BD	HASL-300
	Cesium-137		0.125 ± 0.0249	0.0203		NONE	HASL-300
	Uranium-235		0.0496 ± 0.106	0.1	U	BD	HASL-300
	Uranium-238		1.47 ± 0.948	0.801		J	HASL-300
	Americium-241	C-21	0.0211 ± 0.0719	0.121	U	BD	HASL-300
	Cesium-137		0.175 ± 0.0273	0.0186		NONE	HASL-300
	Uranium-235		0.0869 ± 0.106	0.104	U	BD	HASL-300
	Uranium-238		1.6 ± 1.26	0.938		J	HASL-300
	Americium-241	C-22	0.0113 ± 0.0169	0.027	U	BD	HASL-300
	Cesium-137		0.0789 ± 0.0206	0.0232		NONE	HASL-300
	Uranium-235		0.121 ± 0.0818	0.0924		J	HASL-300
	Uranium-238		1.36 ± 0.479	0.266		NONE	HASL-300
	Americium-241	C-23	0.0859 ± 0.0856	0.134	U	BD	HASL-300
	Cesium-137		0.111 ± 0.0205	0.0183		NONE	HASL-300
	Uranium-235		0.0725 ± 0.105	0.101	U	BD	HASL-300
	Uranium-238		1.62 ± 1.23	1.01		J	HASL-300
	Americium-241	C-24	0.0573 ± 0.0721	0.114	U	BD	HASL-300
	Cesium-137		0.166 ± 0.0235	0.0204		NONE	HASL-300
	Uranium-235		0.0628 ± 0.105	0.115	U	BD	HASL-300
	Uranium-238		1.62 ± 1.25	0.925		J	HASL-300
	Americium-241	C-25	0.012 ± 0.0665	0.11	U	BD	HASL-300
	Cesium-137		0.141 ± 0.0287	0.0242		NONE	HASL-300
	Uranium-235		0.0329 ± 0.112	0.116	U	BD	HASL-300
	Uranium-238		2.01 ± 1.12	0.874		J	HASL-300
	Americium-241	C-26	0.0192 ± 0.0351	0.057	U	BD	HASL-300
	Cesium-137		0.483 ± 0.0471	0.0198		NONE	HASL-300
	Uranium-235		0.126 ± 0.0835	0.104		J	HASL-300
	Uranium-238		1.82 ± 0.663	0.509		NONE	HASL-300
	Americium-241	C-27	0.0963 ± 0.0804	0.111	U	BD	HASL-300
	Cesium-137		0.355 ± 0.0367	0.0221		NONE	HASL-300
	Uranium-235		0.202 ± 0.117	0.142		J	HASL-300
	Uranium-238		02.62 ± 1.14	0.939		J	HASL-300

See notes at end of appendix.

Table A-1. Radiological results for off-site sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
Community	Americium-241	C-28	0.0203 ± 0.0338	0.0474	U	BD	HASL-300
	Cesium-137		0.214 ± 0.0323	0.0277		None	HASL-300
	Uranium-235		0.0601 ± 0.126	0.133	U	BD	HASL-300
	Uranium-238		1.55 ± 0.743	0.457		None	HASL-300
	Americium-241	C-29	0.0223 ± 0.0471	0.0658	U	BD	HASL-300
	Americium-241		0.107 ± 0.0739	0.107	U	BD	HASL-300
	Americium-241		0.0313 ± 0.0258	0.0364	U	BD	HASL-300
	Cesium-137		0.108 ± 0.0199	0.025		None	HASL-300
	Cesium-137		0.408 ± 0.0384	0.019		None	HASL-300
	Cesium-137		0.0892 ± 0.0188	0.0211		None	HASL-300
	Uranium-235		0.0532 ± 0.116	0.13	U	BD	HASL-300
	Uranium-235		0.0991 ± 0.0968	0.115	U	BD	HASL-300
	Uranium-235		0.099 ± 0.118	0.123	U	BD	HASL-300
	Uranium-238		1.94 ± 0.912	0.787		J	HASL-300
	Uranium-238		1.25 ± 0.754	0.611		J	HASL-300
	Uranium-238		1.38 ± 0.576	0.368		None	HASL-300
	Americium-241	C-30	0.0418 ± 0.0695	0.116	U	BD	HASL-300
	Cesium-137		0.236 ± 0.027	0.0188		None	HASL-300
	Uranium-235		0.051 ± 0.107	0.102	U	BD	HASL-300
	Uranium-238		1.45 ± 1.03	0.902		J	HASL-300
	Americium-241	C-31	0.0251 ± 0.0316	0.0347	U	BD	HASL-300
	Cesium-137		0.0975 ± 0.022	0.0227		None	HASL-300
	Uranium-235		0.0599 ± 0.111	0.111	U	BD	HASL-300
	Uranium-238		1.3 ± 0.553	0.339		None	HASL-300
	Americium-241	C-32	-0.047 ± 0.0548	0.0863	U	BD	HASL-300
	Cesium-137		0.0881 ± 0.0164	0.0153		None	HASL-300
	Uranium-235		0.0252 ± 0.085	0.0914	U	BD	HASL-300
	Uranium-238		1.45 ± 0.842	0.707		J	HASL-300
	Americium-241	C-33	0.0323 ± 0.0808	0.138	U	BD	HASL-300
	Cesium-137		0.0755 ± 0.0216	0.021		None	HASL-300
	Uranium-235		0.0312 ± 0.0852	0.115	U	BD	HASL-300

See notes at end of appendix.

Table A-2. Radiological results for perimeter soil sampling locations at SNL/TTR, calendar year 2014

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
Perimeter	Americium-241	P-06	0.15 ± 0.0953	0.15	U	BD	HASL-300
	Cesium-137		0.0948 ± 0.0185	0.0233		None	HASL-300
	Uranium-235		0.0711 ± 0.115	0.129	U	BD	HASL-300
	Uranium-238		1.26 ± 0.901	0.941		J	HASL-300
	Americium-241	P-08	0.0559 ± 0.0756	0.128	U	BD	HASL-300
	Cesium-137		0.0637 ± 0.016	0.0189		None	HASL-300
	Uranium-235		0.111 ± 0.0934	0.0969		J	HASL-300
	Uranium-238		1.08 ± 1.08	0.962		J	HASL-300
	Americium-241	P-11	0.0906 ± 0.0532	0.0906	U	BD	HASL-300
	Americium-241		-0.00901 ± 0.087	0.149	U	BD	HASL-300
	Americium-241		-0.0265 ± 0.105	0.179	U	BD	HASL-300
	Cesium-137		0.222 ± 0.0352	0.0277		None	HASL-300
	Cesium-137		0.221 ± 0.0257	0.0209		None	HASL-300
	Cesium-137		0.203 ± 0.032	0.0303		None	HASL-300
	Uranium-235		0.0936 ± 0.134	0.133	U	BD	HASL-300
	Uranium-235		0.0837 ± 0.104	0.112	U	BD	HASL-300
	Uranium-235		0.114 ± 0.151	0.186	U	BD	HASL-300
	Uranium-238		1.54 ± 1.12	1.16		J	HASL-300
	Uranium-238		1.59 ± 0.621	0.433		None	HASL-300
	Uranium-238		2.06 ± 1.48	1.41		J	HASL-300
	Americium-241	P-12	-0.0172 ± 0.0273	0.0352	U	BD	HASL-300
	Cesium-137		0.258 ± 0.03	0.0229		None	HASL-300
	Uranium-235		0.021 ± 0.114	0.114	U	BD	HASL-300
	Uranium-238		1.3 ± 0.568	0.348		None	HASL-300
	Americium-241	P-34	0.0344 ± 0.0304	0.0396	U	BD	HASL-300
	Cesium-137		0.169 ± 0.0298	0.0244		None	HASL-300
	Uranium-235		0.106 ± 0.11	0.123	U	BD	HASL-300
	Uranium-238		1.59 ± 0.723	0.394		None	HASL-300
	Americium-241	P-35	0.0697 ± 0.0892	0.14	U	BD	HASL-300
	Cesium-137		0.252 ± 0.0298	0.021		None	HASL-300
	Uranium-235		0.0514 ± 0.108	0.12	U	BD	HASL-300
	Uranium-238		1.8 ± 1.26	1.09		J	HASL-300

See notes at end of appendix.

Table A-2. Radiological results for perimeter soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
Perimeter	Americium-241	P-36	--.00253 ± 0.0231	0.0317	U	BD	HASL-300
	Cesium-137		-.0995 ± 0.0228	0.0214		None	HASL-300
	Uranium-235		-.0205 ± 0.0736	0.109	U	BD	HASL-300
	Uranium-238		-.857 ± 0.494	0.321		J	HASL-300
	Americium-241	P-37	-.0597 ± 0.0538	0.0811	U	BD	HASL-300
	Cesium-137		-.0261 ± 0.0137	0.0193		J	HASL-300
	Uranium-235		-.00461 ± 0.096	0.109	U	BD	HASL-300

See notes at end of appendix.

