

SANDIA REPORT  
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Printed September 2010

# Calendar Year 2009 Annual Site Environmental Report for Tonopah Test Range, Nevada and 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.

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# **Calendar Year 2009 Annual Site Environmental Report Tonopah Test Range, Nevada & Kauai Test Facility, Hawaii**

**PRODUCED BY:**  
Sandia National Laboratories  
P.O. Box 5800  
Albuquerque, New Mexico 87185-1042

## **ABSTRACT**

Tonopah Test Range (TTR) in Nevada and Kauai Test Facility (KTF) in Hawaii are government-owned, contractor-operated facilities managed and operated by Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation. The U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA), through the Sandia Site Office (SSO), in Albuquerque, NM, administers the contract and oversees contractor operations at TTR and KTF. Sandia manages and conducts operations at TTR in support of the DOE/NNSA's Weapons Ordnance Program and has operated the site since 1957. Washington Group International subcontracts to Sandia in administering most of the environmental programs at TTR. Sandia operates KTF as a rocket preparation launching and tracking facility. This Annual Site Environmental Report (ASER) summarizes data and the compliance status of the environmental protection and monitoring program at TTR and KTF through Calendar Year (CY) 2009. The compliance status of environmental regulations applicable at these sites include state and federal regulations governing air emissions, wastewater effluent, waste management, terrestrial surveillance, Environmental Restoration (ER) cleanup activities, and the National Environmental Policy Act (NEPA). Sandia is responsible only for those environmental program activities related to its operations. The DOE/NNSA/Nevada Site Office (NSO) retains responsibility for the cleanup and management of TTR ER sites. Environmental monitoring and surveillance programs are required by DOE Order 450.1A, *Environmental Protection Program* (DOE 2008) and DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting Manual* (DOE 2007).

Calendar Year 2009 Annual Site Environmental Report  
Sandia National Laboratories, Tonopah Test Range, Nevada &  
Kauai Test Facility, Hawaii  
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Prepared by:  
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## NOTE TO THE READER

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

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

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The TTR and KTF Annual Site Environmental Reports can be found at the following website:  
<http://www.sandia.gov/news/publications/environmental/index.html>

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<b>1.0</b>	<b>TTR INTRODUCTION.....</b>	<b>1-1</b>
1.1	TTR History and Operations .....	1-1
1.2	Site Description and Demographics.....	1-4
1.3	Regional Geology, Hydrology, Climate, and Fauna .....	1-4
1.4	Clean Slates and Double Track Sites .....	1-5
<b>2.0</b>	<b>TTR COMPLIANCE SUMMARY.....</b>	<b>2-1</b>
2.1	Compliance Status with Federal Regulations.....	2-1
2.1.1	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) .....	2-1
2.1.2	Emergency Planning and Community Right-to-Know Act (EPCRA) .....	2-1
2.1.3	Resource Conservation and Recovery Act (RCRA) .....	2-1
2.1.4	Federal Facility Compliance Act (FFCA).....	2-3
2.1.5	Clean Air Act (CAA) and Clean Air Act Amendments (CAAA) of 1990 .....	2-4
2.1.6	Wastewater .....	2-4
2.1.7	Safe Drinking Water Act (SDWA).....	2-4
2.1.8	Toxic Substances Control Act (TSCA) .....	2-4
2.1.9	Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) .....	2-5
2.1.10	National Environmental Policy Act (NEPA) .....	2-5
2.1.11	Endangered Species Act (ESA) .....	2-5
2.1.12	Migratory Bird Treaty Act (MBTA).....	2-5
2.1.13	Cultural Resources Acts.....	2-5
2.1.14	Environmental Compliance Executive Orders (EO).....	2-8
2.1.15	DOE Directives .....	2-9
2.2	2009 Audits .....	2-9
2.3	2009 Issues and Actions for TTR.....	2-9
2.4	Environmental Permits .....	2-10
2.5	Occurrence Reporting.....	2-10
<b>3.0</b>	<b>TTR ENVIRONMENTAL PROGRAMS INFORMATION.....</b>	<b>3-1</b>
3.1	ER Project Activities .....	3-1
3.2	Waste Management Programs.....	3-2
3.3	Spill Prevention Control and Countermeasures (SPCC) Plan .....	3-6
3.4		

4.2.4	Storm Water Monitoring.....	4-11
4.3	Radiological Air Monitoring.....	4-11
4.4	Non-Radiological Air Emissions .....	4-11
<b>5.0</b>	<b>2009 ASER FOR THE KAUI TEST FACILITY.....</b>	<b>5-1</b>
5.1	Facilities and Operations.....	5-1
5.2	2009 Rocket Launches.....	5-3
5.3	Demographics .....	5-3
5.4	Compliance Summary .....	5-3
5.5	Environmental Program Activities .....	5-9
5.6	Environmental Surveillance and Monitoring Activities .....	5-10
5.7	Terrestrial Surveillance .....	5-11
<b>6.0</b>	<b>TTR &amp; KTF REFERENCES.....</b>	<b>6-1</b>
<b>7.0</b>	<b>GLOSSARY.....</b>	<b>7-1</b>

**NOTE: Appendices are located on the CD that is affixed to the back cover of this report.**

<b>APPENDIX A</b>	2009 TTR Sampling Location Maps .....	See attached CD
<b>APPENDIX B</b>	2009 TTR Terrestrial Surveillance Results.....	See attached CD
<b>APPENDIX C</b>	Chemical Analyses of Soil Samples Collected from the Sandia National Laboratories, Kauai Test Facility, HI, 1999-2007 .....	See attached CD

## **FIGURES**

1-1	Location of the Tonopah Test Range (TTR), Within the Boundaries of the Nevada Test and Training Range (NTTR), Nevada.....	1-3
1-2	Location of Facilities Operated by SNL/NSO and Air Monitoring Stations at TTR .....	1-6
4-1	Historical Pu-239 and Am-241 at S-51 .....	4-7
4-2	Tonopah Test Range TLD Exposure, 2000-2009 .....	4-8
4-3	Tonopah Test Range Firing Range Results, 2009.....	4-8
5-1	Map of the Pacific Missile Range Facility (PMRF) and the Adjacent Area.....	5-2

## **TABLES**

1-1	Project Roller Coaster Test Information .....	1-6
1-2	Gross Alpha Results for TTR Sampling Stations in 2009 .....	1-10
1-3	Gross Beta Results for TTR Sampling Stations in 2009 .....	1-10
2-1	2009 SARA Title III (or EPCRA) Reporting Requirements Applicable to TTR .....	2-3
2-2	Protected Species Potentially Occurring in Nye County, Nevada .....	2-6
2-3	Summary of Environmental Audits Performed at TTR in 2009 .....	2-9
2-4	2009 Summary of Permit Ownership at TTR .....	2-10
2-5	DOE Manual 231.1-2 Reportable Environmental Occurrences at TTR, 2009 .....	2-11
3-1	NNSA/NSO ER Project TTR CAUs and CASs 2009 Status .....	3-3
3-2	Recycled or Energy-Recovered Quantities Shipped Off-Site in 2009.....	3-7
4-1	Decision Matrix for Determining Priority Action Levels .....	4-2
4-2	On-Site Terrestrial Surveillance Locations at TTR .....	4-3
4-3	Off-Site Terrestrial Surveillance Locations at TTR .....	4-4
4-4	Perimeter Terrestrial Surveillance Locations at TTR .....	4-4
4-5	Summary Statistics for Soil Locations, (2000-2009).....	4-6

4-6	Summary Statistics for Soil Locations Noted as Priority-1 and Priority-2 .....	4-6
4-7	Summary Statistics for Soil Locations Noted as Priority-1 and Priority-3 .....	4-6
4-8	Summary Statistics for TLDs by Location Class, 2000 - 2009.....	4-8
4-9	Lead in Soil at Former Firing Range.....	4-9
4-10	Routine Production Well Monitoring at TTR.....	4-10
4-11	Calculated Dose Assessment Results for On-Site Receptor.....	4-12
5-1	Permits in Place at KTF .....	5-5
5-2	2009 SARA Title III (or EPCRA) Reporting Requirements Applicable to KTF .....	5-5
5-3	reatened and Endangered Species Potentially Occurring on KTF .....	5-7
6-1	State of Nevada Administrative Code (NAC) Applicable to the TTR.....	6-7

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## ACRONYMS AND ABBREVIATIONS

<b>A</b>	AEC	U.S. Atomic Energy Commission
	AIRFA	American Indian Religious Freedom Act
	AQC	Air Quality Compliance
	ARPA	Archaeological Resources Protection Act
	ASER	Annual Site Environmental Report
	AST	aboveground storage tank
<b>B</b>	BLM	U.S. Bureau of Land Management
	BMP	Best Management Practice
	BSA	Bulk Storage Areas
<b>C</b>	CAA	Clean Air Act
	CAAA	Clean Air Act Amendments
	CAS	Corrective Action Site
	CAU	Corrective Action Unit
	CEMP	Community Environmental Monitoring Program
	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
	CFR	Code of Federal Regulations
	CGP	Construction General Permit
	COD	chemical oxygen demand
	CWA	Clean Water Act
	CY	Calendar Year
<b>D</b>	DEHP	Di (2-Ethylhexyl) Phthalate
	DMR	Discharge Monitoring Report
	DoD	U.S. Department of Defense
	DOE	U.S. Department of Energy
	DRI	Desert Research Institute, Water Resource Center, University of Nevada System
	DU	depleted uranium
<b>E</b>	EA	environmental assessment
	EDE	effective dose equivalent
	EG&G	Edgerton, Gemeshausen and Grier, Inc.
	EHS	extremely hazardous substance
	EIS	environmental impact statement
	EM	Environmental Management (Department)
	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
	ERDA	U.S. Energy Research and Development Administration
	ESA	Endangered Species Act
ES&H	Environment, Safety, and Health	
<b>F</b>	FFACO	Federal Facilities Agreement and Consent Order
	FFCA	Federal Facilities Compliance Act
	FFPAR	Federal Facility Preliminary Assessment Review
	FIDLER	field instrument detection of low-energy radiation
	FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
	FONSI	Finding of No Significant Impact

	FR	Federal Register
	FTU-1	Flight Test Unit 1
	FY	Fiscal Year
<b>G</b>	GOES	Geostationary Operational Environmental Satellite
<b>H</b>	HAA5	haloacetic acid
	HAPS	Hazardous air pollutants
	HAR	Hawaii Administrative Rules
	HQ	Headquarters
<b>I</b>	IOC	inorganic compound
	ISMS	Integrated Safety Management System
<b>J</b>	JTA	Joint Test Assembly
<b>K</b>	KTF	Kauai Test Facility
<b>L</b>	LMC	Lockheed Martin Corporation
	LOB	Launch Operations Building
<b>M</b>	M&O	Management and Operating Contract
	MAB	Missile Assembly Building
	MBTA	Migratory Bird Treaty Act
	MCL	maximum contaminant level
	MCLG	maximum contaminant level goal
	MDA	minimum detectable activity
	MDA	Missile Defense Agency (applies to Chapter 5.1 only)
	MEI	maximally exposed individual
	MSDS	Material Safety Data Sheet
	MST	Missile Service Tower
<b>N</b>	NAEG	Nevada Applied Ecology Group
	NAFB	Nellis Air Force Base (Range Complex)
	NDEP	Nevada Department of Environmental Protection
	NEDS	Non-Explosive Destruction Site
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants
	NFA	No Further Action
	NHPA	National Historic Preservation Act
	NNSA	National Nuclear Security Administration
	NOI	Notice of Intent
	NPDES	National Pollutant Discharge Elimination System
	NPL	National Priorities List
	NSO	Nevada Site Office
	NSP	Non-covered Source Permit
	NSPS	New Source Performance Standard
	NTS	Nevada Test Site
	NTTR	Nevada Test and Training Range

<b>O</b>	OCC	Operations Control Center
<b>P</b>	PA	Preliminary Assessment
	PCB	polychlorinated biphenyl
	PEMS	Portable Environmental Monitoring Station
	pH	Potential of Hydrogen
	PIC	pressured ion chamber
	PM	Particulate matter
	PMRF	Pacific Missile Range Facility
	PMS	portable monitoring station
	PRG	Protective Remediation Goal
	PSD	Prevention of Significant Deterioration
	Pu	plutonium
	PWS	Public Water System
<b>Q</b>	QA	quality assurance
<b>R</b>	R&D	research and development
	RCRA	Resource Conservation and Recovery Act
	RCT	Radiation Control Technician
	ROC	Range Operations Center
	ROD	Record of Decision
	RQ	Reportable Quantity
	RSL	Radiological Services Laboratory
	RY	Reporting Year
<b>S</b>	Sandia	Sandia Corporation
	SARA	Superfund Amendments and Reauthorization Act
	SDWA	Safe Drinking Water Act
	SHPO	State Historic Preservation Office
	SME	Subject Matter Expert
	SNL	Sandia National Laboratories
	SNL/NM	Sandia National Laboratories, New Mexico
	SNL/TTR	Sandia National Laboratories, Tonopah Test Range
	SOC	Species of Concern
	SOC	Synthetic Organic Compound (applies to Chapter 4 - Table 4-10 only)
	SPAC-MT	Solar Powered Air Sampler and Meteorological Tower
	SPCC	Spill Prevention, Control, and Countermeasures
	Std Dev	Standard Deviation
	SSO	Sandia Site Office
	SVOC	semi-volatile organic compound
	SWDA	Safe Drinking Water Act
	SWEIS	Site Wide Environmental Impact Statement
<b>T</b>	TAL	toxic analyte list (metals)
	TLD	thermoluminescent dosimeter
	TPH	total petroleum hydrocarbon
	TQ	threshold quantity
	TRI	Toxic Release Inventory