Table A-3. Radiological results for South Plume area soil sampling locations at SNL/TTR, calendar year 2014

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Americium-241	S-48	0.0156 ± 0.0242	0.0277	U	BD	HASL-300
	Cesium-137		0.294 ± 0.0298	0.0197		None	HASL-300
	Uranium-235		0.102 ± 0.0791	0.0904		J	HASL-300
	Uranium-238		1.22 ± 0.45	0.279		None	HASL-300
	Americium-241	S-49	0.651 ± 0.102	0.068		None	HASL-300
	Cesium-137		0.45 ± 0.0413	0.0168		None	HASL-300
	Plutonium-238		0.183 ± 0.122	0.163		J	HASL-300
	Plutonium-239/240		1.1 ± 0.279	0.262		None	HASL-300
	Uranium-235		0.0282 ± 0.0821	0.0984	U	BD	HASL-300
	Uranium-238		1.57 ± 0.775	0.606		J	HASL-300
	Americium-241	S-50	0.0782 ± 0.0482	0.0482		J	HASL-300
	Cesium-137		0.464 ± 0.048	0.0282		None	HASL-300
	Plutonium-238		0.0264 ± 0.0116	0.0106		J	HASL-300
	Plutonium-239/240		1.21 ± 0.119	0.0171		None	HASL-300
	Uranium-235		0.132 ± 0.144	0.137	U	BD	HASL-300
	Uranium-238		1.48 ± 0.751	0.47		None	HASL-300
	Americium-241	S-51	3.92 ± 0.368	0.109		None	HASL-300
	Cesium-137		0.301 ± 0.0323	0.0183		None	HASL-300
	Plutonium-238		0.176 ± 0.255	0.247	U	BD	HASL-300
	Plutonium-239/240		9.5 ± 1.42	0.397		None	HASL-300
	Uranium-235		0.0758 ± 0.096	0.108	U	BD	HASL-300
	Uranium-238		1.16 ± 0.907	0.855		J	HASL-300
	Americium-241	S-52	0.0746 ± 0.127	0.127	U	BD	HASL-300
	Cesium-137		0.255 ± 0.0298	0.0184		None	HASL-300
	Uranium-235		0.107 ± 0.103	0.107		J	HASL-300
	Uranium-238		0.673 ± 1.14	1.01	U	BD	HASL-300

See notes at end of appendix.

Table A-4. Radiological results for Range Operations Center on-site soil sampling locations at SNL/TTR, calendar year 2014

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Americium-241	S-40	0.0246 ± 0.0209	0.0296	U	BD	HASL-300
	Cesium-137		0.0868 ± 0.0193	0.0215		NONE	HASL-300
	Uranium-235		0.0683 ± 0.0571	0.0991	U	BD	HASL-300
	Uranium-238		1.3 ± 0.457	0.292		NONE	HASL-300
	Americium-241	S-41	0.045 ± 0.0374	0.0539	U	BD	HASL-300
	Cesium-137		0.0469 ± 0.0139	0.0176		J	HASL-300
	Uranium-235		0.079 ± 0.0859	0.103	U	BD	HASL-300
	Uranium-238		1.11 ± 0.637	0.49		J	HASL-300
	Americium-241	S-42	0.0211 ± 0.0196	0.0289	U	BD	HASL-300
	Cesium-137		0.338 ± 0.0333	0.0198		NONE	HASL-300
	Uranium-235		0.0462 ± 0.0791	0.0904	U	BD	HASL-300
	Uranium-238		1.29 ± 0.453	0.284		NONE	HASL-300
	Americium-241	S-43	-0.00851 ± 0.0404	0.0525	U	BD	HASL-300
	Cesium-137		0.0337 ± 0.0126	0.0177		J	HASL-300
	Uranium-235		0.0954 ± 0.0955	0.0966	U	BD	HASL-300
	Uranium-238		1.79 ± 0.622	0.479		NONE	HASL-300
	Americium-241	S-44	0.07 ± 0.0565	0.0797	U	BD	HASL-300
	Cesium-137		0.123 ± 0.0208	0.0167		NONE	HASL-300
	Uranium-235		0.171 ± 0.112	0.1		J	HASL-300
	Uranium-238		1.23 ± 0.818	0.659		J	HASL-300
	Americium-241	S-45	0.0988 ± 0.0641	0.0989	U	BD	HASL-300
	Cesium-137		0.0134 ± 0.0198	0.0193	U	BD	HASL-300
	Uranium-235		0.0586 ± 0.0931	0.106	U	BD	HASL-300
	Uranium-238		1.69 ± 0.779	0.657		J	HASL-300
	Americium-241	S-46	0.0264 ± 0.031	0.0486	U	BD	HASL-300
	Cesium-137		0.0375 ± 0.0239	0.0289		J	HASL-300
	Uranium-235		0.0244 ± 0.13	0.136	U	BD	HASL-300
	Uranium-238		1.4 ± 0.737	0.475		J	HASL-300
	Americium-241	S-47	0.0895 ± 0.0902	0.133	U	BD	HASL-300
	Cesium-137		0.109 ± 0.0228	0.019		NONE	HASL-300
	Uranium-235		0.077 ± 0.101	0.114	U	BD	HASL-300

See notes at end of appendix.

Table A-5. Radiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Americium-241	S-02	0.12 ± 0.122	0.143	U	BD	HASL-300
	Cesium-137		0.173 ± 0.0257	0.0213		None	HASL-300
	Uranium-235		0.0136 ± 0.106	0.117	U	BD	HASL-300
	Uranium-238		1.29 ± 1.17	1.12		J	HASL-300
	Americium-241	S-03	0.336 ± 0.107	0.122		J	HASL-300
	Cesium-137		0.42 ± 0.0394	0.023		None	HASL-300
	Plutonium-238		0.137 ± 0.158	0.226	U	BD	HASL-300
	Plutonium-239/240		2.84 ± 0.559	0.362		None	HASL-300
	Uranium-235		0.0874 ± 0.0846	0.137	U	BD	HASL-300
	Uranium-238		1.33 ± 0.881	1.03		J	HASL-300
	Americium-241	S-04	0.0225 ± 0.0311	0.0446	U	BD	HASL-300
	Cesium-137		0.283 ± 0.0428	0.03		None	HASL-300
	Uranium-235		0.0787 ± 0.149	0.145	U	BD	HASL-300
	Uranium-238		1.47 ± 0.693	0.461		None	HASL-300
	Americium-241	S-09	1.11 ± 0.178	0.162		None	HASL-300
	Cesium-137		0.218 ± 0.0288	0.0221		None	HASL-300
	Plutonium-238		0.412 ± 0.195	0.196		J	HASL-300
	Plutonium-239/240		5.02 ± 0.81	0.314		None	HASL-300
	Uranium-235		0.102 ± 0.128	0.124	U	BD	HASL-300
	Uranium-238		1.37 ± 1.09	1.19		J	HASL-300
	Americium-241	S-10	0.0254 ± 0.0244	0.0313	U	BD	HASL-300
	Cesium-137		0.0703 ± 0.0211	0.021		None	HASL-300
	Uranium-235		0.0087 ± 0.0764	0.107	U	BD	HASL-300
	Uranium-238		1.09 ± 0.438	0.331		None	HASL-300
	Americium-241	S-38	0.058 ± 0.0618	0.0968	U	BD	HASL-300
	Cesium-137		0.198 ± 0.0215	0.0161		None	HASL-300
	Uranium-235		0.0659 ± 0.0966	0.0992	U	BD	HASL-300
	Uranium-238		2.06 ± 0.994	0.749		J	HASL-300
	Americium-241	S-39	0.057 ± 0.0604	0.0642	U	BD	HASL-300
	Cesium-137		0.251 ± 0.0267	0.0182		None	HASL-300
	Uranium-235		0.135 ± 0.0966	0.109		J	HASL-300
	Uranium-238		1.87 ± 0.784	0.591		None	HASL-300

See notes at end of appendix.

Table A-5. Radiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Activity (pCi/g)	MDA (pCi/g)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Cesium-137	S-53	0.259 ± 0.0304	0.0193		None	HASL-300
	Plutonium-238		0.00069 ± 0.00303	0.00779	U	BD	HASL-300
	Plutonium-239/240		0.0193 ± 0.00845	0.0125		J	HASL-300
	Uranium-235		0.0661 ± 0.0908	0.0985	U	BD	HASL-300
	Uranium-238		1.67 ± 0.49	0.298		None	HASL-300

See notes at end of appendix.