	TSCA	Toxic Substances Control Act
	TSD	treatment, storage, and disposal (facility)
	TSS	total suspended solids
	TTHM	total trihalomethane
	TTR	Tonopah Test Range
<b>U</b>	UDP	underground discharge point
	USAF	U.S. Air Force
	U.S.	United States
	USFS	U.S. Forest Service
	USGS	U.S. Geological Survey
	USN	United States Navy
	UST	underground storage tank
	UXO	unexploded ordnance
<b>V</b>	VOC	volatile organic compound
<b>W</b>	WGI	Washington Group International
	WRCC	DRI Western Regional Climate Center
	WWII	World War II

## UNITS OF MEASURE

°C .....	degree Celsius	m.....	meter
cm.....	centimeter	m <sup>2</sup> .....	square meter
°F.....	degree Fahrenheit	m <sup>3</sup> .....	cubic meter
ft.....	feet	mg.....	milligram
g.....	gram	mi.....	mile
gal.....	gallon	ppm.....	parts per million
in. ....	inch	kg.....	kilogram
yd.....	yard	km.....	kilometer
yd <sup>3</sup> .....	cubic yard	lb.....	pound
yr.....	year	m/s.....	meters per second

## RADIOACTIVITY MEASUREMENT UNITS

Ci	curie (unit of radioactivity)	pCi/g	picocurie per gram
mrem/yr	millirem per year (unit of radiation dose)	µg/L	microgram per liter
mSv	millisievert (unit of radiation dose)	µg/m <sup>2</sup>	microgram per square meter
Bq/m	becquerel per cubic meter		

## CHEMICAL ABBREVIATIONS

Am-241 .....americium-241	Pu-239.....plutonium-239
CO <sub>2</sub> .....carbon dioxide	Pu-240.....plutonium-240
Cs-137.....cesium-137	U <sub>tot</sub> .....uranium, total
Pu-238.....plutonium-238	

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

Multiply Si (metric) unit	by	To obtain U.S. customary unit
Celsius (°C).....	[°F] = [°C] × 9/5 + 32 .....	Fahrenheit (°F)
centimeter (cm).....	0.39 .....	inch (in.)
cubic meter (m <sup>3</sup> ).....	35 .....	cubic feet (ft <sup>3</sup> )
gram (g) .....	0.035 .....	ounce (oz)
hectare (ha) .....	2.5 .....	acre
kilogram (kg).....	2.2 .....	pound (lb)
kilometer (km) .....	0.62 .....	mile (mi)
liter (L).....	0.26 .....	gallon (gal)
meter (m).....	3.3.....	feet (ft)
microgram per gram (mg/g) .....	1 .....	parts per million (ppm)
milligram per liter (mg/L) .....	1 .....	parts per million (ppm)
square kilometer (km <sup>2</sup> ) .....	0.39 .....	square mile (mi <sup>2</sup> )

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# TTR & KTF Executive Summary

Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation (LMC) 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 Site Office (SSO) administers the contract and oversees contractor operations at the site.

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

- DOE Order 450.1A, *Environmental Protection Program* (DOE 2008);
- DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting* (DOE 2007);
- DOE Manual 231.1-2, *Occurrence Reporting and Processing of Operations Information* (DOE 2003);
- DOE Order 430.2B, *Departmental Energy, Renewable Energy and Transportation Management* (DOE 2008a);
- DOE Order 435.1, Chg 1, *Radioactive Waste Management* (DOE 2001); and
- DOE Order 5400.5, Chg 2, *Radiation Protection of the Public and the Environment* (DOE 1993).

This ASER summarizes data from environmental protection and monitoring programs at TTR and KTF for Calendar Year (CY) 2009. It also covers Sandia's compliance with environmental statutes, regulations, and permit provisions, and highlights other significant environmental programs and efforts at TTR and KTF. This report is a key component of Sandia's and DOE's efforts to keep the public informed about environmental conditions throughout the DOE/NNSA complex.

## TTR

Sandia conducts operations at TTR in support of the DOE/NNSA's Weapons Ordnance Program. Sandia's activities involve research and development (R&D) 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. Other activities include explosive tests and gun firings.

There was one reportable environmental occurrence in 2009.

## ***Follow-up on Wild Horses at TTR***

An Occurrence Report detailed the deaths of 71 wild horses in July 2007. The horses were from a herd that frequently drank from a man-made depression on a dry lake bed controlled by Sandia. The deaths most likely came from natural nitrate sources concentrated by evaporation of the water within the depression during the heat of the summer. The DRI Publication containing details of this conclusion can be found in the *CY 2008 Annual Site Environmental Report for Tonopah Test Range, Nevada and Kauai Test Facility, Hawaii* (SNL 2009) as Appendix C. This depression was completely filled in with clean soils during 2009.

## ***Environmental Programs***

The following environmental programs are in place at TTR:

- Waste Management,
- Environmental Restoration (ER) Project,
- Terrestrial Surveillance,
- Water Quality monitoring,
- Air Quality Compliance (AQC), and
- National Environmental Policy Act (NEPA).

## ***Waste Management***

Waste generated during 2009 at TTR included hazardous waste regulated by the Resource Conservation and Recovery Act (RCRA) and non-hazardous industrial and sanitary waste. All hazardous waste was shipped to permitted treatment, storage, and disposal facilities. Sandia does not handle waste generated by ER activities.

## ***ER Project***

ER activities at TTR are conducted through the DOE/NNSA, Nevada Site Office (NSO). ER sites that are scheduled for remediation, or that have been closed at TTR, include areas impacted from target tests and detonations, including non-impacted surface

debris and areas impacted by ordnance, depleted uranium, heavy metals, and fuel spills.

### ***Terrestrial Surveillance***

Soil is the only terrestrial medium routinely sampled at TTR. Samples are collected to detect air-deposited pollutants or contaminants transported and deposited as a result of surface water runoff. During 2009, soil samples were collected from 16 off-site, 10 perimeter, and 27 on-site locations.

In 2009, soils were analyzed for radiological constituents. The results showed that further investigation for elevated Am-241 is required in 2010 at location S-51. Non-radiological monitoring of Toxic Analyte List (TAL) metals soil samples are historically monitored every three to five years, and was last conducted in 2008. Although 2009 was not a scheduled year for collection of TAL metals, soil samples were collected in 2009 for lead only at the active TTR Firing Range at the request of the SNL/TTR Range Manager. These sample results are shown in Figure 4-2 and tabulated in Table 4-9 in Chapter 4. If the Firing Range were to close at some point in the future these results will be considered when determining the annual deposition of the firing range.

A summary report for non-radiological constituents collected between 1994 and 2005 was prepared, analyzed, and published in a summary report (SNL 2006) which was included in the CY07 Annual Site Environmental Report for TTR, Nevada and KTF, Hawaii. This year one of the on-site locations (S-51) was identified as a Priority-1 for Americium-241 and at the same location in 2009 had the maximum recorded level for Plutonium-239/240.

The location in the "South Plume Area" is expected to have elevated readings. However, this year's observation justifies additional sampling in 2010 to understand the significance of this single sample. For the Plutonium-239/240 result it may simply be attributed to a sample that contained a "hot particle" or a generalized trend of increased mobilization and migration."

### ***Water Quality Monitoring***

SNL wastewater discharges did not negatively impact the U.S. Air Force (USAF)-held National Pollutant Discharge Elimination System (NPDES) permit in 2009.

The public water system (PWS) at TTR is registered with the Nevada Department of Environmental Protection (NDEP) as a non-transient, non-community water

system under the identification number NV003014. Production Well 6 supplies potable water for TTR's potable water and fire water distribution systems.

The well water is routinely sampled and analyzed per the requirements of the NDEP to demonstrate conformance with primary drinking water standards.

There was one Drinking Water Public Notice issued to Area 3 personnel during August 2009 and occurred in August during a water line repair and affected two buildings. A public notice was issued and total coliform samples were collected from the system on two consecutive days. No coliform bacteria was detected.

In 2009, all sample results were below the maximum contaminant levels (MCL) established for the substances monitored. However, two of these substances did exceed the maximum contaminant level goals (MCLG) for disinfection by-products for the second year in a row. MCLGs of zero are established for bromodichloromethane (1 micrograms per liter [ $\mu\text{g/L}$ ] detected) and bromoform (4.9  $\mu\text{g/L}$  detected). Total trihalomethanes (TTHM) and total haloacetic acid (HAA5) results are well below established MCLs. Lead sample 90<sup>th</sup> percentile results (0.018 milligrams per liter [ $\text{mg/L}$ ]) initially exceeded the action level of 0.015  $\text{mg/L}$  but on resample was within the established action level limit indicating a 90<sup>th</sup> percentile level of 0.014  $\text{mg/L}$ .

### ***Air Quality Compliance***

Radiological air emissions are regulated by National Emission Standards for Hazardous Air Pollutants (NESHAP). The only radionuclide sources at TTR are the three Clean Slate sites, which are sources of diffuse radionuclide emissions as a result of the re-suspension of contaminated soils. These sites are currently being addressed by DOE/NNSA/NSO under the ER Project. The calculated dose for the maximally exposed individual (MEI) was 0.024 millirem per year (mrem/yr), which is approximately 400 times less than the 10 mrem/yr standard set by the U.S. Environmental Protection Agency (EPA). Based on this value, an annual dose assessment is not required to be calculated for the TTR site.

TTR's Class II Air Quality Permit requires emission reports from significant non-radionuclide sources. At TTR, these sources include the screening plant, portable screen, and maintenance shop activities.

### ***National Environmental Policy Act (NEPA)***

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

The SNL/NM NEPA Team completed one DOE NEPA checklist for TTR in 2009, which was transmitted to DOE/NNSA/SSO for review and determination.

As described in the July 24, 2009 Federal Register Notice of Intent (NOI), NNSA is preparing a new site-wide environmental impact statement (SWEIS) (DOE 1999) for the continued operation of DOE/NNSA activities at Nevada Test Site (NTS) and certain off-site locations, e.g., the Nevada Test and Training Range (NTTR), including activities at TTR (DOE/NNSA 2009). The new NTS SWEIS will consider a No Action Alternative, which is to continue current operations through implementation of the 1996 Record of Decision (ROD) (DOE 1996a), and subsequent decisions. Three action alternatives proposed for consideration in the SWEIS would be compared to the No Action Alternative. The three action alternatives would differ by either their type or

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# 1.0 TTR Introduction

Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation (LMC), manages and operates the Tonopah Test Range (TTR) in Nevada through its contract with the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA), Sandia Site Office (SSO). TTR is owned by DOE/NNSA and overseen by the DOE/NNSA/SSO in Albuquerque, New Mexico.

TTR is located on approximately 280 square miles (179,200 acres) within the boundaries of the Nevada Test and Training Range (NTTR) withdrawal and is used to support DOE/NNSA and U.S. Air Force (USAF) activities and missions. Washington Group International (WGI) performs most environmental program functions on behalf of Sandia, including environmental media sampling, wastewater effluent and drinking water monitoring, water treatment, spill response, and waste management operations. WGI also supports TTR during tests by operating optics equipment and recovering test objects.

The Annual Site Environmental Report (ASER) is prepared in accordance and as required by:

- DOE Order 450.1A, *Environmental Protection Program* (DOE 2008).
- DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting* (DOE 2007).
- DOE Manual 231.1-2, *Occurrence Reporting and Processing of Operations Information* (DOE 2003).
- DOE Order 435.1, Chg 1, *Radioactive Waste Management* (DOE 2001).
- DOE Order 5400.5, Chg 2, *Radiation Protection of the Public and the Environment* (DOE 1993).
- DOE Order 430.2B, *Department of Energy Renewable Energy and Transportation Management* (DOE 2008a).

The ASER summarizes data from environmental protection and monitoring programs at TTR for 2009. It also discusses Sandia's compliance with environmental statutes, regulations, permit provisions and other significant environmental activities. 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 (NEPA). DOE Order 450.1A specifies the requirements for environmental monitoring conducted at and around the TTR site. The ASER is an important component of DOE's and Sandia's efforts to keep the public informed about environmental conditions at DOE/NNSA facilities.

Sandia's strategy for managing and implementing its Environment, Safety, and Health (ES&H) Program is described in the Integrated Safety Management System (ISMS). The ISMS is structured around five safety management functions and provides processes to guide line management in identifying and controlling hazards. Sandia is utilizing an Environmental Management System (EMS) as an enhancement of the ISMS. The EMS is that part of the ISMS that addresses the environmental consequences of Sandia activities, products, and services. On December 2, 2005, Sandia informed the DOE/NNSA/SSO that it had fully implemented an EMS in accordance with the requirements outlined in DOE Order 450.1A. In 2006, Sandia has continued working to improve environmental management (EM) based on best management practices (BMP), bench marking, and process improvements.