Table A-6. TLD measurements by quarter and location class, calendar year 2014

Location Classification	Location Number	1st Quarter (90 Days)		2nd Quarter (92 Days)		3rd Quarter (86 Days)		4th Quarter (97 Days)	
		Exposure (mR)	Error	Exposure (mR)	Error	Exposure (mR)	Error	Exposure (mR)	Error
On-Site	S-01	53.4	1.2	39.9	5.7	33.4	2.5	50.0	3.4
	S-02	52.4	2.2	37.3	0.9	33.9	2.2	44.7	0.8
	S-03	52.5	1.9	36.8	0.9	33.7	0.9	45.3	3.4
	S-04	52.2	0.9	37.3	1.7	33.6	1.2	45.8	1.1
	S-09	48.5	1.6	34.5	1.1	38.9	9.0	42.0	1.4
	S-10	51.2	1.1	37.7	0.8	43.0	2.5	45.2	0.7
	S-13	49.9	1.6	36.3	1.0	32.2	1.8	43.0	1.5
	S-14	47.8	1.1	35.8	5.1	30.7	1.7	40.1	1.1
	S-15	52.0	1.6	36.2	0.9	34.6	1.1	43.9	0.8
	S-16	52.1	2.9	37.0	0.9	33.2	0.9	45.0	1.7
Perimeter	S-17	50.5	1.6	36.3	1.3	33.8	0.9	45.2	2.3
	P-05	52.4	1.0	37.1	1.3	35.9	2.3	44.5	0.9
	P-06	50.5	1.0	36.0	1.6	33.3	3.1	44.0	0.7
	P-07	50.3	1.7	33.7	0.9	30.9	1.1	41.5	0.7
	P-08	47.5	1.0	33.2	0.9	29.8	1.1	40.0	0.7
	P-11	58.2	0.9	43.6	0.8	44.0	8.7	52.5	1.3
Community	P-12	52.6	1.4	38.8	1.1	46.1	4.7	41.6	1.5
	C-19	41.7	0.9	28.3	1.3	25.9	1.4	33.7	2.2
	C-21	50.2	1.1	36.7	1.4	33.1	1.4	45.2	0.7
	C-22	55.8	6.3	33.9	0.8	30.9	1.1	42.5	0.7

See notes at end of appendix.

Table A-7. Nonradiological results for South Plume Area soil sampling locations at SNL/TTR, calendar year 2014

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Aluminum	S-48	14300	13.6	45.4		J	SW846 3050B/6020
	Antimony		0.312	0.312	0.945	NU	UJ	SW846 3050B/6010B
	Arsenic		2.75	0.181	0.907		None	SW846 3050B/6020
	Barium		240	0.454	1.81		J	SW846 3050B/6020
	Beryllium		0.585	0.0181	0.0907		None	SW846 3050B/6020
	Cadmium		0.26	0.0181	0.181		None	SW846 3050B/6020
	Calcium		5570	5.99	18.1	*	J	SW846 3050B/6020
	Chromium		6.86	0.181	0.544	B	None	SW846 3050B/6020
	Cobalt		3.76	0.0544	0.181	*	None	SW846 3050B/6020
	Copper		7.68	0.0599	0.181		None	SW846 3050B/6020
	Iron		12100	59.9	181	*	J	SW846 3050B/6020
	Lead		10.5	0.0907	0.363		None	SW846 3050B/6020
	Magnesium		4390	1.81	5.44		None	SW846 3050B/6020
	Manganese		443	0.907	4.54	*	J	SW846 3050B/6020
	Nickel		6.05	0.0907	0.363		None	SW846 3050B/6020
	Potassium		4900	14.5	54.4		None	SW846 3050B/6020
	Selenium		0.299	0.299	0.907	U	None	SW846 3050B/6020
	Silver		0.377	0.0945	0.473	J	None	SW846 3050B/6010B
	Sodium		631	14.5	45.4		None	SW846 3050B/6020
	Thallium		0.155	0.0544	0.363	JB	0.54U	SW846 3050B/6020
	Vanadium		32.7	0.0945	0.473		None	SW846 3050B/6010B
	Zinc		38.4	0.363	1.81	BN	J+	SW846 3050B/6020
	Aluminum	S-49	13600	13.3	44.5		J	SW846 3050B/6020
	Antimony		0.556	0.314	0.952	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		2.75	0.178	0.89		None	SW846 3050B/6020
	Barium		245	0.445	1.78		J	SW846 3050B/6020
	Beryllium		0.583	0.0178	0.089		None	SW846 3050B/6020
	Cadmium		0.269	0.0178	0.178		None	SW846 3050B/6020
	Calcium		5170	5.87	17.8	*	J	SW846 3050B/6020
	Chromium		5.94	0.178	0.534	B	None	SW846 3050B/6020
	Cobalt		3.46	0.0534	0.178	*	None	SW846 3050B/6020
	Copper		7.19	0.0587	0.178		None	SW846 3050B/6020

See notes at end of appendix.

Table A-7. Nonradiological results for South Plume Area soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Iron	S-49	11000	58.7	178	*	J	SW846 3050B/6020
	Lead		10.8	0.089	0.356		None	SW846 3050B/6020
	Magnesium		4310	1.78	5.34		None	SW846 3050B/6020
	Manganese		493	0.89	4.45	*	J	SW846 3050B/6020
	Nickel		5.7	0.089	0.356		None	SW846 3050B/6020
	Potassium		5380	14.2	53.4		None	SW846 3050B/6020
	Selenium		0.294	0.294	0.89	U	None	SW846 3050B/6020
	Silver		0.201	0.0952	0.476	J	None	SW846 3050B/6010B
	Sodium		565	14.2	44.5		None	SW846 3050B/6020
	Thallium		0.16	0.0534	0.356	JB	0.54U	SW846 3050B/6020
	Vanadium		16.8	0.0952	0.476		None	SW846 3050B/6010B
	Zinc		38	0.356	1.78	BN	J+	SW846 3050B/6020
	Aluminum	S-50	11900	13.8	46		J	SW846 3050B/6020
	Antimony		0.283	0.283	0.858	NU	UJ	SW846 3050B/6010B
	Arsenic		2.53	0.184	0.919		None	SW846 3050B/6020
	Barium		198	0.46	1.84		J	SW846 3050B/6020
	Beryllium		0.543	0.0184	0.0919		None	SW846 3050B/6020
	Cadmium		0.244	0.0184	0.184		None	SW846 3050B/6020
	Calcium		3960	6.07	18.4	*	J	SW846 3050B/6020
	Chromium		6.47	0.184	0.551	B	None	SW846 3050B/6020
	Cobalt		3.65	0.0551	0.184	*	None	SW846 3050B/6020
	Copper		7.01	0.0607	0.184		None	SW846 3050B/6020
	Iron		10900	60.7	184	*	J	SW846 3050B/6020
	Lead		11.4	0.0919	0.368		None	SW846 3050B/6020
	Magnesium		3950	1.84	5.51		None	SW846 3050B/6020
	Manganese		436	0.919	4.6	*	J	SW846 3050B/6020
	Nickel		5.73	0.0919	0.368		None	SW846 3050B/6020
	Potassium		4640	14.7	55.1		None	SW846 3050B/6020
	Selenium		0.303	0.303	0.919	U	None	SW846 3050B/6020
	Silver		0.232	0.0858	0.429	J	None	SW846 3050B/6010B
	Sodium		542	14.7	46		None	SW846 3050B/6020
	Thallium		0.141	0.0551	0.368	JB	0.54U	SW846 3050B/6020
	Vanadium		23.2	0.0858	0.429		None	SW846 3050B/6010B
	Zinc		36.4	0.368	1.84	BN	J+	SW846 3050B/6020

See notes at end of appendix.

Table A-7. Nonradiological results for South Plume Area soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Aluminum	S-51	12900	12.7	42.2		J	SW846 3050B/6020
	Antimony		0.315	0.315	0.954	NU	UJ	SW846 3050B/6010B
	Arsenic		3.92	0.169	0.845		None	SW846 3050B/6020
	Barium		211	0.422	1.69		J	SW846 3050B/6020
	Beryllium		0.628	0.0169	0.0845		None	SW846 3050B/6020
	Cadmium		0.303	0.0169	0.169		None	SW846 3050B/6020
	Calcium		6580	5.57	16.9	*	J	SW846 3050B/6020
	Chromium		7.52	0.169	0.507	B	None	SW846 3050B/6020
	Cobalt		4.47	0.0507	0.169	*	None	SW846 3050B/6020
	Copper		8.74	0.0557	0.169		None	SW846 3050B/6020
	Iron		11800	55.7	169	*	J	SW846 3050B/6020
	Lead		12.2	0.0845	0.338		None	SW846 3050B/6020
	Magnesium		4630	1.69	5.07		None	SW846 3050B/6020
	Manganese		584	0.845	4.22	*	J	SW846 3050B/6020
	Nickel		7.14	0.0845	0.338		None	SW846 3050B/6020
	Potassium		4580	13.5	50.7		None	SW846 3050B/6020
	Selenium		0.279	0.279	0.845	U	None	SW846 3050B/6020
	Silver		0.211	0.0954	0.477	J	None	SW846 3050B/6010B
	Sodium		598	13.5	42.2		None	SW846 3050B/6020
	Thallium		0.161	0.0507	0.338	JB	0.54U	SW846 3050B/6020
	Vanadium		24.4	0.0954	0.477		None	SW846 3050B/6010B
	Zinc		40.7	0.338	1.69	BN	J+	SW846 3050B/6020
	Aluminum	S-52	6450	2.87	9.56		J	SW846 3050B/6020
	Antimony		0.474	0.304	0.921	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		3.04	0.191	0.956		None	SW846 3050B/6020
	Barium		101	0.0956	0.382		J	SW846 3050B/6020
	Beryllium		0.363	0.0191	0.0956		None	SW846 3050B/6020
	Cadmium		0.149	0.0191	0.191	J	None	SW846 3050B/6020
	Calcium		2070	6.31	19.1	*	J	SW846 3050B/6020
	Chromium		3.23	0.191	0.574	B	None	SW846 3050B/6020
	Cobalt		2.18	0.0574	0.191	*	None	SW846 3050B/6020
	Copper		3.74	0.0631	0.191		None	SW846 3050B/6020
	Iron		6160	63.1	191	*	J	SW846 3050B/6020
	Lead		7.18	0.0956	0.382		None	SW846 3050B/6020

See notes at end of appendix.

Table A-7. Nonradiological results for South Plume Area soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Magnesium	S-52	2010	1.91	5.74		None	SW846 3050B/6020
	Manganese		302	0.956	4.78	*	J	SW846 3050B/6020
	Nickel		2.93	0.0956	0.382		None	SW846 3050B/6020
	Potassium		2400	15.3	57.4		None	SW846 3050B/6020
	Selenium		0.315	0.315	0.956	U	None	SW846 3050B/6020
	Silver		0.122	0.0921	0.46	J	None	SW846 3050B/6010B
	Sodium		221	15.3	47.8		None	SW846 3050B/6020
	Thallium		0.0834	0.0574	0.382	JB	0.54U	SW846 3050B/6020
	Vanadium		10.9	0.0921	0.46		None	SW846 3050B/6010B
	Zinc		20.8	0.382	1.91	BN	J+	SW846 3050B/6020

See notes at end of appendix.

Table A-8. Nonradiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Aluminum	S-02	8920	2.92	9.73		J	SW846 3050B/6020
	Antimony		0.567	0.327	0.992	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		3.36	0.195	0.973		None	SW846 3050B/6020
	Barium		94.3	0.0973	0.389		J	SW846 3050B/6020
	Beryllium		0.533	0.0195	0.0973		None	SW846 3050B/6020
	Cadmium		0.124	0.0195	0.195	J	None	SW846 3050B/6020
	Calcium		3020	6.42	19.5	*	J	SW846 3050B/6020
	Chromium		4.14	0.195	0.584	B	None	SW846 3050B/6020
	Cobalt		2.36	0.0584	0.195	*	None	SW846 3050B/6020
	Copper		3.96	0.0642	0.195		None	SW846 3050B/6020
	Iron		7410	64.2	195	*	J	SW846 3050B/6020
	Lead		8.16	0.0973	0.389		None	SW846 3050B/6020
	Magnesium		2420	1.95	5.84		None	SW846 3050B/6020
	Manganese		233	0.973	4.86	*	J	SW846 3050B/6020
	Nickel		4.05	0.0973	0.389		None	SW846 3050B/6020
	Potassium		3170	15.6	58.4		None	SW846 3050B/6020
	Selenium		0.321	0.321	0.973	U	None	SW846 3050B/6020
	Silver		0.106	0.0992	0.496	J	None	SW846 3050B/6010B
	Sodium		472	15.6	48.6		None	SW846 3050B/6020
	Thallium		0.132	0.0584	0.389	JB	0.54U	SW846 3050B/6020
	Vanadium		12.6	0.0992	0.496		None	SW846 3050B/6010B
	Zinc		28.2	0.389	1.95	BN	J+	SW846 3050B/6020
	Aluminum	S-03	11800	14.8	49.4		J	SW846 3050B/6020
	Antimony		0.692	0.324	0.98	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		3.15	0.198	0.988		None	SW846 3050B/6020
	Barium		111	0.0988	0.395		J	SW846 3050B/6020
	Beryllium		0.618	0.0198	0.0988		None	SW846 3050B/6020
	Cadmium		0.181	0.0198	0.198	J	None	SW846 3050B/6020
	Calcium		2510	6.52	19.8	*	J	SW846 3050B/6020
	Chromium		5.86	0.198	0.593	B	None	SW846 3050B/6020
	Cobalt		3.04	0.0593	0.198	*	None	SW846 3050B/6020
	Copper		5.79	0.0652	0.198		None	SW846 3050B/6020
	Iron		9960	65.2	198	*	J	SW846 3050B/6020

See notes at end of appendix.

Table A-8. Nonradiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Lead	S-03	9.43	0.0988	0.395		None	SW846 3050B/6020
	Magnesium		3430	1.98	5.93		None	SW846 3050B/6020
	Manganese		354	0.988	4.94	*	J	SW846 3050B/6020
	Nickel		4.84	0.0988	0.395		None	SW846 3050B/6020
	Potassium		3320	15.8	59.3		None	SW846 3050B/6020
	Selenium		0.326	0.326	0.988	U	None	SW846 3050B/6020
	Silver		0.239	0.098	0.49	J	None	SW846 3050B/6010B
	Sodium		221	15.8	49.4		None	SW846 3050B/6020
	Thallium		0.163	0.0593	0.395	JB	0.54U	SW846 3050B/6020
	Vanadium		18.9	0.098	0.49		None	SW846 3050B/6010B
	Zinc		31.7	0.395	1.98	BN	J+	SW846 3050B/6020
	Aluminum	S-04	9250	2.8	9.35		J	SW846 3050B/6020
	Antimony		0.842	0.31	0.938	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		3.25	0.187	0.935		None	SW846 3050B/6020
	Barium		113	0.0935	0.374		J	SW846 3050B/6020
	Beryllium		0.547	0.0187	0.0935		None	SW846 3050B/6020
	Cadmium		0.246	0.0187	0.187		None	SW846 3050B/6020
	Calcium		3050	6.17	18.7	*	J	SW846 3050B/6020
	Chromium		4.89	0.187	0.561	B	None	SW846 3050B/6020
	Cobalt		2.63	0.0561	0.187	*	None	SW846 3050B/6020
	Copper		6.13	0.0617	0.187		None	SW846 3050B/6020
	Iron		9100	61.7	187	*	J	SW846 3050B/6020
	Lead		7.34	0.0935	0.374		None	SW846 3050B/6020
	Magnesium		3280	1.87	5.61		None	SW846 3050B/6020
	Manganese		410	0.935	4.67	*	J	SW846 3050B/6020
	Nickel		4.39	0.0935	0.374		None	SW846 3050B/6020
	Potassium		3550	15	56.1		None	SW846 3050B/6020
	Selenium		0.308	0.308	0.935	U	None	SW846 3050B/6020
	Silver		0.205	0.0938	0.469	J	None	SW846 3050B/6010B
	Sodium		598	15	46.7		None	SW846 3050B/6020
	Thallium		0.112	0.0561	0.374	JB	0.54U	SW846 3050B/6020
	Vanadium		15.3	0.0938	0.469		None	SW846 3050B/6010B
	Zinc		32.3	0.374	1.87	BN	J+	SW846 3050B/6020

See notes at end of appendix.