## 1.1 TTR History and Operations

In 1940, President Franklin Delano Roosevelt established the Las Vegas Bombing and Gunnery Range (now referred to as NTTR), which is part of the U.S. Nellis Air Force Base (NAFB) Complex.

The NAFB Complex, located eight miles north of

Las Vegas, Nevada, includes several auxiliary small arms ranges and the NTTR, which is divided into the North Range and the South Range (Figure 1-1).

The Nevada Test Site (NTS) is located between these two ranges. The entire NAFB Complex is comprised of approximately three million acres. TTR is located 32 miles southeast of Tonopah, Nevada.

### ***TTR Site Characteristics***

The topography at 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 TTR) and the Kawich Range to the east. Cactus Flat is the valley floor where the main operational area of TTR is located. An area of low hills outcrops in the south. Elevations range from 5,347 feet (ft) at the valley floor to 7,482 ft at Cactus Peak. The elevation of the town of Tonopah is 6,030 ft.

### ***TTR Site Selection***

TTR was selected as a test range after similar facilities at Salton Sea Test Base in California, as well as Yucca Flat on the NTS, became inadequate. By the mid-1950s, the atmosphere at Salton Sea Test Base became permeated with haze, which limited visibility and hampered photography. Nevada's Yucca Flat site also became inadequate due to the increasing emphasis on low-altitude approaches and deliveries that required flat terrain and a long approach corridor. The TTR site was located in the northwest corner of the (then) Las Vegas Bombing and Gunnery Range. The site, which was approximately seven times the size of Salton Sea Test Base, was well suited because it had immense areas of flat terrain needed for the increasing use of rockets and low-altitude, high-speed aircraft operations. A permit from the USAF was obtained in 1956, and TTR became operational to test new weapon systems in 1957. Following World War II (WWII), facilities built at TTR were designed and equipped to gather data on aircraft-delivered inert test vehicles under U.S. Atomic Energy Commission (AEC) cognizance (now DOE). As technologies changed, the facilities and capabilities at TTR were expanded to accommodate tests related to DOE/NNSA's Weapons Ordnance Program.

### ***Operations Control Center***

The Main Compound in Area 3 is the heart of test range activities. The Operations Control Center (OCC) controls and coordinates all test functions and affords a 360 degree view of the site. During

test operations, the test director, range safety officer, test project engineer, camera controller, and range communicator operate the consoles in the OCC to control and coordinate all test functions.

### ***TTR Activities***

Principal DOE activities at TTR include stockpile reliability testing; research and development (R&D) testing support for structural development; arming, fusing, and firing systems testing; and testing nuclear weapon delivery systems. No nuclear devices are tested at TTR.

TTR is instrumented with a wide array of signal tracking equipment that includes video; high-speed cameras; radar tracking devices used to characterize ballistics, aerodynamics, and parachute performance on artillery shells; bomb drops; missiles; and rockets.

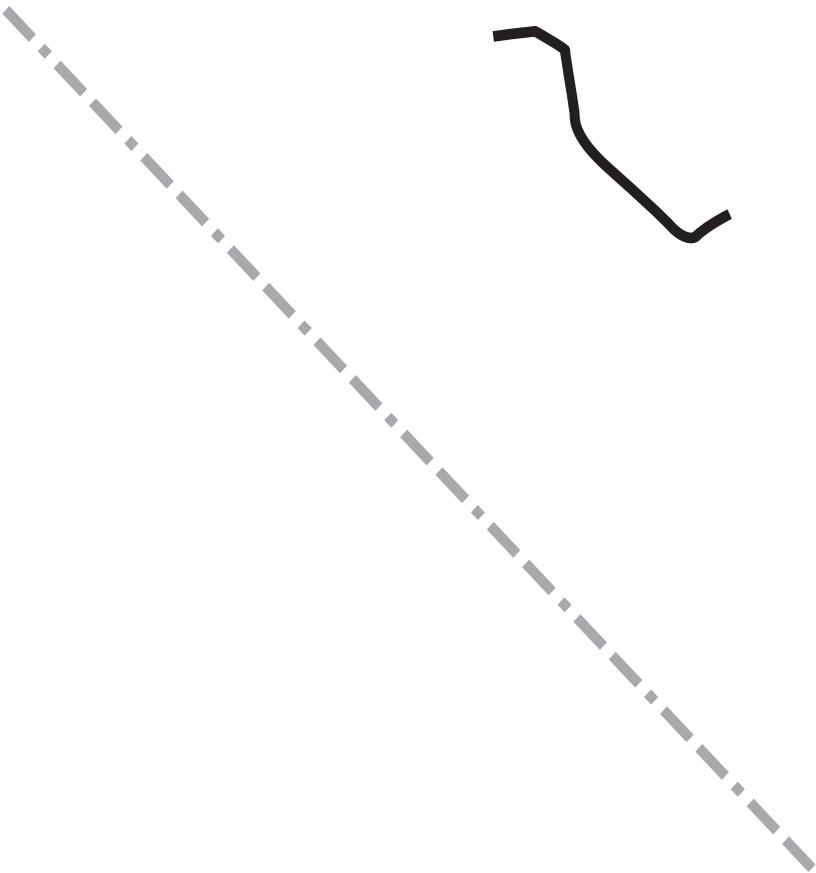
In recent years, specific test activities at TTR have consisted of the following:

- Air drops (trajectory studies of simulated weapons)
- Gun firings
- Ground-launched rockets (study of aeroballistics and material properties)
- Air-launched rockets (deployed from aircraft)
- Explosive testing (e.g., shipping and storage containers)
- Static rocket tests (related to the Trident Submarine Program)
- Ground penetrator tests

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

### ***Site Responsibility***

The ER Project at 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 (HQ) and the Albuquerque and Nevada field offices to designate responsibility for all ER sites to DOE's Nevada Site Office (NSO). The National Nuclear Security Administration (NNSA) was established during 2000 and 2001. Today, responsibility for all ER



sites still resides with NNSA/NSO. However the environmental program management of TTR as discussed in this ASER, is a joint effort between Sandia National Laboratories, Tonopah Test Range (SNL/TTR) and Sandia National Laboratories, New Mexico (SNL/NM) employees and contractors, with oversight from DOE/NNSA/SSO. In April 2002, a Land Use Permit was signed between the USAF and NNSA entitled, "Department of the Air Force Permit to the National Nuclear Security Administration to Use Property Located on the Nevada Test and Training Range, Nevada" (USAF/DOE/NNSA 2002). The current size of TTR is now approximately 280 square miles (179,200 acres). Prior to the April 2002 lease agreement, the footprint was 335,655 acres.

## 1.2 *Site Description and Demographics*

TTR is located within the NTTR at its northern boundary. The area north of the TTR boundary is comprised of sparsely populated public lands jointly administered by the U.S. Bureau of Land Management (BLM) and the U.S. Forest Service (USFS). The land is currently used to graze cattle. There also is a substantial irrigated farming operation north of the range. To the east of TTR, and within the NTTR, is the Nevada Wild Horse Range, which is administered by BLM.

The nearest residents are located in the town of Goldfield (population 659), approximately 22 miles west of the site boundary. The town of Tonopah (population 4,400) is approximately 30 miles northwest of the site (DOC 2010). Las Vegas is 140 miles southeast of TTR. The total population within the 50 mile radius around TTR is approximately 7,000, which includes the potential population at TTR if all housing units at the site were occupied.

## 1.3 *Regional Geology, Hydrology, Climate, and Fauna*

### *Geology*

The regional area around 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. TTR lies northeast of the Walker Lane, a zone of transcurrent faulting and shear,

and the Las Vegas Valley shear zone to the southeast (Sinnock 1982).

The Cactus Range to the west of TTR is the remnants of a major volcanic center consisting of relatively young (six-million year 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).

### *Surface Water*

Drainage patterns within and near 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 lakebeds; 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 TTR's boundaries: Cactus Springs, Antelope Springs, and Silverbow Springs. Water from these springs does not travel more than several tens of meters before it dissipates through evaporation and infiltration. The effect on the landscape is purely local.

### *Groundwater*

TTR obtains its water from local wells. The U.S. Geological Survey (USGS) 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 and at the EH2 well near the TTR Airport at 454 ft. The depth to groundwater at the Area 9 well, located at the north end of the site, is approximately 131 ft. South of the Area 9 well, groundwater is encountered at 361 to 394 ft in Area 3. The static water level at the main water supply well (Well 6) is approximately 350 ft.

### *Climate*

The climate at 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 40° C (104° F) in summer, with lows approaching -30° C (-22° F) in winter. July and August are the hottest months with highs generally between 32° to 37° C (90s° F) during the day and dropping to between 10° and 15° C (50s° F) at night. January conditions vary from highs of 5° to 10° C

(40s° F) to lows -7° to -11° C (teens° F). An eight year climatology developed from data taken in the 1960s identified the record high of 38.8° C (102° F) with a record low of -31° C (24° F) (Schaefer 1970).

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 falls (USAF 1999).

Winds are generally from the northwest in winter and early spring, switching to southerly directions during summer. The mountain/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 6.7 m/s (15 miles per second). During the spring and fall, a diurnal cycle to the wind may occur, bringing northwest drainage winds for a time in the earlier hours, and shifting to southerly winds by afternoon.

#### *Vegetation*

The temperature extremes and arid conditions of the high desert limit vegetation coverage. The sparse vegetation that occurs in Cactus Flat is predominantly range grasses and low shrubs typical of Great Basin Desert flora (ERDA 1975; EG&G 1979).

TTR's vegetation is divided into two basic types by elevation: salt desert shrub in low areas and northern desert shrub at high elevations (USAF 1999, DRI 1991). Salt desert shrub is characteristic of poorly drained soils and common along dry lakebeds. Specific plants in this group include shadscale (*Atriplex confertifolia*), Russian thistle (*Salsola kali*), and sagebrush (*Artemisia tridentata*). Northern desert shrub, found in the Cactus Range, includes a variety of sagebrush, rabbitbrush (*Chrysothamnus nauseosus*), squirrel tail (*Elymus longifolius*), juniper (*Juniperus* spp.), and Nevada bluegrass (*Poa nevadensis*). Joshua tree (*Yucca brevifolia*) and juniper grow in the transition zone at the base of the mountains.

#### *Wildlife*

The Nevada Wild Horse Range and other wild horse land-use areas compose a significant portion of the North Range with herds common in Cactus and Gold Flats, Kawich Valley, Goldfield Hills, and the Stonewall Mountains. Hundreds of wild horses (*Equus caballus*) graze freely throughout TTR, and activities on-site have had little effect on the horse population or their grazing habits. The BLM routinely rounds up

a portion of the herds for auction through the Wild Horse and Burro Adoption Program.

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 burros (*Equus asinus*) are also present (USAF 1999, DRI 1991).

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.

### **1.4 Clean Slates and Double Track 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 TTR, the fourth was conducted on the NTTR just west of TTR. The three Project Roller Coaster test sites at TTR are referred to as Clean Slates 1, 2, and 3 (Figure 1-2). 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 picocuries per gram (pCi/g) of transuranics.

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

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 back filled. An initial fence was built around each test area where the soil contamination was set at approximately 1,000 micrograms per square meter ( $\mu\text{g}/\text{m}^2$ ) of plutonium. The soil survey was conducted on 61 meter grids with a hand-held survey meter,



or old instrument, for the detection of low-energy radiation (FIDLER). In 1973, additional outer fences were set at 40 pCi/g of plutonium in soil also using the hand-held meter method. The areas are visually inspected each year to determine whether any fence repairs or sign replacement is required.

In 1977, an aerial radiological survey was performed by EG&G, Inc. for the Nevada Applied Ecology Group (NAEG) (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 Project Roller Coaster tests. Radiation isopleths showing soil activity due to americium-241 (Am-241), plutonium-239 (Pu-239), and plutonium-240 (Pu-240) were drawn for each area. The cumulative area of the discharge sources, as determined by the aerial radiological survey, is 20 million square meters (approximately 4,900 acres). The results of 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 the results of the previous surveys in terms of extent. Comparing the 2006 to the 1993 survey, it can be determined that significant migration has not occurred.

#### *Air Monitoring at ER 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 has been presented to DOE/NNSA/NSO in the form of a draft report (DRI 1997). The report documented the as-left condition at the site, but does not require follow-up action.

During CY09, at the request of DOE/NNSA/NSO; the DRI maintained two portable environmental monitoring stations at the TTR as part of the ER Project Soils Sub-Project. The primary objective of the monitoring stations is to evaluate whether and under what conditions there is wind transport of radiological contaminants from one of the three Soil Sub-Project Corrective Action Units (CAU) associated with Operation Roller Coaster on TTR.