Table A-8. Nonradiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Aluminum	S-09	16800	14.9	49.5		J	SW846 3050B/6020
	Antimony		0.72	0.31	0.938	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		4.11	0.198	0.99		None	SW846 3050B/6020
	Barium		166	0.099	0.396		J	SW846 3050B/6020
	Beryllium		0.897	0.0198	0.099		None	SW846 3050B/6020
	Cadmium		0.215	0.0198	0.198		None	SW846 3050B/6020
	Calcium		8590	6.53	19.8	*	J	SW846 3050B/6020
	Chromium		9.32	0.198	0.594	B	None	SW846 3050B/6020
	Cobalt		6.18	0.0594	0.198	*	None	SW846 3050B/6020
	Copper		9.66	0.0653	0.198		None	SW846 3050B/6020
	Iron		17100	65.3	198	*	J	SW846 3050B/6020
	Lead		12.7	0.099	0.396		None	SW846 3050B/6020
	Magnesium		6280	1.98	5.94		None	SW846 3050B/6020
	Manganese		421	0.99	4.95	*	J	SW846 3050B/6020
	Nickel		8.17	0.099	0.396		J-	SW846 3050B/6020
	Potassium		5240	15.8	59.4		None	SW846 3050B/6020
	Selenium		0.327	0.327	0.99	U	None	SW846 3050B/6020
	Silver		0.36	0.0938	0.469	J	None	SW846 3050B/6010B
	Sodium		315	15.8	49.5		None	SW846 3050B/6020
	Thallium		0.24	0.0594	0.396	JB	0.54U	SW846 3050B/6020
	Vanadium		29.2	0.0938	0.469		None	SW846 3050B/6010B
	Zinc		51.4	0.396	1.98	BN	J+	SW846 3050B/6020
	Aluminum	S-10	7930	2.76	9.21		J	SW846 3050B/6020
	Antimony		0.704	0.288	0.874	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		3.94	0.184	0.921		None	SW846 3050B/6020
	Barium		117	0.0921	0.368		J	SW846 3050B/6020
	Beryllium		0.5	0.0184	0.0921		None	SW846 3050B/6020
	Cadmium		0.18	0.0184	0.184	J	None	SW846 3050B/6020
	Calcium		4010	6.08	18.4	*	J	SW846 3050B/6020
	Chromium		4.2	0.184	0.552	B	None	SW846 3050B/6020
	Cobalt		4.54	0.0552	0.184	*	None	SW846 3050B/6020
	Copper		4.68	0.0608	0.184		None	SW846 3050B/6020
	Iron		7700	60.8	184	*	J	SW846 3050B/6020
	Lead		6.67	0.0921	0.368		None	SW846 3050B/6020

See notes at end of appendix.

Table A-8. Nonradiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Magnesium	S-10	2810	1.84	5.52		None	SW846 3050B/6020
	Manganese		444	0.921	4.6	*	J	SW846 3050B/6020
	Nickel		3.87	0.0921	0.368		None	SW846 3050B/6020
	Potassium		2750	14.7	55.2		None	SW846 3050B/6020
	Selenium		0.304	0.304	0.921	U	None	SW846 3050B/6020
	Silver		0.105	0.0874	0.437	J	None	SW846 3050B/6010B
	Sodium		342	14.7	46		None	SW846 3050B/6020
	Thallium		0.0991	0.0552	0.368	JB	0.54U	SW846 3050B/6020
	Vanadium		14.7	0.0874	0.437		None	SW846 3050B/6010B
	Zinc		34.3	0.368	1.84	BN	J+	SW846 3050B/6020
	Aluminum	S-38	12100	12.8	42.7		J	SW846 3050B/6020
	Antimony		0.297	0.297	0.901	NU	UJ	SW846 3050B/6010B
	Arsenic		4.45	0.171	0.855		None	SW846 3050B/6020
	Barium		109	0.0855	0.342		J	SW846 3050B/6020
	Beryllium		0.628	0.0171	0.0855		None	SW846 3050B/6020
	Cadmium		0.189	0.0171	0.171		None	SW846 3050B/6020
	Calcium		14000	28.2	85.5	*	J	SW846 3050B/6020
	Chromium		6.3	0.171	0.513	B	None	SW846 3050B/6020
	Cobalt		2.93	0.0513	0.171	*	None	SW846 3050B/6020
	Copper		5.72	0.0564	0.171		None	SW846 3050B/6020
	Iron		9800	56.4	171	*	J	SW846 3050B/6020
	Lead		8.64	0.0855	0.342		None	SW846 3050B/6020
	Magnesium		3910	1.71	5.13		None	SW846 3050B/6020
	Manganese		253	0.855	4.27	*	J	SW846 3050B/6020
	Nickel		5.41	0.0855	0.342		None	SW846 3050B/6020
	Potassium		3530	13.7	51.3		None	SW846 3050B/6020
	Selenium		0.282	0.282	0.855	U	None	SW846 3050B/6020
	Silver		0.154	0.0901	0.45	J	None	SW846 3050B/6010B
	Sodium		412	13.7	42.7		None	SW846 3050B/6020
	Thallium		0.141	0.0513	0.342	JB	0.54U	SW846 3050B/6020
	Vanadium		18.4	0.0901	0.45		None	SW846 3050B/6010B
	Zinc		30.2	0.342	1.71	BN	J+	SW846 3050B/6020

See notes at end of appendix.

Table A-8. Nonradiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Aluminum	S-39	14200	13.8	46		J	SW846 3050B/6020
	Antimony		0.326	0.326	0.988	NU	UJ	SW846 3050B/6010B
	Arsenic		5.98	0.184	0.919		None	SW846 3050B/6020
	Barium		147	0.0919	0.368		J	SW846 3050B/6020
	Beryllium		0.704	0.0184	0.0919		None	SW846 3050B/6020
	Cadmium		0.278	0.0184	0.184		None	SW846 3050B/6020
	Calcium		5770	6.07	18.4	*	J	SW846 3050B/6020
	Chromium		8.88	0.184	0.551	B	None	SW846 3050B/6020
	Cobalt		4.32	0.0551	0.184	*	None	SW846 3050B/6020
	Copper		9.24	0.0607	0.184		None	SW846 3050B/6020
	Iron		15000	60.7	184	*	J	SW846 3050B/6020
	Lead		11.2	0.0919	0.368		None	SW846 3050B/6020
	Magnesium		4620	1.84	5.51		None	SW846 3050B/6020
	Manganese		614	0.919	4.6	*	J	SW846 3050B/6020
	Nickel		7.55	0.0919	0.368		None	SW846 3050B/6020
	Potassium		3930	14.7	55.1		None	SW846 3050B/6020
	Selenium		0.303	0.303	0.919	U	None	SW846 3050B/6020
	Silver		0.206	0.0988	0.494	J	None	SW846 3050B/6010B
	Sodium		433	14.7	46		None	SW846 3050B/6020
	Thallium		0.184	0.0551	0.368	JB	0.54U	SW846 3050B/6020
	Vanadium		29.8	0.0988	0.494		None	SW846 3050B/6010B
	Zinc		46	0.368	1.84	BN	J+	SW846 3050B/6020
	Aluminum	S-53	3690	2.94	9.78		J	SW846 3050B/6020
	Antimony		0.871	0.322	0.977	JB	3.8UJ	SW846 3050B/6010B
	Arsenic		2.26	0.196	0.978		None	SW846 3050B/6020
	Barium		207	0.489	1.96		J	SW846 3050B/6020
	Beryllium		0.249	0.0196	0.0978		None	SW846 3050B/6020
	Cadmium		0.134	0.0196	0.196	J	None	SW846 3050B/6020
	Calcium		8730	6.46	19.6	*	J	SW846 3050B/6020
	Chromium		2.16	0.196	0.587	B	None	SW846 3050B/6020
	Cobalt		1.14	0.0587	0.196	*	None	SW846 3050B/6020
	Copper		2.6	0.0646	0.196		None	SW846 3050B/6020
	Iron		3850	32.3	97.8	*	J	SW846 3050B/6020
	Lead		3.55	0.0978	0.391		None	SW846 3050B/6020

See notes at end of appendix.

Table A-8. Nonradiological results for various on-site soil sampling locations at SNL/TTR, calendar year 2014 (continued)

Location Classification	Analyte	Location	Result (mg/kg)	MDL (mg/kg)	PQL (mg/kg)	Laboratory Data Qualifiers	Data Validation Qualifiers	Analytical Method
On-Site	Magnesium	S-53	1510	1.96	5.87		None	SW846 3050B/6020
	Manganese		144	0.196	0.978	*	J	SW846 3050B/6020
	Nickel		1.67	0.0978	0.391		None	SW846 3050B/6020
	Potassium		2110	15.7	58.7		None	SW846 3050B/6020
	Selenium		0.323	0.323	0.978	U	None	SW846 3050B/6020
	Silver		0.0977	0.0977	0.488	U	None	SW846 3050B/6010B
	Sodium		442	15.7	48.9		None	SW846 3050B/6020
	Thallium		0.0693	0.0587	0.391	JB	0.54U	SW846 3050B/6020
	Vanadium		9.93	0.0977	0.488		None	SW846 3050B/6010B
	Zinc		12.4	0.391	1.96	BN	J+	SW846 3050B/6020

See notes at end of appendix.

NOTES

Units

mg/kg = milligrams per kilogram

mR = milliroentgen

pCi/g = picocuries per gram

MDA or MDL

MDA = minimal detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level

MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix specific

PQL

PQL = practical quantitation limit; the lowest concentration of analytes in a sample that can be determined reliably within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions

Laboratory Data Qualifier

B = analyte detected in the blank

J = estimated value, the analyte concentration fell above the effective MDL and below the effective practical quantitation limit

N = a spike was outside limits

U = analyte is absent or below the method detection limit

* = a replicate was outside limits

Data Validation Qualifier

BD = below detection limit as used in radiochemistry to identify results that are not statistically different from zero

J = associated value is an estimated quantity

J+ = The associated numerical value is an estimated quantity with a suspected positive base

None = no data validation for corrected gross alpha activity

U = The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit

UJ = The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise

Analytical Method

DOE (U.S. Department of Energy) Environmental Measurements Laboratory. 1997. *The Procedures Manual of the Environmental Measurements Laboratory*, HASL-300, 28th ed., vol. 1. New York, NY: DOE.

EPA (U.S. Environmental Protection Agency). 1986 (and updates). *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed. Washington, D.C.: EPA.



Appendix B

2014 SNL/TTR Wastewater Sampling Results

Table B-1. Summary of inorganic analyses for sanitary outfalls, June 2014	B-2
Table B-2. Summary of radiological analyses for sanitary outfalls, June 2014.....	B-3
Table B-3. Summary of semivolatile organic compound results for sanitary outfalls, June 2014	B-4
Table B-4. Summary of volatile organic compound results for sanitary outfalls, June 2014.....	B-7
NOTES	B-9

Appendix B presents the SNL/TTR wastewater sampling results for calendar year 2014.

Table B-1. Summary of inorganic analyses for sanitary outfalls, June 2014

Station	Date Collected	Sample Identifier	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers	Analytical Method
SNL/TTR	4-Jun-2014	095927-001	Aluminum	1.44	0.068		SW846 3010/6010B
		095927-001	Arsenic		0.005	U	SW846 3010/6010B
		095927-001	Boron	0.544	0.015		SW846 3010/6010B
		095927-001	Cadmium	0.00103	0.001	J	SW846 3010/6010B
		095927-001	Chromium	0.0024	0.001	J	SW846 3010/6010B
		095927-001	Copper	0.119	0.003		SW846 3010/6010B
		095927-001	Lead	0.00492	0.0033	J	SW846 3010/6010B
		095927-001	Mercury		0.000067	U	SW846 7470A
		095927-001	Molybdenum	0.00693	0.002	J	SW846 3010/6010B
		095927-001	Nickel	0.00539	0.0015		SW846 3010/6010B
		095927-001	Selenium		0.006	U	SW846 3010/6010B
		095927-001	Silver		0.001	U	SW846 3010/6010B
		095927-001	Zinc	0.148	0.0033		SW846 3010/6010B
		095927-002	Cyanide, total	0.00611	0.00167		SW846 9012B
		095927-003	Solids, total suspended	124	8.14		SM 2540D
		095927-007	Phenols, Total	0.0436	0.00167		SW846 9066
		095927-008	Grease and oil	6.64	1.16		EPA 1664A/1664B
		095927-009	Grease and oil	5.17	1.17		EPA 1664A/1664B
		095927-009	Petroleum hydrocarbon, total	2.58	1.17	JN	EPA 1664A/1664B
		095927-013	Chemical oxygen demand	344	6.67	B	EPA 410.4

See notes at end of appendix.

Table B-2. Summary of radiological analyses for sanitary outfalls, June 2014

Station	Date Collected	Sample Identifier	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers	Analytical Method
SNL/TTR	4-Jun-2014	095927-010	Actinium-228	-6.84 ± 11.6	13.3	U	EPA 901.1
		095927-010	Americium-241	-2.5 ± 7.69	11.9	U	EPA 901.1
		095927-010	Beryllium-7	8.76 ± 14.4	24.4	U	EPA 901.1
		095927-010	Bismuth-212	12.2 ± 23.6	40.6	U	EPA 901.1
		095927-010	Bismuth-214	15.8 ± 8.29	5.81		EPA 901.1
		095927-010	Cesium-137	-1.54 ± 3.63	3.79	U	EPA 901.1
		095927-010	Cobalt-60	1.5 ± 2	3.15	U	EPA 901.1
		095927-010	Lead-212	4.13 ± 5.33	4.84	U	EPA 901.1
		095927-010	Lead-214	22.2 ± 8.22	8.83		EPA 901.1
		095927-010	Neptunium-237	-0.129 ± 3.15	5.51	U	EPA 901.1
		095927-010	Potassium-40	21.5 ± 35.6	29.2	U	EPA 901.1
		095927-010	Radium-223	-15.5 ± 31.8	53.2	U	EPA 901.1
		095927-010	Radium-224	8.25 ± 37	50.2	U	EPA 901.1
		095927-010	Radium-226	-36.9 ± 70.8	71.5	U	EPA 901.1
		095927-010	Radium-228	-6.84 ± 11.6	13.3	U	EPA 901.1
		095927-010	Sodium-22	0.0129 ± 1.73	3.11	U	EPA 901.1
		095927-010	Thorium-227	6.65 ± 12.5	21.7	U	EPA 901.1
		095927-010	Thorium-231	18.7 ± 34.3	32.8	U	EPA 901.1
		095927-010	Thorium-234	26.7 ± 101	125	U	EPA 901.1
		095927-010	Uranium-235	7.08 ± 17.1	17.2	U	EPA 901.1
		095927-010	Uranium-238	26.7 ± 101	125	U	EPA 901.1
		095927-011	Alpha, gross	2.15 ± 1.91	3.09	U	EPA 900.0/SW846 9310
		095927-011	Beta, gross	30.5 ± 5.32	1.58		EPA 900.0/SW846 9310
		095927-012	Tritium	79.4 ± 95.9	159	U	EPA 906.0 Modified

See notes at end of appendix.

Table B-3. Summary of semivolatile organic compound results for sanitary outfalls, June 2014

Station	Date Collected	Sample Identifier	Analyte	Result (µg/L)	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
SNL/TTR	4-Jun-2014	095927-006	1,1'-Biphenyl		3	U	SW846 3510C/8270D
		095927-006	Acenaphthene		0.3	U	SW846 3510C/8270D
		095927-006	Acenaphthylene		0.3	U	SW846 3510C/8270D
		095927-006	Acetophenone		3	U	SW846 3510C/8270D
		095927-006	Anthracene		0.3	U	SW846 3510C/8270D
		095927-006	Atrazine		3	U	SW846 3510C/8270D
		095927-006	Benzaldehyde		3	U	SW846 3510C/8270D
		095927-006	Benzo(a)anthracene		0.3	U	SW846 3510C/8270D
		095927-006	Benzo(a)pyrene		0.3	U	SW846 3510C/8270D
		095927-006	Benzo(b)fluoranthene		0.3	U	SW846 3510C/8270D
		095927-006	Benzo(ghi)perylene		0.3	U	SW846 3510C/8270D
		095927-006	Benzo(k)fluoranthene		0.3	U	SW846 3510C/8270D
		095927-006	Bromophenyl phenyl ether, 4-		3	U	SW846 3510C/8270D
		095927-006	Butylbenzyl phthalate		3	U	SW846 3510C/8270D
		095927-006	Caprolactam		3	U	SW846 3510C/8270D
		095927-006	Carbazole		0.3	U	SW846 3510C/8270D
		095927-006	Chloro-3-methylphenol, 4-		3	U	SW846 3510C/8270D
		095927-006	Chlorobenzenamine, 4-		3.3	U	SW846 3510C/8270D
		095927-006	Chloroethoxy)methane, bis(2-		3	U	SW846 3510C/8270D
		095927-006	Chloroethyl)ether, bis(2-		3	U	SW846 3510C/8270D
		095927-006	Chloroisopropyl ether, bis-		3	U	SW846 3510C/8270D
		095927-006	Chloronaphthalene, 2-		0.41	U	SW846 3510C/8270D
		095927-006	Chlorophenol, 2-		3	U	SW846 3510C/8270D
		095927-006	Chlorophenyl phenyl ether, 4-		3	U	SW846 3510C/8270D
		095927-006	Chrysene		0.3	U	SW846 3510C/8270D
		095927-006	Cresol, m,p-		3.7	U	SW846 3510C/8270D
		095927-006	Cresol, o-		3	U	SW846 3510C/8270D
		095927-006	Di-n-butyl phthalate		3	U	SW846 3510C/8270D
		095927-006	Di-n-octyl phthalate		3	U	SW846 3510C/8270D
		095927-006	Dibenz[a,h]anthracene		0.3	U	SW846 3510C/8270D
		095927-006	Dibenzofuran		3	U	SW846 3510C/8270D

See notes at end of appendix.