One station is located in the general vicinity of the Range Operations Center (ROC) and other located on the north edge of Clean Slate 3. The ROC station measures potential radionuclide concentration 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 TTR Soils Sub-Project CAUs. Clean Slate 3 covers an area of approximately 1.82 square kilometers (km<sup>2</sup>) (450 acres), of which, 0.404685 km<sup>2</sup> (100 acres) is estimated to contain soils with plutonium concentrations as high as 3,200 picocuries per gram (pCi/g). This station measures the radionuclide concentration at the boundary of the site in one of the predominant downwind directions.

The fundamental design of these stations is similar to that used in the Community Environmental Monitoring Program (CEMP). The TTR stations collect data on selected meteorological and environmental parameters, e.g. wind speed and direction, 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 Climatic Center (WRCC) for management and incorporation into a TTR-specific database. Both stations have been in continuous operations since July 2008.

#### *Monitoring Station Locations and Capabilities*

As part of its work under the Soils Sub-Project, DRI deployed two portable monitoring stations at TTR. The Station 400 Portable Environmental Monitoring Station (PEMS) is located south of the ROC. This station was located to provide data at the ROC where there is the greatest concentration of personnel associated with Sandia, who manages TTR for the DOE/NNSA. In addition, Station 400 was located where line power was available to operate the instruments. The second, Station 401, Solar Powered Air Sampler and Meteorological Tower, consists of two components: 1) the air sampler, and 2) the auxiliary meteorological tower. These components are located along the fenced perimeter of the north end of Clean Slate 3. Their locations were selected based on a review of wind speed and direction data collected at the Tonopah Airport (Engelbrecht 2008) as well as for ease of access. Although these data are of limited time duration, they are continuous and less influenced by local topography than the CEMP in

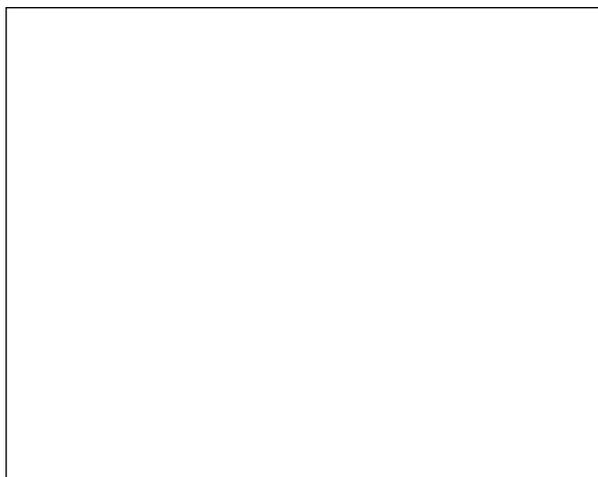
Tonopah, Nevada. Figure 1-2 shows the location of the monitoring stations at TTR.

Both stations are equipped with continuous low volume air samplers (flow rate approximately 0.05663 cubic meter (m<sup>3</sup>) (2 cubic feet [ft<sup>3</sup>]) per minute whose filters are collected, routinely, every two weeks.

These filters are delivered to the Radiological Services Laboratory at the University of Nevada, Las Vegas for analyses. Standard analyses include gross alpha/beta measurements, and gamma spectral analysis; samples may undergo alpha spectral analysis if initial gamma spectral analyses indicated the presence of Am-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 x 4 ft trailer. The station is located approximately 91.44 m (100 yards) south-southwest of the ROC. The station configuration as currently deployed is shown below. Sensors include an anemometer, wind direction, pyranometer, tipping rain bucket, temperature/relative humidity probe, barometric pressure, soil temperature probe, pressurized ion chamber (PIC), and a ambient air particulate size profiler. Data from these sensors are collected and stored on a Campbell Scientific™ data logger. These data are then transmitted through a Geostationary Operational Environmental Satellite transmitter to the WRCC. Regular quality assurance procedures include checking the PIC response and air volume throughput on the air sampler on a month basis. In addition to the real-time instruments, this station is equipped with two low volume air samplers



Station 400 (PEMS) near ROC

(AirMetrics MiniVols™) that can collect air samples on quartz and Teflon® filter media, which allows for different types of chemical and elemental analysis.

These air samplers are intended to run in case of nearby wildfire or in conditions of extreme dust storms in which there may be value in distinguishing the relative contribution of organic and inorganic constituents. In addition, the station is equipped with an ambient air particulate size profiler (DustTrak™). The DustTrak™ 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, and whether there are correlations between particulate concentrations and radionuclide concentration.

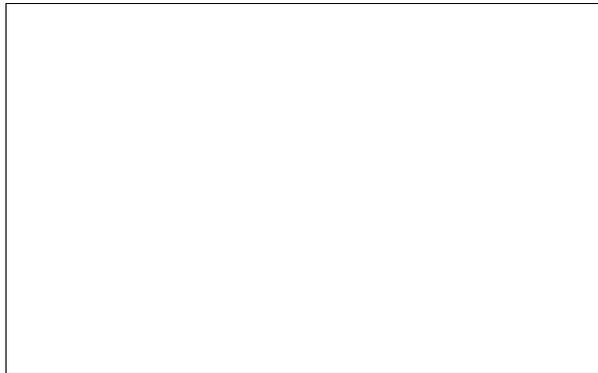
**Station 400 Air Sampling Results**

Station 400 is equipped with a continuous air particulate sampler from which a 4 inch air filter sample is collected every two weeks. Between January 14, 2009 and December 30, 2009, 26 air particulate filter samples were collected and analyzed by gamma spectroscopy and for gross alpha/beta activity. Only naturally occurring radionuclides were identified and measured on these samples. Beryllium (Be)-7 and Potassium (K)-40 were the most frequently measured radionuclides followed by Lead (Pb)-210, Pb-212, and Bismuth (Bi)-214. No anthropogenic gamma emitting radionuclides, e.g. Cesium (Cs)-137, Cobalt (Co)-60, or Am-241 have been detected on any sample. The mean annual gross alpha activity from all samples (Table 1-2) was 2.48 x 10<sup>-15</sup> microcuries per milliliter (μCi/mL), with a maximum of 6.77 x 10<sup>-15</sup> μCi/mL, a minimum of 0.73 x 10<sup>-15</sup> μCi/mL, and a standard deviation of 1.46 x 10<sup>-15</sup> μCi/mL. The mean annual gross beta activity from all samples (Table 1-3) was 1.18x 10<sup>-14</sup> μCi/mL, with a maximum of 1.92 x 10<sup>-14</sup> μCi/mL, a minimum of 0.55 x 10<sup>-14</sup> μCi/mL, and a standard deviation of 0.31 x 10<sup>-14</sup> μCi/mL.

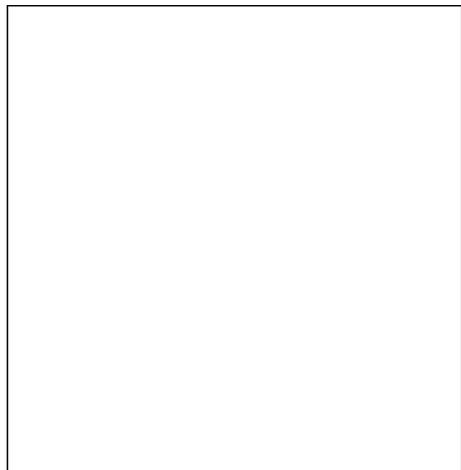
**Station 401: Clean Slate 3**

Station 401 consists of a solar powered air sampler (sampler and solar panels) mounted on a 7 ft X 14 ft trailer, plus a portable meteorological tower, with an anemometer, a temperature/relative humidity probe, and a DustTrak™. The station is located on the north end of Clean Slate 3. 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 the NTTR. Internal air flow monitoring and self-adjustment capabilities allow the air sampler to maintain a near constant flow rate. An internal totalizer is used to collect and store air flow data. Data from the sensors are collected and stored on a Campbell Scientific™ data logger, and periodically downloaded to a personal computer and transmitted to the WRCC. Solar panels, with battery assist, provide power for the air sampler and the meteorological station. Configuration of the solar powered air sampler and the location and configuration of the portable meteorological station are shown below.



Station 401, Solar Powered Air Sampler



Station 401, Portable Meteorological Station

#### ***Station 401: Air Sampling Results***

Air samples are collected every two weeks from Station 401 and delivered to the laboratory on a quarterly basis for batch processing. Between January 14, 2009 and December 30, 2009, 26 air particulate filter samples were collected and analyzed. Only naturally occurring radionuclides were measured on the samples. Be-7, K-40 and Pb-210 were the most frequently measured radionuclides followed by Pb-212, and Bi-214. No anthropogenic gamma emitting radionuclides have been detected on any sample. The mean annual gross alpha activity (Table 1-2) from all samples was  $2.07 \times 10^{-15} \mu\text{Ci/mL}$ , with a maximum of  $4.84 \times 10^{-15} \mu\text{Ci/mL}$ , a minimum of  $0.48 \times 10^{-15} \mu\text{Ci/mL}$ , and a standard deviation of  $1.05 \times 10^{-15} \mu\text{Ci/mL}$ . The mean annual gross beta activity from all samples (Table 1-3) was  $1.03 \times 10^{-14} \mu\text{Ci/mL}$ , with a maximum of  $1.53 \times 10^{-14} \mu\text{Ci/mL}$ , a minimum of  $0.49 \times 10^{-14} \mu\text{Ci/mL}$ , and a standard deviation of  $0.26 \times 10^{-14} \mu\text{Ci/mL}$ .

#### ***TTR Air Monitoring Network Online Database***

Data from the network at TTR are stored and managed via a database at the WRCC in Reno, Nevada. Most



**TABLE 1-2. Gross Alpha Results for TTR Sampling Stations in 2009**

Sampling Location	Number of Samples	Concentration ( $\times 10^{-15}$ $\mu\text{Ci}/\text{mL}$ [ $3.7 \times 10^{-5}$ Becquerel ( $\text{Bq}/\text{m}^3$ )]			
		Mean	Standard Deviation	Minimum	Maximum
400	26	2.48	1.46	0.73	6.77
401	26	2.07	1.05	0.48	4.84

**TABLE 1-3. Gross Beta Results for TTR Sampling Stations in 2009**

Sampling Location	Number of Samples	Concentration ( $\times 10^{-14}$ $\mu\text{Ci}/\text{mL}$ [ $3.7 \times 10^{-4}$ Becquerel ( $\text{Bq}/\text{m}^3$ )]			
		Mean	Standard Deviation	Minimum	Maximum
400	26	1.18	0.31	0.55	1.92
401	26	1.03	0.26	0.49	1.53



# TTR Compliance Summary



Sandia Corporation (Sandia) is responsible for environment, safety, and health (ES&H) compliance with federal environmental statutes, regulations, and U.S. Department of Energy (DOE) directives in the Prime contract between Sandia and DOE. Presidential Executive Orders (EO) and DOE guidance documents are also used to establish program criteria.

This chapter discusses Sandia's ES&H responsibilities and the status of ES&H compliance. Environmental audit summaries, occurrence reporting, and environmental permit status for 2009 are also presented in this chapter.

The State of Nevada administers most environmental regulations applicable to Tonopah Test Range (TTR). Specific state regulations listed in Chapter 6 include regulations governing air quality, solid and hazardous waste management, wildlife, water quality, and radiation control. Radionuclide air emission regulations are administered directly by the U.S. Environmental Protection Agency (EPA).

## 2.1 Compliance Status with Federal Regulations

This section summarizes DOE's and Sandia's compliance status with major environmental regulations, statutes, and DOE Orders that pertain to the environment.

The major federal laws applicable to environmental compliance at TTR are presented on page 2-2.

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

CERCLA defines assessment activities and reporting requirements for inactive waste sites at federal facilities. As required by CERCLA, a Preliminary Assessment (PA) 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 (NPL) for cleanup (EPA 2010). There are no NPL or "Superfund" sites located at TTR.

The Superfund Amendments and Reauthorization Act (SARA) Title III amended CERCLA requirements for reportable quantity (RQ) releases and chemical inventory reporting. Sandia at TTR was in full compliance with CERCLA/SARA in 2009. Table 2-1 lists SARA Title III reporting requirements.

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

SARA Title III (also known as EPCRA) requires the submittal of a Toxic Release Inventory (TRI) report for chemical releases over a given threshold quantity (TQ). The release reporting limit for lead is 100 pounds (lb). The TTR Firing Range released approximately 390.7 lb of non-recovered lead in 2009.

This information was reported in the Reporting Year (RY) 2009 TRI Report (SNL 2010c).

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

RCRA and the Nevada Revised Statutes regulate the generation, transportation, treatment, storage, and disposal of hazardous chemical waste and non-hazardous solid wastes. Applicable regulations are listed in Chapter 6.

Sandia generates some hazardous waste through normal operations at TTR; is classified as a "small quantity generator," and is subject to the applicable requirements (see Chapter 3, which summarizes Sandia's hazardous waste management activities during 2009, and specifically Section 3.2 - Waste Management). 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. At TTR, hazardous waste shipments are scheduled to occur at least two to three times a year.

Sanitary solid waste, which is also regulated under RCRA, is disposed of at landfills on-site. There is one Class II sanitary landfill in operation at

## Major Environmental Regulations & Statutes Applicable to TTR

Regulation/Statute	Description	Where to go for more information
Clean Air Act (CAA) and CAA Amendments (CAAA)	Provides standards to protect the nation's air quality	<a href="http://www.epa.gov/air/caa/">http://www.epa.gov/air/caa/</a>
Clean Water Act (CWA)	Provides general water quality standards to protect the nation's water sources and byways	<a href="http://www.epa.gov/region09/water/">http://www.epa.gov/region09/water/</a>
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Provides federal funding for cleanup of inactive waste sites on the National Priorities List (NPL) and mandates requirements for reportable releases of hazardous substances	<a href="http://www.epa.gov/lawsregs/laws/cercla.html">http://www.epa.gov/lawsregs/laws/cercla.html</a>
Cultural Resources Acts	Includes various acts that protect archeological, historical, religious sites, and resources	<a href="http://recreation.usgs.gov/env_guide/cultural.html">http://recreation.usgs.gov/env_guide/cultural.html</a>
Endangered Species Act (ESA)	Provides special protection status for federally listed endangered or threatened species.	<a href="http://www.epa.gov/lawsregs/laws/esa.html">http://www.epa.gov/lawsregs/laws/esa.html</a>
Executive Orders (EOs)	Several EOs provide specific protection for wetlands, floodplains, environmental justice in minority and low-income populations, and encourages greening the government through leadership in EM	<a href="http://www.archives.gov/federal-register/executive-orders/disposition.html">http://www.archives.gov/federal-register/executive-orders/disposition.html</a>
Federal Facility Compliance Act (FFCA)	Directs federal agencies regarding environmental compliance	<a href="http://www.hss.energy.gov/nuclearsafety/env/policy/">http://www.hss.energy.gov/nuclearsafety/env/policy/</a>
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Controls the distribution and use of various pesticides	<a href="http://www.epa.gov/lawsregs/laws/fifra.html">http://www.epa.gov/lawsregs/laws/fifra.html</a>
Migratory Bird Treaty Act (MBTA) of 1918	Prevents the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts, and nests	<a href="http://www.fws.gov/migratorybirds/RegulationsPolicies/treatlaw.html#mbta">http://www.fws.gov/migratorybirds/RegulationsPolicies/treatlaw.html#mbta</a>
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Specifies standards for radionuclide air emissions and other hazardous air releases under the CAA	<a href="http://www.epa.gov/radiation/neshaps/">http://www.epa.gov/radiation/neshaps/</a>
National Environmental Policy Act (NEPA)	Requires federal agencies to review all proposed activities so as to include environmental aspects in agency decision-making	<a href="http://nepa.energy.gov/">http://nepa.energy.gov/</a>
Resource Conservation and Recovery Act (RCRA)	Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks (USTs).	<a href="http://www.epa.gov/lawsregs/laws/rcra.html">http://www.epa.gov/lawsregs/laws/rcra.html</a>
Safe Drinking Water Act (SDWA)	Enacts specific health standards for drinking water sources	<a href="http://ndep.nv.gov/">http://ndep.nv.gov/</a> also see <a href="http://www.epa.gov/safewater/sdwa/sdwa.html">http://www.epa.gov/safewater/sdwa/sdwa.html</a>
Superfund Amendments and Reauthorization Act (SARA)	SARA, Title III, also known as the Emergency Planning and Community-Right-to-Know Act (EPCRA), mandates communication standards for hazardous materials over a threshold amount that are stored or used in a community	<a href="http://www.epa.gov/lawsregs/laws/epcra.html">http://www.epa.gov/lawsregs/laws/epcra.html</a>
Toxic Substance Control Act (TSCA)	Specifies rules for the manufacture, distribution, and disposal of specific toxic materials such as asbestos and polychlorinated biphenyls (PCBs)	<a href="http://www.epa.gov/compliance/civil/tscaindex.html">http://www.epa.gov/compliance/civil/tscaindex.html</a>

**TABLE 2-1. 2009 SARA Title III (or EPCRA) Reporting Requirements Applicable to TTR**

Section	SARA Title III Section Title	Requires Reporting?		Description
		Yes	No	
302–303	Emergency Planning	X		Sandia Corporation submits an annual report listing chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 Appendix B, location of the chemicals and emergency contacts. The report is prepared for the DOE/NNSA/SSO, which distributes it to the required entities.
304	Emergency Notification		X	No RQ releases of an EHS, or as defined under CERCLA, occurred in 2009.
311-312	Hazardous Chemical Storage Reporting Requirements	X		There are two “Community Right-to-Know” reporting requirements: (a) SNL/NM completes the EPA Tier II forms for all hazardous chemicals present at the facility at any one time in amounts equal to or greater than 10,000 lbs and for all EHSs present at the facility in an amount greater than or equal to 500 lbs or the Threshold Planning Quantity, whichever is lower; (b) TTR provides MSDSs for each chemical entry on a Tier II form unless it decides to comply with the EPA’s alternative MSDS reporting, which is detailed in 40 CFR Part 370.21.
313	Toxic Chemical Release Forms	X		EPCRA, Section 313, requires that facilities that use toxic chemicals listed in SARA Title III over a threshold value must submit a TRI report. In 2009, a report was submitted for lead.

**NOTES:** CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act  
 SSO = Sandia Site Office  
 EHS = extremely hazardous substance  
 lbs = pounds  
 SARA = Superfund Amendments and Reauthorization Act  
 EPCRA = Emergency Planning and Community Right-to-Know Act  
 DOE = U.S. Department of Energy  
 NNSA = National Nuclear Security Administration  
 CFR = Code of Federal Regulations  
 EPA = U.S. Environmental Protection Agency  
 TRI = Toxic Release Inventory  
 RQ = reportable quantity  
 MSDS = material safety data sheet

TTR operated by the U.S. Air Force (USAF) Operations and Maintenance contractor. The land fill is used cooperatively by all organizations at TTR. In November 2007 a contract was obtained with the Republic Services land fill located at Apex just north of Las Vegas to dispose of bulk non-regulated solid waste there. The main purpose for obtaining this contract is clean-up of the Area 3 Salvage Yard. This waste material is not being disposed of in the USAF Land fill on Range due to volume restrictions.

***Underground Storage Tanks (UST) and Aboveground Storage Tanks (AST)***

RCRA, Subchapter I (40 CFR 280) sets forth requirements for USTs that contain hazardous materials or petroleum products. USTs and ASTs, although not registered by the state, are subject to EPA regulations 40 CFR 112, Oil Pollution Prevention and 40 CFR 110, Discharge of Oil. The last five USTs were

removed in August 1995. This includes the removal of two diesel tanks and two gasoline tanks from a former gas station in Area 3, and one diesel tank that had supplied generator fuel in Area 9. There are no ASTs requiring registration with the State of Nevada at TTR.

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

The FFCA requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste, 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 Sandia operations at TTR do not generate mixed waste

and Sandia currently has no mixed waste stored on-site, these requirements are not applicable to Sandia's operations at TTR.

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

CAA and CAAA of 1990 requirements are regulated by State of Nevada air quality regulations. Air emissions from non-radionuclide sources, such as a portable screen or maintenance shop activities, are permitted under a Class II Air Quality Permit. Sandia tracks emissions and pays a fee to the State of Nevada based on the total standard tons emitted. Sandia met all air quality permit conditions in 2009.

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

The EPA retains compliance authority for all radionuclide air releases, which are regulated by 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 TTR. Continuous air monitoring was conducted from February 22, 1996 to February 25, 1997 (SNL 1997). The TTR Airport was determined to be the location of the maximally exposed individual (MEI). The result of 0.024 millirems per year (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 2009 (SNL 2010) and Chapter 4 of this report discuss these monitoring results.

### **2.1.6 Wastewater**

At TTR wastewater discharges are controlled by the State of Nevada, Department 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 TTR sewage lagoon permitted by the NDEP and operated by the USAF. Sandia also maintains five active and one inactive septic tank systems in remote areas at TTR, which are used only for domestic sanitary sewage collection. These systems are periodically sampled as a Best Management Practice and do not require sampling by the NDEP. During Calendar Year (CY) 2009 there were no excursions or violation of concentration limits.

### ***Storm Water***

The issuance of a National Pollutant Discharge Elimination System (NPDES) storm water permit is generally based on whether or not storm water runoff is discharged to "Waters of the U.S." This definition includes rivers, lakes, streams, and swamps, as well as channels and arroyos that lead to waters that are currently used, have been used in the past, or may be susceptible for use in interstate or foreign commerce.

The 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 storm water runoff and has cognizance over all storm water issues at the site. The State of Nevada has determined that there are no industrial activities at TTR that require permitting. New construction activities that exceed one acre of soil disturbance may require permitting under the Construction General Permit (CGP). In 2009, one CGP was obtained to grade a site on the Main Lake in Area 9 that collected storm water runoff. Construction at this site consisted of filling the low areas with soil and re-grading the site to prevent accumulation of storm water. The completed site matches the existing dry lake bed that surrounds the area.

### **2.1.7 Safe Drinking Water Act (SDWA)**

Sandia meets standards for drinking water as defined in the SDWA and NDEP public water supply and public water system regulations. Well 6 normally provides all drinking water for Sandia's operations at TTR and is operated under a permit issued by the NDEP. The USAF Public Water System (PWS) and the Sandia PWS are designed such that they can, on an as needed basis, provide backup to each other. Chapter 4 of this report discusses monitoring activities. The NDEP, Bureau of Safe Drinking Water, characterizes this PWS as a Non-Transient Non-Community system.

### **2.1.8 Toxic Substances Control Act (TSCA)**

Compliance with TSCA at TTR primarily concerns the management of asbestos and polychlorinated biphenyls (PCB). As defined by TSCA, any material with greater than or equal to 500 parts per million (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 TTR transformers to determine if

PCBs were present in the soil (IT 1993). All samples contained less than 50 ppm of PCBs.

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

Chemical pesticides used at TTR include herbicides, rodenticides, and insecticides, as required. All chemicals used are EPA approved and 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 Material Safety Data Sheets (MSDS) for each pesticide. There were no violations of FIFRA in 2009.

### **2.1.10 National Environmental Policy Act (NEPA)**

NEPA requires federal agencies (and other organizations that perform federally sponsored projects) to consider the 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. Additionally, if a proposed action is determined to have environmentally “significant” impacts, the agency must prepare an environmental assessment (EA) or an environmental impact statement (EIS) before 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 impact. The DOE, National Nuclear Security Administration (NNSA), Sandia Site Office (SSO) coordinates NEPA compliance at SNL/TTR with personnel from SNL/NM. NEPA activities are discussed in Section 3.4.

#### **2.1.11 Endangered Species Act (ESA)**

The ESA 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. The ESA 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 the proposed action, an EA or an EIS must be prepared.

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

#### **2.1.12 Migratory Bird Treaty Act (MBTA)**

The MBTA of 1918 implemented the 1916 Convention for the Protection of Migratory Birds. The original statute implemented the agreement between the United States (U.S.) and Great Britain (for Canada) and later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and Russia. The MBTA prevents the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, or nests. Federal institutions are not exempt from the MBTA. At TTR, the MBTA is coordinated through NEPA reviews and the Ecology Program.

#### **2.1.13 Cultural Resources Acts**

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

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

The DOE/NNSA/SSO is responsible for determining the level of applicability of cultural resources requirements. In 2009, Sandia’s operations did not impact any known cultural resources sites at TTR.

#### **Historic Building Assessment**

In 2004, DOE/NNSA/SSO initiated a consultation with the Nevada State Historic Preservation Office (SHPO) on the TTR site. The SHPO did not concur with the DOE determination of TTR’s eligibility for the National Register of Historic Places as a historic district. At the SHPO’s request, Sandia contracted with an external architectural historian to further

**TABLE 2-2. Protected Species Potentially Occurring in Nye County, Nevada**

Common Name	Scientific Name	Federal Status	State of Nevada Protected Status
<b>PLANTS</b>			
Sodaville milkvetch	<i>Astragalus lentiginosus var. sesquimetrals</i>	-----	State Protected
Halfring milkvetch	<i>Astragalus mohavensis var hemigyus</i>	SOC	State Protected
Ash Meadows milkvetch	<i>Astragalus phoenix</i>	Threatened	State Protected
Spring-loving centaury	<i>Centaurium namophilum</i>	Threatened	State Protected
Clokey pincushion	<i>Coryphantha vivipara var. rosea</i>	-----	State Protected
Armored hedgehog cactus	<i>Echinocereus engelmannii var. armatus</i>	-----	State Protected
Ash meadows sunray	<i>Enceliopsis nudicaulis var. corrugata</i>	Threatened	State Protected
Mojave barrel cactus	<i>Ferocactus cylindraceus var. lecontei</i>	-----	State Protected
Sunnyside green gentian	<i>Frasera gypsicola</i>	-----	State Protected
Ash Meadows gumplant	<i>Grindelia fraxinoprattensis</i>	Threatened	State Protected
Sand cholla	<i>Grusonia pulchella</i>	-----	State Protected
Ash Meadows mousetails	<i>Ivesia kingii var. eremica</i>	Threatened	State Protected
Ash Meadows blazingstar	<i>Mentzelia leucophylla</i>	Threatened	State Protected
Amargosa niterwort	<i>Nitrophila mohavensis</i>	Endangered	State Protected
Simpson hedgehog cactus	<i>Pediocactus simpsonii</i>	-----	State Protected
Williams combleaf	<i>Polycytenium williamsiae</i>	-----	State Protected
Blaine pincushion	<i>Sclerocactus blainei</i>	-----	State Protected
Tonopah pincushion	<i>Sclerocactus nyensis</i>	-----	State Protected
Hermit cactus	<i>Sclerocactus polyancistrus</i>	-----	State Protected
<b>INSECTS</b>			
Ash Meadows naucorid	<i>Ambrysus amargosus</i>	Threatened	-----
<b>FISH</b>			
White River desert sucker	<i>Catostomus clarki intermedius</i>	-----	State Protected
Moorman White River springfish	<i>Crenichthys baileyi thermophilus</i>	-----	State Protected
Railroad Valley springfish	<i>Crenichthys nevadae</i>	Threatened	State Protected
Devils Hole pupfish	<i>Cyprinodon diabolis</i>	Endangered	State Protected
Ash Meadows Amargosa pupfish	<i>Cyprinodon nevadensis mionectes</i>	Endangered	State Protected
Warm Springs Amargosa pupfish	<i>Cyprinodon nevadensis pectoralis</i>	Endangered	State Protected
Pahrump poolfish	<i>Empetrichthys latos latos</i>	Endangered	State Protected
White River spinedace	<i>Lepidomeda albivallis</i>	Endangered	State Protected
Moapa dace	<i>Moapa coriacea</i>	Endangered	State Protected
Lahontan cutthroat trout	<i>Oncorhynchus clarki henshawi</i>	Threatened	State Protected
Big Smoky Valley speckled dace	<i>Rhinichthys osculus lariversi</i>	-----	State Protected
Ash Meadows speckled dace	<i>Rhinichthys osculus nevadensis</i>	Endangered	State Protected
Little Fish Lake Valley tui chub	<i>Siphateles bicolor ssp. 4</i>	-----	State Protected
Hot Creek Valley tui chub	<i>Siphateles bicolor ssp. 5</i>	-----	State Protected
Little Fish Lake Valley tui chub	<i>Siphateles bicolor ssp. 6</i>	-----	State Protected
Railroad Valley tui chub	<i>Siphateles bicolor ssp. 7</i>	-----	State Protected
Big Smokey Valley tui chub	<i>Siphateles bicolor ssp. 8</i>	-----	State Protected

**TABLE 2-2. Protected Species Potentially Occurring in Nye County, Nevada (continued)**

Common Name	Scientific Name	Federal Status	State of Nevada Protected Status
<b>AMPHIBIANS</b>			
Amargosa toad	<i>Bufo nelsoni</i>	-----	State Protected
Columbia spotted frog	<i>Rana luteiventris</i> pop. 3	Candidate	-----
<b>REPTILES</b>			
Banded gila monster	<i>Heloderma suspectum cinctum</i>	SOC	State Protected
Desert tortoise (Mojave Desert pop.)	<i>Gopherus agassizii</i>	Threatened	State Protected
<b>MAMMALS</b>			
Pallid bat	<i>Antrozous pallidus</i>	-----	State Protected
Pygmy rabbit	<i>Brachylagus idahoensis</i>	SOC	State Protected
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	-----	State Protected
Spotted bat	<i>Euderma maculatum</i>	-----	State Protected
Ash Meadows montane vole	<i>Microtus thysanodes</i>	SOC	State Protected
American pika	<i>Ochotona princeps</i>	-----	State Protected
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	-----	State Protected
Kit fox	<i>Vulpes macrotis</i>	-----	State Protected
<b>BIRDS</b>			
Northern goshawk	<i>Accipiter gentilis</i>	SOC	State Protected
Golden eagle	<i>Aquila chrysaetos</i>	-----	State Protected
Long-eared owl	<i>Asio otus</i>	-----	State Protected
Western burrowing owl	<i>Athene cunicularia hypugaea</i>	SOC	State Protected
Juniper titmouse	<i>Baeolophus griseus</i>	-----	State Protected
Ferruginous hawk	<i>Buteo regalis</i>	SOC	State Protected
Swainson's hawk	<i>Buteo swainsoni</i>	-----	State Protected
Sage grouse	<i>Centrocercus urophasianus</i>	-----	State Protected
Western snowy plover	<i>Charadrius alexandrinus nivosus</i>	Threatened	State Protected
Mountain plover	<i>Charadrius montanus</i>	Proposed Threatened	State Protected
Black tern	<i>Chlidonias niger</i>	SOC	State Protected
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	Candidate	State Protected
Yellow warbler	<i>Dendroica petechia</i>	-----	State Protected
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	State Protected
Prairie falcon	<i>Falco mexicanus</i>	-----	State Protected
Common yellowthroat	<i>Geothlypis trichas</i>	-----	State Protected
Greater sandhill crane	<i>Grus canadensis tabida</i>	-----	State Protected
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>	-----	State Protected
Yellow-breasted chat	<i>Icteria virens</i>	-----	State Protected
Western least bittern	<i>Ixobrychus exilis hesperis</i>	SOC	State Protected
Loggerhead shrike	<i>Lanius ludovicianus</i>	SOC	State Protected
Lewis' woodpecker	<i>Melanerpes lewis</i>	-----	State Protected
Long-billed curlew	<i>Numenius americanus</i>	-----	State Protected

**TABLE 2-2.** Protected Species Potentially Occurring in Nye County, Nevada (concluded)

Common Name	Scientific Name	Federal Status	State of Nevada Protected Status
Macgillivray’s warbler	<i>Oporornis tolmiei</i>	-----	State Protected
Mountain quail	<i>Oreortyx pictus</i>	-----	State Protected
Flammulated owl	<i>Otus flammeolus</i>	-----	State Protected
Osprey	<i>Pandion haliaetus</i>	-----	State Protected
Phainopepla	<i>Phainopepla nitens</i>	-----	State Protected
White-faced ibis	<i>Plegadis chihi</i>	SOC	State Protected
Vesper sparrow	<i>Pooecetes gramineus</i>	-----	State Protected
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	Endangered	State Protected
Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>	-----	State Protected
Crissal thrasher	<i>Toxostoma crissale</i>	-----	State Protected
Orange-crowned warbler	<i>Vermivora celata</i>	-----	State Protected
Lucy’s warbler	<i>Vermivora luciae</i>	-----	State Protected
Grey vireo	<i>Vireo vicinior</i>	-----	State Protected

**NOTES:** SOC = Species of Concern

evaluate the TTR buildings under National Register Criterion C. In 2009, a revised report on the buildings at TTR was submitted to SSO to support consultation with the Nevada SHPO.

**2.1.14 Environmental Compliance Executive Orders (EO)**

EO 11988, *Floodplain Management*, as amended, and EO 11990, *Protection of Wetlands*, as amended, require evaluation of the potential effects of actions taken in these environmentally sensitive areas. There are no floodplains or significant wetlands at 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, 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 United States and its territories and possessions. Sandia must include in the assessment of its operations

any disproportionate impacts on minority or low-income populations within the area of influence of the laboratories’ operations.

EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, was issued in January 2007. EO 13423 sets goals in the areas of energy efficiency, acquisition, renewable energy, toxics reductions, recycling, sustainable buildings, electronics stewardship, e-waste, and water conservation. EO 13423 also requires more widespread use of Environmental Management Systems (EMS) as the framework in which to manage and continually improve these sustainable practices. EO 13423 incorporates the requirements of and cancels EOs 13101, 13123, 13134, 13148, and 13149, which were implemented through DOE Order 450.1 in 2007. DOE revised Order 450.1 to include the requirements of EO 13423 in June 2008. Anticipating this change, Sandia TTR personnel established new EMS objectives and targets starting in fiscal year (FY) 2008 to support upcoming requirements.

EO 13514, *Leadership in Environmental, Energy, and Economic Performance*, was issued in October 2009. EO 13514 establishes an integrated strategy towards sustainability to safeguard the health of our environment and make greenhouse gas emissions a priority for all federal agencies. EO 13514 sets goals in the areas of promoting electronics stewardship,

pollution prevention, increased renewable energy, waste reduction, recycling, and fossil fuel usage reduction,

### 2.1.15 DOE Directives

DOE directives on the Management and Operating Contract (M&O) between Sandia and the DOE define the primary contractual obligations for operating SNL/NM. The DOE directives on the contract baseline that pertain to environmental protection and management are discussed in Chapter 1. Sandia met all the requirements stated in these DOE directives.

## 2.2 2009 Audits

### *NDEP - Air Quality Permit Inspection*

The NDEP, Air Quality Bureau conducted an Air Quality Permit inspection of TTR on August 2, 2009. Shop Facilities and the Portable Screen were inspected. There were no violations or findings noted during this inspection.

### *NDEP - RCRA Compliance Evaluation*

In 2009 there was no NDEP RCRA Compliance Evaluation conducted. The next NDEP RCRA inspection at TTR should occur in 2010.

A summary of 2009 environmental audits is presented in Table 2-3.

## 2.3 2009 ISSUES AND ACTIONS FOR TTR

Ongoing self-assessments at Sandia continue to identify potential compliance issues and subsequent follow-up actions.

### *Federal Facility Agreement and Consent Order (FFACO) Compliance for ER Activities*

An ongoing action started in 1996 is the FFACO with the State of Nevada. This agreement was implemented in May 1996 between the State of Nevada, DOE, and the U.S. Department of Defense (DoD) (DoD/DOE/State of Nevada 1996). All DOE cleanup activities 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 ER sites for which DOE has assumed responsibility, which are subject to the FFACO are:

- NTS
- Areas within TTR
- Areas within the NTTR
- 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 report (DoD/DOE/State of Nevada 1996). The list of sites has been modified for consistency with NDEP requirements and grouped

**TABLE 2-3.** Summary of Environmental Audits at TTR in 2009

Type/Subject	Date	Audit Organization	Findings Summary
Air Quality Permit Inspection	08/06/2009	State of Nevada / NDEP / Bureau of Air Quality	No violations or findings.
RCRA Compliance Evaluation Inspection	Scheduled for Nov 2009 but cancelled by NDEP	State of Nevada/NDEP/ Bureau of Federal Facilities	Cancelled
FY09 TTR ES&H SME Self-Assessment Walk-Through	08/03-07/2009	2950	No environmental issues documented.

**NOTES:** RCRA = Resource Conservation and Recovery Act  
 NDEP = Nevada Department of Environmental Protection  
 TTR = Tonopah Test Range  
 SME = Subject Matter Expert  
 ES&H = Environment, Safety, and Health

into Corrective Action Units (CAU), which are listed by Corrective Action Site (CAS) numbers. Each CAU/CAS is listed in the FFACO under Appendix II (Corrective Action Sites/Units, this section includes inactive CAU/CASs), Appendix III (Corrective Action Investigations/Corrective Actions, this section includes active CAU/CASs), and Appendix IV (Closed Corrective Action Units, this section lists CAU/CASs where corrective actions are complete). The FFACO is updated every six months. A listing of ER sites located at TTR is shown in Chapter 3, Table 3-1.

## 2.4 Environmental Permits

Environmental compliance permits for TTR include those for hazardous materials storage, potable water supply, RCRA, and Air Quality. The State of Nevada

issues permits for these Sandia activities directly to DOE/NNSA/SSO, and they are administered by WGI on behalf of Sandia. Sandia and WGI ensure that all permit conditions are met. Table 2-4 lists all permits and registrations in effect in 2009.

## 2.5 Occurrence Reporting

Under DOE Manual 231.1-2, an *occurrence* is defined as “one or more (i.e., recurring) events or conditions that adversely affect, or may adversely affect, DOE (including NNSA) or contractor personnel, the public, property, the environment, or the DOE mission.” Events or conditions meeting criteria thresholds identified in DOE Manual 231.1-2, or determined to be recurring through performance analysis, are considered occurrences. There are environmental

**TABLE 2-4.** 2009 Summary of Permits at TTR

Permit Type and Location	Permit Number	Issue Date	Expiration Date	Comments
<b>Air Quality Permits</b>				
Class II Air Quality Operation Permit	AP8733-0680.02	Original issue date: July 23, 2006 Reissue Date: December 11, 2007	July 23, 2011	1- 12' X 8' Portable Screen Welding Shops Carpenter Shop Paint Shop Non-Permit Equipment List Generators (10 emission units) Boilers (2 emission units) Maintenance Activities (5 emission units) Propane Storage Tanks (23 emission units) Surface Area Disturbance (> 5 acres)
<b>RCRA - Hazardous Waste</b>				
Hazardous Waste Generator	NV1890011991*	January 7, 1993	Indefinite	State of Nevada
<b>Stormwater Permit (Construction)</b>				
Storm water Discharge Permit	Site Number 10032	April 29, 2009	Until terminated	Gun Pit Grading Project
<b>Production Well (Drinking Water)</b>				
Well 6 Production Well	NY-3014-12NTNC	September 2009	September 2010**	State of Nevada
Permit to Operate a Treatment Plant	NY-3014-1112NTNC	September 2009	September 2010**	State of Nevada
<b>Nevada State Fire Marshal (Hazardous Material)</b>				
Hazardous Materials Permit	212 FDID Number (13007)	February 2009	February 28, 2010	Initial permit issuance.
<b>NPDES Construction Permits</b>				
Backfilling Horse Pond	SNL/NM – NV 10031	May 1, 2009	December 31, 2009	State of Nevada

**NOTES:** \*Generator ID number (not a permit number)

\*\*The State of Nevada Bureau of Health Protection Services renews the permit for Well 6 (NY-3014-12NC) annually.