Table B-3. Summary of semivolatile organic compound results for sanitary outfalls, June 2014 (continued)

Station	Date Collected	Sample Identifier	Analyte	Result (µg/L)	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
SNL/TTR	4-Jun-2014	095927-006	Dichlorobenzidine, 3,3'-		3	NU	SW846 3510C/8270D
		095927-006	Dichlorophenol, 2,4-		3	U	SW846 3510C/8270D
		095927-006	Diethylphthalate		3	U	SW846 3510C/8270D
		095927-006	Dimethylphenol, 2,4-		3	U	SW846 3510C/8270D
		095927-006	Dimethylphthalate		3	U	SW846 3510C/8270D
		095927-006	Dinitro-o-cresol		3	U	SW846 3510C/8270D
		095927-006	Dinitrophenol, 2,4-		5	U	SW846 3510C/8270D
		095927-006	Dinitrotoluene, 2,4-		3	U	SW846 3510C/8270D
		095927-006	Dinitrotoluene, 2,6-		3	U	SW846 3510C/8270D
		095927-006	Dioxane, 1,4-		3	U	SW846 3510C/8270D
		095927-006	Diphenyl amine		3	U	SW846 3510C/8270D
		095927-006	Ethylhexyl)phthalate, bis(2-	3.79	3	J	SW846 3510C/8270D
		095927-006	Fluoranthene		0.3	U	SW846 3510C/8270D
		095927-006	Fluorene		0.3	U	SW846 3510C/8270D
		095927-006	Hexachlorobenzene		3	U	SW846 3510C/8270D
		095927-006	Hexachlorobutadiene		3	U	SW846 3510C/8270D
		095927-006	Hexachlorocyclopentadiene		3	U	SW846 3510C/8270D
		095927-006	Hexachloroethane		3	U	SW846 3510C/8270D
		095927-006	Indeno(1,2,3-c,d)pyrene		0.3	U	SW846 3510C/8270D
		095927-006	Isophorone		3.5	U	SW846 3510C/8270D
		095927-006	Methylnaphthalene, 2-	0.37	0.3	J	SW846 3510C/8270D
		095927-006	Naphthalene		0.3	U	SW846 3510C/8270D
		095927-006	Nitro-benzene		3	U	SW846 3510C/8270D
		095927-006	Nitroaniline, 2-		3	NU	SW846 3510C/8270D
		095927-006	Nitroaniline, 3-		3	U	SW846 3510C/8270D
		095927-006	Nitroaniline, 4-		3	U	SW846 3510C/8270D
		095927-006	Nitrophenol, 2-		3	U	SW846 3510C/8270D
		095927-006	Nitrophenol, 4-		3	U	SW846 3510C/8270D
		095927-006	Nitrosodipropylamine, n-		3	U	SW846 3510C/8270D
		095927-006	Pentachlorophenol		3	U	SW846 3510C/8270D
		095927-006	Phenanthrene		0.3	U	SW846 3510C/8270D
		095927-006	Phenol		3	U	SW846 3510C/8270D

See notes at end of appendix.

Table B-3. Summary of semivolatile organic compound results for sanitary outfalls, June 2014 (continued)

Station	Date Collected	Sample Identifier	Analyte	Result (µg/L)	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
SNL/TTR	4-Jun-2014	095927-006	Pyrene		0.3	U	SW846 3510C/8270D
		095927-006	Trichlorobenzene, 1,2,4-		3	U	SW846 3510C/8270D
		095927-006	Trichlorophenol, 2,4,5-		3	U	SW846 3510C/8270D
		095927-006	Trichlorophenol, 2,4,6-		3	U	SW846 3510C/8270D

See notes at end of appendix.

Table B-4. Summary of volatile organic compound results for sanitary outfalls, June 2014

Station	Date Collected	Sample Identifier	Analyte	Result (µg/L)	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
SNL/TTR	4-Jun-2014	095927-005	Acetone	10.8	2.5		SW846 8260B DOE-AL
		095927-005	Benzene		0.3	U	SW846 8260B DOE-AL
		095927-005	Bromochloromethane		0.3	U	SW846 8260B DOE-AL
		095927-005	Bromodichloromethane		0.3	U	SW846 8260B DOE-AL
		095927-005	Bromoform		0.3	U	SW846 8260B DOE-AL
		095927-005	Bromomethane		0.3	U	SW846 8260B DOE-AL
		095927-005	Butanone, 2-	2.37	2	J	SW846 8260B DOE-AL
		095927-005	Carbon disulfide		1.5	U	SW846 8260B DOE-AL
		095927-005	Carbon tetrachloride		0.3	U	SW846 8260B DOE-AL
		095927-005	Chlorobenzene		0.3	U	SW846 8260B DOE-AL
		095927-005	Chloroethane		0.3	U	SW846 8260B DOE-AL
		095927-005	Chloroform		0.3	U	SW846 8260B DOE-AL
		095927-005	Chloromethane	0.59	0.3	J	SW846 8260B DOE-AL
		095927-005	Cyclohexane		0.3	U	SW846 8260B DOE-AL
		095927-005	Dibromo-3-chloropropane, 1,2-		0.5	U	SW846 8260B DOE-AL
		095927-005	Dibromochloromethane		0.3	U	SW846 8260B DOE-AL
		095927-005	Dibromoethane, 1,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichlorobenzene, 1,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichlorobenzene, 1,3-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichlorobenzene, 1,4-	6.11	0.3		SW846 8260B DOE-AL
		095927-005	Dichlorodifluoromethane		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloroethane, 1,1-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloroethane, 1,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloroethene, 1,1-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloroethene, cis-1,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloroethene, trans-1,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloropropane, 1,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloropropene, cis-1,3-		0.3	U	SW846 8260B DOE-AL
		095927-005	Dichloropropene, trans-1,3-		0.3	U	SW846 8260B DOE-AL
		095927-005	Ethyl benzene		0.3	U	SW846 8260B DOE-AL
		095927-005	Hexanone, 2-		2.2	U	SW846 8260B DOE-AL
		095927-005	Isopropylbenzene		0.3	U	SW846 8260B DOE-AL

See notes at end of appendix.

Table B-4. Summary of volatile organic compound results for sanitary outfalls, June 2014 (continued)

Station	Date Collected	Sample Identifier	Analyte	Result (µg/L)	MDL (µg/L)	Laboratory Data Qualifiers	Analytical Method
SNL/TTR	4-Jun-2014	095927-005	Methyl Acetate		1.5	U	SW846 8260B DOE-AL
		095927-005	Methylcyclohexane		0.3	U	SW846 8260B DOE-AL
		095927-005	Methylene chloride		1.7	U	SW846 8260B DOE-AL
		095927-005	Pentanone, 4-methyl-, 2-	1.75	1.5	J	SW846 8260B DOE-AL
		095927-005	Styrene		0.3	U	SW846 8260B DOE-AL
		095927-005	Tert-butyl methyl ether		0.3	U	SW846 8260B DOE-AL
		095927-005	Tetrachloroethane, 1,1,2,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Tetrachloroethene		0.3	U	SW846 8260B DOE-AL
		095927-005	Toluene		0.3	U	SW846 8260B DOE-AL
		095927-005	Trichloro-1,2,2-trifluoroethane, 1,1,2-		1.5	U	SW846 8260B DOE-AL
		095927-005	Trichlorobenzene, 1,2,3-		0.3	U	SW846 8260B DOE-AL
		095927-005	Trichlorobenzene, 1,2,4-		0.3	U	SW846 8260B DOE-AL
		095927-005	Trichloroethane, 1,1,1-		0.3	U	SW846 8260B DOE-AL
		095927-005	Trichloroethane, 1,1,2-		0.3	U	SW846 8260B DOE-AL
		095927-005	Trichloroethene		0.3	U	SW846 8260B DOE-AL
		095927-005	Trichlorofluoromethane		0.3	U	SW846 8260B DOE-AL
		095927-005	Vinyl chloride		0.3	U	SW846 8260B DOE-AL
		095927-005	Xylene	1.22	0.3		SW846 8260B DOE-AL
		095927-005	Xylene, m- & p-	0.74	0.3	J	SW846 8260B DOE-AL
		095927-005	Xylene, o-	0.48	0.3	J	SW846 8260B DOE-AL

See notes at end of appendix.

NOTES

Units

µg/L = micrograms per liter

mg/L = milligrams per liter

pCi/L = picocuries per liter

Station

SNL/TTR = Sandia National Laboratories, Tonopah Test Range

MDA or MDL

MDA = minimal detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level

MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix specific

Laboratory Data Qualifier

B = analyte detected in the blank

J = estimated value, the analyte concentration fell above the effective MDL and below the effective practical quantitation limit

N = a spike was outside limits

U = analyte is absent or below the method detection limit

Analytical Method

Clesceri, Greenburg, and Eaton. 1998. *Standard Methods for the Examination of Water and Wastewater*, 20th ed. Section 2540D. Washington, D.C.: American Public Health Association, American Water Works Association, and Water Environment Federation.


EPA (U.S. Environmental Protection Agency). 1980. *Prescribed Procedures for the Measurement of Radioactivity in Drinking Water*. EPA 600-4-80-032. Method 900.0, Method 901.1, Method 906.0. Washington, D.C.: EPA.

———. 1986 (and updates). *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed. Washington, D.C.: EPA.