“Emission units” are sources such as generators and boilers.

NTNC = Non-Transient Non-Community

releases that may not meet DOE Manual 231.1-2 reporting thresholds, however, they are still reportable to outside agencies. There was one reportable environmental occurrence in 2009 (Table 2-5).

***Follow-up on Wild Horses at TTR***

An Occurrence Report detailed the deaths of 71 wild horses in July 2007. The horses were from a herd that frequently drank from a man-made depression on a

dry lake bed controlled by Sandia. The deaths most likely came from natural nitrate sources concentrated by evaporation of the water within the depression during the heat of the summer. The DRI Publication containing details of this conclusion can be found in the *CY 2008 Annual Site Environmental Report for Tonopah Test Range, Nevada and Kauai Test Facility, Hawaii* (SNL 2009) as Appendix C. This depression was completely filled in with clean soils during 2009.

**TABLE 2-5.** DOE Manual 231.1-2 Reportable Environmental Occurrences at TTR, 2009

Month	Occurrence Significance Category	Reporting Criteria	Description
October	3	10(2)	During August 2009, the SNL/NM IH department performed silica sampling for several days during down-hole Joint Test Assembly excavation probing and recovery operations at TTR. One of the sample results exceeded the ACGIH TLV for silica. The worker whose results are in question wore a full face air purifying respirator when accomplishing high risk (visible dust, down-hole/probing) activities. When not wearing a respirator, the worker was a hands-on supervisor in the same area of operations as the other workers involved, having the same potential exposures. No task-specific monitoring was performed on the worker in question so it is impossible to tell if the TLV was exceeded when the worker was protected or un-protected. The only activities not shared with other workers who were sampled in the area of operation were when this one worker was protected wearing appropriate respiratory protection. Further industrial hygiene sampling is required to determine if respiratory protection is required for certain elements of visible dust down-hole/probing activities and associated support recovery operations.

**NOTES:** TLV = threshold limit value  
 IH = industrial hygiene  
 TTR = Tonopah Test Range  
 ACGIH = American Conference of Governmental Industrial Hygienists

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# TTR Environmental Programs Information

The Environmental Restoration (ER) Project, the Waste Management Program, and the National Environmental Policy Act (NEPA) Program are some of the programs and activities the Tonopah Test Range (TTR) utilizes to comply with various federal and state regulations, and U. Department of Energy (DOE) directives. Presidential Executive Orders (EO) and DOE guidance documents are also used to establish program criteria. These are discussed in this chapter. Refer to Chapter 4 for information on other programs, including terrestrial surveillance, drinking water, wastewater, and air quality programs.

## 3.1 ER Project Activities

The ER Project at 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 (HQ) and the Albuquerque and Nevada field offices to designate responsibility for all ER sites to DOE's Nevada Site Office (NSO). The National Nuclear Security Administration (NNSA) was established during 2000 and 2001. Today, responsibility for all ER sites resides with NNSA/NSO.

Since 1996, cleanup activities for sites located in the State of Nevada have been regulated by the Federal Facility Agreement and Consent Order (FFACO) of 1996 (as amended February 2008). The FFACO was negotiated between the State of Nevada, DOE Environmental Management, the U. S. Department of Defense (DoD), and DOE Legacy Management.

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

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

The FFACO is also discussed in Section 2.3 of this report.

CAUs located at TTR are addressed by two ER sub-projects:

- **Industrial Sites Project** – Sites historically used to support nuclear testing and Sandia Corporation (Sandia) activities. Industrial sites include historic septic systems, landfills, sewage lagoons, depleted uranium (DU) sites, and ordnance testing sites.
- **Soil Sites Project** – 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., DU and plutonium) and non-radiological constituents (e.g., munitions, solvents, pesticides, septic sludge, and heavy metals).

### CAS Identification

The initial identification, description, and listing of CASs at TTR were derived from the Preliminary Assessment (PA) and the Federal Facility Preliminary Assessment Review (FFPAR) (E&E, 1989). Twelve additional potential CASs, not included in the PA, were also identified, using the following methods:

- ER sites inventory processes
- Ordnance removal activities
- Geophysical surveys
- Former worker interviews
- Archive reviews
- Site visits
- Aerial radiological and multi-spectral surveys (1993 – 1996)

the remediation activities at the Clean Slate and Double Tracks sites (Project Roller Coaster) are discussed in Chapter 1. These sites are listed under Soil Sites CAUs/CASs in Table 3-1 as CAU 411, 412, 413, and 414.

Table 3-1 summarizes the existing Industrial Sites CAUs and CASs at TTR. The ER activities planned for these CASs range from “no activities currently planned” to “Nevada Department of Environmental Protection (NDEP)-approved closure.” The list of CASs and general information presented in Table 3-1 is contained in Appendices II, III, and IV of the FFACO (DoD/DOE/State of Nevada 1996).

### 2009 ER Activities

ER activities in 2009 were focused on planning activities for CAU 408 (Bomblet Target Area) and implementation of field activities towards investigation and remediation of CAU 408. No Resource Conservation and Recovery Act (RCRA) hazardous, Toxic Substances Control Act (TSCA), low-level waste, or mixed waste was disposed during ER activities in 2009.

CAU 408 (Bomblet Target Area) field remediation activities were initiated in July 2009 by NNSA/NSO. CAU 408 closure activities include:

- Clearing bomblet target areas at seven discrete targets, including
  - South Antelope Lake
  - Tomahawk Target 1
  - Tomahawk Target 2
  - Strategic Air Command Target 1
  - Strategic Air Command Target 2
  - Mid Target, and Flight Line Target
- Identification and remediation of disposal pits
- Collection of verification samples
- Removal of soil containing contaminants at concentrations above action levels.

RCRA hazardous waste was identified in the form of unexploded ordnance and stored on-site at CAU 408 during the 2009 remediation activities pending treatment through detonation to render the items explosively inert. No items were disposed or shipped for disposal during the 2009 ER activities.

CAU 408 closure activities are expected to be complete in September 2010.

## 3.2 Waste Management Programs

All waste generated at TTR, which excludes any waste generated by ER activities, is managed by Washington Group International (WGI) under the Waste Management Program. Waste categories include radioactive waste, RCRA-hazardous waste, other chemical waste, and non-hazardous solid waste. Waste minimization and recycling efforts are integrated into Waste Management Program activities.

Waste generated and shipped from TTR to approved facilities in 2009 was as follows:

<u>Waste Type</u>	<u>Weight</u>
RCRA hazardous waste	456 kg (1,003 lb)
Non-RCRA regulated	1,774 kg (3,903 lb)
Recycled material	6,038 kg (13,284 lb)
TSCA waste (Asbestos/ PCB)	1,282 kg (2,820 lb)
Radioactive waste	0 kg (0 lb)
<b>Sanitary landfill:</b>	
USAF Sanitary Landfill	15,827 kg (34,820 lb)
<b>Construction debris:</b>	
USAF Construction Landfill	7,636 kg (16,800 lb)
<b>Tires and scrap metal:</b>	
Apex Landfill (Salvage Yard Cleanup)	36,955 kg (81,300 lb)
<b>Hydrocarbon Contaminated Waste:</b>	
U.S. Ecology Landfill Beatty	0 kg (0 lb)

Notes: TSCA = Toxic Substances Control Act  
kg = kilogram  
lb = pound

**TABLE 3-1. NNSA/NSO ER Project TTR CAUs and CASs**

<b>Industrial Sites CAUs/CASs</b>		
<b>CAS Number</b>	<b>CAS Description</b>	<b>General Location</b>
<b>CAU 400 – Closed</b> Bomblet Pit and Five Points Landfill (TTR)		
TA-19-001-05PT	Ordnance Disposal Pit	Five Points Intersection
TA-55-001-TAB2	Ordnance Disposal Pit	Bunker 2 Road
<b>CAU 401 – Closed</b> Area 3 Gas Station Underground Storage Tank Site (TTR)		
03-02-003-0357	Underground Storage Tank, Gas	First Gas Station, Area 3
<b>CAU 402 – Closed</b> Area 3 Building 0353 Underground Storage Tank Site (TTR)		
03-02-001-0353	Underground Storage Tank, Diesel	Building 0353
<b>CAU 403 – Closed</b> Area 3 Second Gas Station Underground Storage Tank (TTR)		
03-02-004-0360	Underground Storage Tanks	Second Gas Station
<b>CAU 404 – Closed</b> Roller Coaster Lagoons and Trench (TTR)		
TA-03-001-TARC	Roller Coaster Lagoons	NW of Antelope Lake
TA-21-001-TARC	Roller Coaster N. Disposal Trench	NW of Antelope Lake
<b>CAU 405 – Closed</b> Area 3 Septic Systems (TTR)		
03-05-002-SW03	Septic Waste System	Area 3
03-05-002-SW04	Septic Waste System	Area 3
03-05-002-SW07	Septic Waste System	Area 3
<b>CAU 406 – Closed</b> Area 3 Building 03-74 & Building 03-58 Underground Discharge Points (TTR)		
03-51-002-0374	Heavy Duty Shop UDP, Sumps	Building 0374
03-51-003-0358	UPS Building UDP	UPS Building, Area 3
<b>CAU 407 – Closed</b> Roller Coaster RadSafe Area (TTR)		
TA-23-001-TARC	Roller Coaster RadSafe Area	NW of Antelope Lake
<b>CAU 408 – Remediation Phase</b> Bomblet Target Area (TTR)		
TA-55-002-TAB2	Bomblet Target Areas	Antelope Lake
<b>CAU 409 – Closed</b> Other Waste Sites (TTR)		
RG-24-001-RGCR	Battery Dump Site	Cactus Repeater
TA-53-001-TAB2	Septic Sludge Disposal Pit	Area 3
TA-53-002-TAB2	Septic Sludge Disposal Pit	Area 3

**TABLE 3-1. NNSA/NSO ER Project TTR CAUs and CASs 2009 Status (continued)**

<b>Industrial Sites CAUs/CASs</b>		
<b>CAS Number</b>	<b>CAS Description</b>	<b>General Location</b>
<b>CAU 410 – Closed</b> Waste Disposal Trenches (TTR)		
03-19-001	Waste Disposal Site	Bldg 0385-T
09-21-001-TA09	Disposal Trenches	Area 9
TA-19-002-TAB2	Debris Mound	Bunker 2
TA-21-002-TAAL	Disposal Trench	S Antelope Lake
TA-21-003-TANL	Disposal Trench	NEDS Lake
<b>CAU 423 – Closed</b> Area 3 Underground Discharge Point, Building 0360 (TTR)		
03-02-002-0308	Underground Discharge Point	Building 0360
<b>CAU 424 – Closed</b> Area 3 Landfill Complex (TTR)		
03-08-001-A301	Landfill Cell A3-1	Area 3 Landfill Complex
03-08-002-A302	Landfill Cell A3-2	Area 3 Landfill Complex
03-08-002-A303	Landfill Cell A3-3	Area 3 Landfill Complex
03-08-002-A304	Landfill Cell A3-4	Area 3 Landfill Complex
03-08-002-A305	Landfill Cell A3-5	Area 3 Landfill Complex
03-08-002-A306	Landfill Cell A3-6	Area 3 Landfill Complex
03-08-002-A307	Landfill Cell A3-7	Area 3 Landfill Complex
03-08-002-A308	Landfill Cell A3-8	Area 3 Landfill Complex
<b>CAU 425 – Closed</b> Area 9 Main Lake Construction Debris Disposal Area (TTR)		
09-08-001-TA09	Construction Debris Disposal Area	Area 9, Main Lake
<b>CAU 426 – Closed</b> Cactus Spring Waste Trenches (TTR)		
RG-08-001-RGCS	Waste Trenches	Cactus Spring Ranch
<b>CAU 427 – Closed</b> Area 3 Septic Waste Systems 2, 6 (TTR)		
03-05-002-SW02	Septic Waste System	Area 3
03-05-002-SW06	Septic Waste System	Area 3
<b>CAU 428 – Closed</b> Area 3 Septic Waste Systems 1, 5 (TTR)		
03-05-002-SW01	Septic Waste System	Area 3
03-05-002-SW05	Septic Waste System	Area 3

**TABLE 3-1. NNSA/NSO ER Project TTR CAUs and CASs 2009 Status (concluded)**

<b>Industrial Sites CAUs/CASs</b>		
<b>CAS Number</b>	<b>CAS Description</b>	<b>General Location</b>
<b>CAU 490 – Closed</b> Station 44 Burn Area (TTR)		
03-56-001-03BA	Fire Training Area	Area 3
03-58-001-03FN	Sandia Service Yard	Area 3
09-54-001-09L2	Gun Propellant Burn Area	Area 9
RG-56-001-RGBA	Station 44 Burn Area	Station 44
<b>CAU 495 – Closed</b> Unconfirmed JTA Sites (TTR)		
TA-55-006-09SE	Buried Artillery Round	Test Area
TA-55-007-09SE	Buried Artillery Round	Test Area
<b>CAU 496 – Closed</b> Buried Rocket Site – Antelope Lake (TTR)		
TA-55-008-TAAL	Buried Rocket	Antelope Lake
<b>CAU 499 – Closed</b> Hydrocarbon Spill Site, TTR		
RG-25-001-RD24	Radar 24 Diesel Spill Site	Radar 24 Site
<b>Soil Sites CAUs/CASs:</b>		
<b>CAU 411 – Interim Closure</b> Double Tracks Plutonium Dispersion (Nellis)		
NAFR-23-01	Pu Contaminated Soil	Nellis Range 71
<b>CAU 412 – Interim Closure</b> Clean Slate I Plutonium Dispersion (TTR)		
TA-23-01CS	Pu Contaminated Soil	Tonopah Test Range
<b>CAU 413 – Remediation Phase</b> Clean Slate II Plutonium Dispersion (TTR)		
TA-23-02CS	Pu Contaminated Soil	Tonopah Test Range
<b>CAU 414 – Not Started</b> Clean Slate III Plutonium Dispersion (TTR)		
TA-23-03CS	Pu Contaminated Soil	Tonopah Test Range

**SOURCE:** FFAO, 1996 and ongoing updates

**NOTES:** CAS = Corrective Action Site  
 CAU = Corrective Action Unit  
 DOE = U.S. Department of Energy  
 DU = depleted uranium  
 ER = Environmental Restoration  
 JTA = Joint Test Assembly  
 NEDS = Non-Explosive Destruction Site  
 NNSA = National Nuclear Security Administration

NSO = Nevada Site Office  
 Pu = plutonium  
 TTR = Tonopah Test Range  
 UDP = underground discharge point  
 UST = underground storage tank  
 UXO = unexploded ordnance  
 WWII = World War II

All regulated waste was shipped off-site to permitted treatment, storage, and disposal (TSD) facilities.

#### ***Waste Minimization Program***

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

- Solvents
- E-Waste - computers, monitors, radios, Electronics, etc.
- Fuels and oil
- Antifreeze (on-site recycling unit)
- Lead acid batteries
- Freon (on-site recovery unit)
- Fluorescent and sodium bulbs
- Mercury containing equipment

Recyclables and used oil were sent for recycling or disposed of through the waste disposal contractor. Recycled or energy-recovered quantities shipped off-site in 2009 are presented in Table 3-2.

#### ***Radioactive Waste Management***

There were no shipments of radioactive waste in 2009; however a cobalt 60 source that had been used for non-destructive radiography operations was shipped back to the manufacturer for recycling/reuse. There is no longer a need to maintain a radiographic source on-site.

### ***3.3 Spill Prevention Control and Countermeasures (SPCC) Plan***

The *SPCC Plan for SNL Tonopah Test Range* (SNL 2004) pertains to oil storage equipment and secondary containments subject to 40 Code of Federal Regulations (CFR) 112, *Oil Pollution Prevention*, and 40 CFR 110, *Discharge of Oil*.

There are 11 aboveground storage tanks (AST), two bulk storage areas (BSA), and one transformer storage area that are covered by the SPCC Plan at TTR.

### ***3.4 National Environmental Policy Act (NEPA) Program***

#### ***NEPA Activities at TTR***

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

The Final Environmental Impact Statement (EIS) for Nevada Test Site (NTS) and off-site locations in the State of Nevada, which includes TTR, was completed in 1996; the DOE Record of Decision (ROD) was issued on December 9, 1996 (DOE 1996).

#### ***2009 NEPA Documentation***

The SNL/NM NEPA Team completed one DOE NEPA checklist for TTR in 2009, which was transmitted to DOE/NNSA/SSO for review and determination.

As described in the 07/24/09 Federal Register Notice of Intent, NNSA is preparing a new site-wide environmental impact statement (SWEIS) (DOE/EIS-0426) for the continued operation of DOE/NNSA activities at NTS and certain off-site locations, e.g., the Nevada Test and Training Range (NTTR), including activities at TTR (74 FR 36691) (DOE/NNSA 2009). The new NTS SWEIS will consider a No Action Alternative, which is to continue current operations through implementation of the 1996 Record of Decision (ROD) (61 FR 65551, December 13, 1996) (DOE 1999a), and subsequent decisions. The three action alternatives proposed for consideration in the SWEIS would be compared to the No Action Alternative. The three action alternatives would differ by either their type or level of ongoing operations, and may include proposals for new operations, or the reduction or elimination of certain operations. NNSA expects to issue the draft NTS SWEIS for public review in mid-2010. SSO, TTR personnel, and the SNL/NM NEPA Team supported ongoing NTS SWEIS data calls for TTR in 2009.

**TABLE 3-2.** Recycled or Energy-Recovered Quantities Shipped Off-Site in 2009

Categories of Waste Recycled or Energy-Recovered	Shipped (lb)	Shipped (kg)
NAPA Auto Batteries Recycled	8,290	3,768
Used Oil	671	305
Combustible Liquid NOS	132	60
Batteries Wet Filled with Acid (Lead Acid)	420	191
Batteries Dry (Alkaline)	352	160
Electronic Equipment	11,616	5,280
Fluorescent Lights	326	148
Incandescent Bulbs	57	26
Batteries (Nicad)	145	66
Photographic Fixer	40	18
Non-PCB Ballasts	134	61
Lithium Batteries	26	12
<b>TOTALS</b>	<b>22,209</b>	<b>10,095</b>

**NOTES:** The lb or kg column weights are provided for convenience and indicate the same recycled material.  
 lb = pound  
 kg = kilogram

### 3.5 Environmental Monitoring Performed By Outside Agencies

In addition to Sandia, other entities perform environmental monitoring activities at TTR, as described below.

#### *U.S. Environmental Protection Agency (EPA)*

The EPA Environmental Monitoring Systems Laboratory in Las Vegas, Nevada monitored background radiation in the area of TTR as part of its *Off-site Radiation Monitoring Reports Program* (EPA 1999), which is now being conducted by DRI.

#### *DRI, University of Nevada System*

The DRI trains and provides monitoring station managers to run the EPA air monitoring equipment set up at locations within the local community, including the towns of Tonopah and Goldfield. The EPA laboratory in Las Vegas, Nevada provides the equipment and performs the analysis and reporting.

The DRI also provides external quality assurance (QA) on field measurements taken by the EPA at these community monitoring stations. DRI monitors selected locations concurrently using a portable monitoring station (PMS) and thermoluminescent

dosimeters (TLD). The DRI's Community Radiation Monitoring Program Annual Report is part of the *NTS Annual Site Environmental Report (ASER)* (DOE 2009).

The DRI also performs other monitoring as requested by the DOE, such as archeological surveys. No archeological surveys were requested in 2009.

#### *WGI*

As part of its TTR support activities, WGI personnel perform environmental monitoring activities for DOE and/or SNL/NM when needed. This can include:

- Drinking water and wastewater sampling (details can be found in Section 4.3);
- National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 Code of Federal Regulations (CFR) 61, Subpart H (radionuclides), air quality monitoring;
- Soil sampling and site characterization of spill sites;
- Waste sampling and characterization; and
- ER support activities.

### 3.6 Summary of Release Reporting

The following four release reporting documents must be submitted to external regulatory agencies if releases exceed applicable threshold quantities (TQ):

- *NESHAP Annual Report for CY 2009, SNL/NV* (SNL 2010) requires that an annual report be submitted from each DOE/NNSA site where facility sources contribute a public dose of over 0.1 millirems per year (mrem/yr). The NESHAP report must be submitted to EPA by June 30th

each year following the reporting year. The report includes the calculated effective dose equivalent (EDE) in mrem/yr for the maximally exposed individual (MEI).

- *State of Nevada Extremely Hazardous Material Reporting Requirements* – This is not currently required since extremely hazardous materials are not used during TTR routine operations.
- *Toxic Chemical Release Reporting Community Right-to-Know: Calendar Year 2009* (SNL 2010a) was submitted for lead released at the TTR firing range.



# TTR Terrestrial and Ecological Surveillance

## 4.1 Terrestrial Surveillance

Terrestrial surveillance is conducted at the Tonopah Test Range (TTR) to detect the possible migration of contaminants to off-site locations, and to determine the potential impact of TTR operations on human health and the environment.

### 4.1.1 Program Objectives

The objectives of the Terrestrial Surveillance Program can be summarized by the following excerpts of requirements given in U.S. Department of Energy (DOE) Order 450.1A, *Environmental Protection Program* (DOE 2008):

- Collect and analyze samples to characterize environmental conditions and define increasing or decreasing trends,
- Establish background levels of pollutants to define baseline conditions (off-site sampling),
- Provide continuing assessment of pollution abatement programs,
- Identify and quantify new or existing environmental quality problems and their potential impacts, if any, and
- Verify compliance with applicable environmental laws and regulations and commitments made in National Environmental Policy Act (NEPA) documents such as Environmental Impact Statements (EIS), as well as other official documents.

### 4.1.2 Regulatory Standards and Comparisons

The Terrestrial Surveillance Program is designed and conducted in accordance with the requirements of DOE Order 450.1A, *Environmental Protection Program* (DOE 2008). Concentration limits for radionuclides and metals in terrestrial media are not well defined. However, the terrestrial surveillance coordinator

does compare the results from on-site and perimeter locations to on-site results to determine what impact, if any, TTR operations has on the environment. In addition, sample results for metals in surface soils are compared to U.S. surface soil average concentrations that are published in *Trace Elements in Soils and Plants* (Kabata-Pendias 2000) or local/regional surface soil average concentrations that are published in *Elements in North American Soils* (Dragun and Chekiri 2005).

A summary report of metals in soils at TTR has been prepared and will serve as another point of reference (SNL 2006). This report was an appendix in the 2006 ASER.

### 4.1.3 Statistical Analyses

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

The results of the statistical analyses allow for prioritization of sample locations for possible follow-up action. The prioritization process is a decision making tool to assist in determining the appropriate level of concern for each sample result. The *Statistical Analysis Prioritization Method* (Shyr, Herrera, and Haaker 1998) is based on two "Yes or No" questions resulting in a matrix of four priority levels (Table 4-1). In addition, a qualitative, visual inspection of a graphical presentation of the data is conducted to

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

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

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

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

compare sampling results to local/regional and site-specific concentrations. This step is performed to ensure that anomalous data that would otherwise pass statistical scrutiny is flagged for further investigation.

In some instances, this qualitative inspection of the data is augmented by the graphical evaluation methodology as discussed in the metals-in-soil summary report (SNL 2006). This enables the visual identification of anomalies in the data that stand out from the data population for the entire site, or for just that location. This is particularly useful where insufficient data exists for trending, but comparison of new data to “expected values” is desired. Until this year, there have been no terrestrial sample results that have indicated a significant level of concern (Priority-1) that would trigger actions at locations that are not already being addressed by the Environmental Restoration (ER) Project. In 2009 Am-241 at S-51 was identified as Priority-1, and will be investigated by additional sampling in 2010.

In 2000, Sandia National Laboratories, New Mexico (SNL/NM) personnel changed analytical laboratories for lower (better) detection capabilities for many of the metals and radiological analyses. As a result, a large number of false decreasing trends were noted for many of the parameters when the whole data set was analyzed. The analysis in 2009 utilized data from the same analytical laboratory for the ten-year period.

#### 4.1.4 Sampling Locations

Terrestrial surveillance began at TTR in 1992. In addition to routine sampling, a large-scale baseline sampling was performed in 1994 in areas where Sandia

Corporation (Sandia) activities had a long-term or continued presence.

Routine terrestrial surveillance is conducted at on-site, perimeter, and off-site locations that remain essentially the same from year to year. The sampling locations, number of samples, and analyses performed are prioritized based on the following criteria:

- On-site locations are near areas of known contamination, potential sources of contamination, or in areas where contamination, if present, would be expected to accumulate (such as in the vicinity of ER sites). A list of on-site sampling locations is shown in Table 4-2. Maps of the on-site sampling locations are shown in Appendix A, Figures A-4 and A-5.
- Off-site locations are selected to provide a measurement of environmental conditions unaffected by TTR activities. Data collected from off-site locations serve as a reference point to compare data collected at perimeter and on-site locations. Multiple years of sampling data are compiled to determine statistical averages for off-site concentrations. Off-site locations are chosen both in remote, natural settings and in areas near local population centers and along highways. Table 4-3 contains a list of the off-site sample locations, and a map of these locations is shown in Appendix A, Figure A-6.
- Perimeter locations are selected to establish if contaminants are migrating either onto or off of TTR property. A list of perimeter sampling locations is shown in Table 4-4. A map of

**TABLE 4-2. On-Site