———. 1993. *The Determination of Chemical Oxygen Demand by Semi-Automated Colorimetry*, EPA Method 410.4. Cincinnati, OH: EPA National Exposure Research Laboratory Office of Research and Development.

———. 2009. *Analytical Methods*, EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry. Cincinnati, OH: EPA National Exposure Research Laboratory Office of Research and Development.

———. 2010. *Analytical Methods*, EPA Method 1664, Revision B: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry. Cincinnati, OH: EPA National Exposure Research Laboratory Office of Research and Development.



Appendix C

SNL/KTF Sampling Location Maps

Figure C-1. On-site sampling locations at SNL/KTF.....	2
Figure C-2. Off-site sampling locations near SNL/KTF.....	3

Appendix C presents maps of sampling locations at Sandia National Laboratories, Kauai Test Facility.

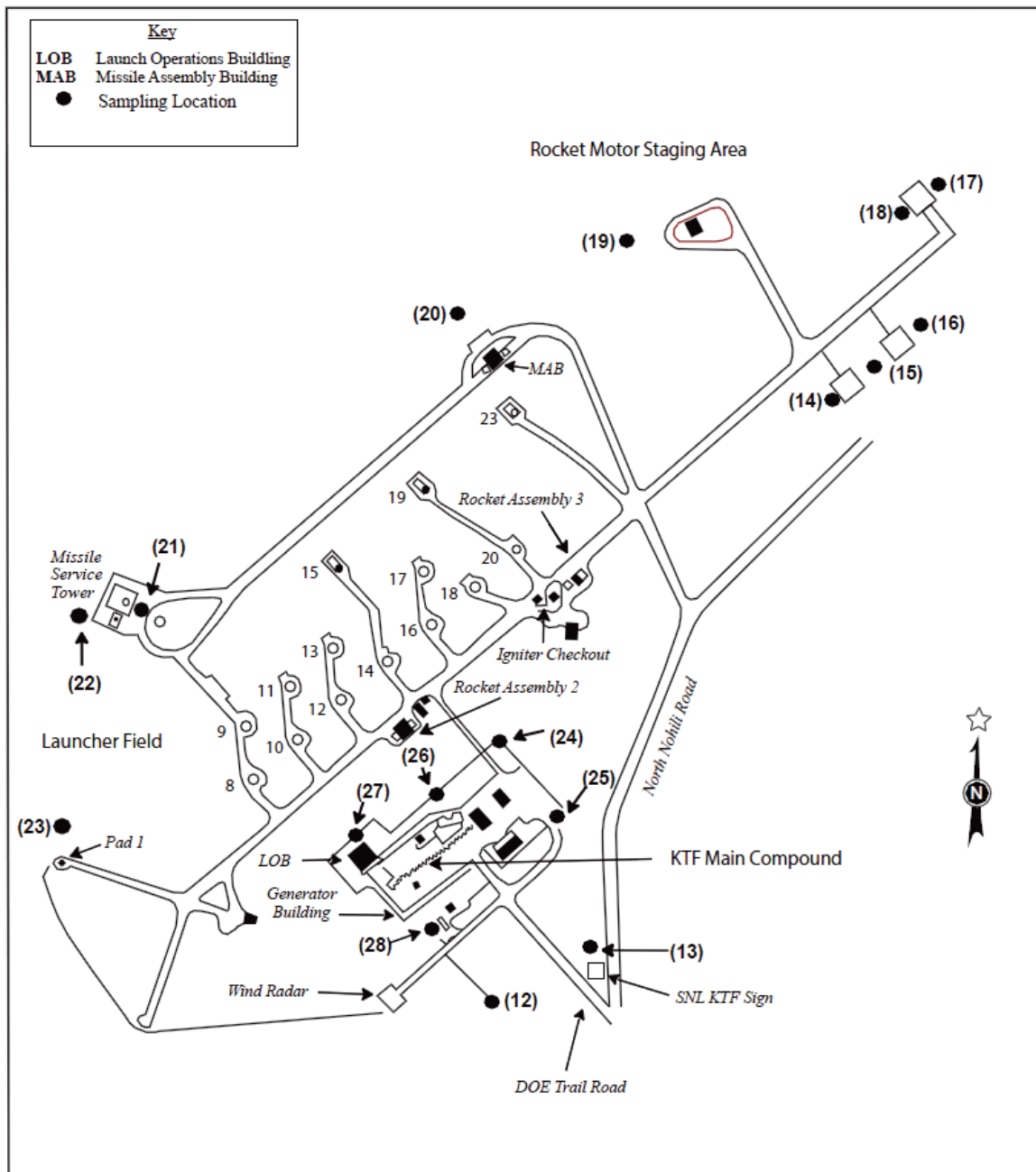


Figure C-1. On-site sampling locations at SNL/KTF

NOTES: DOE = U.S. Department of Energy
 KTF = Kauai Test Facility
 SNL/KTF = Sandia National Laboratories, Kauai Test Facility

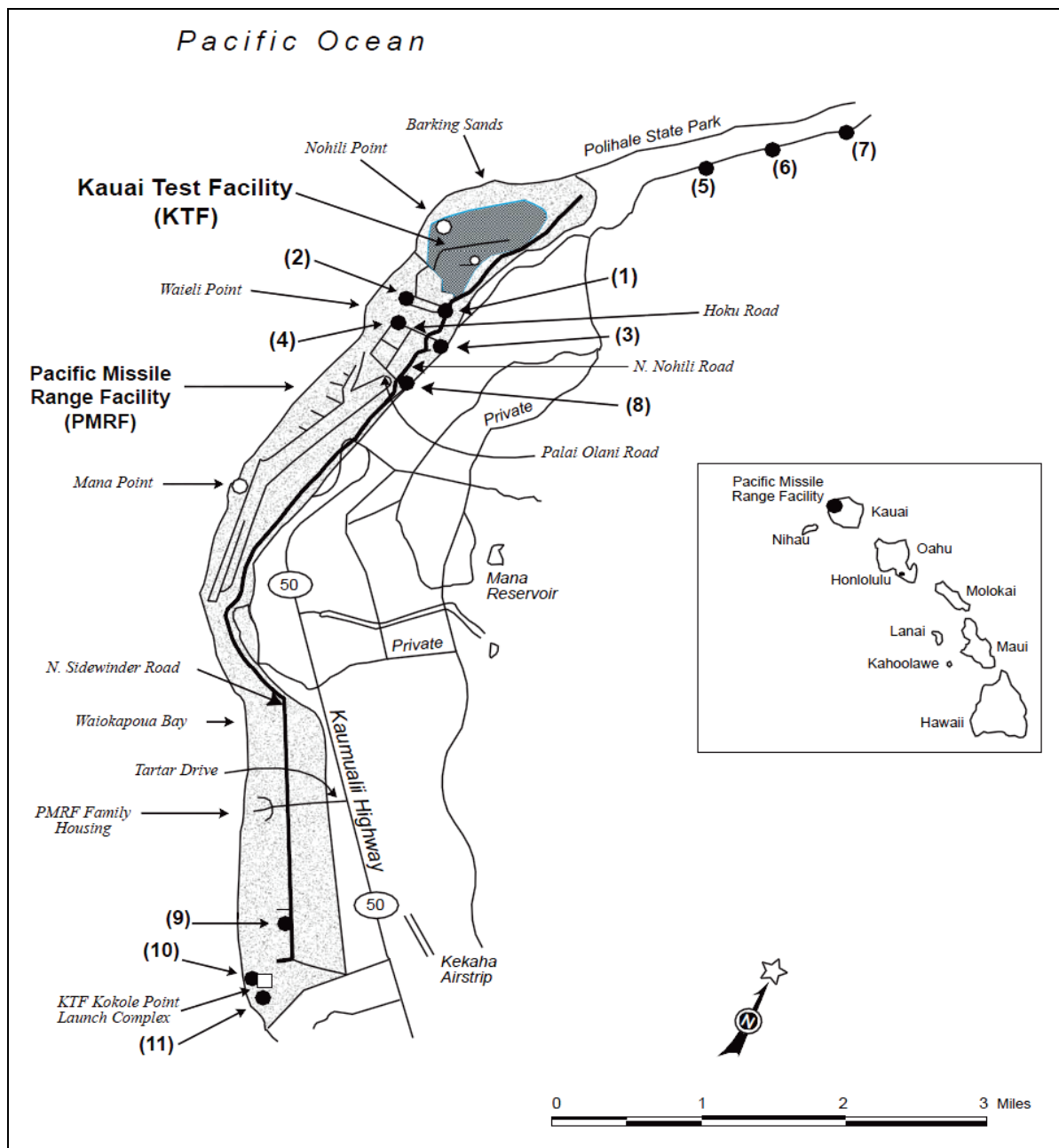


Figure C-2. Off-site sampling locations near SNL/KTF

NOTES: N = north

SNL/KTF = Sandia National Laboratories, Kauai Test Facility

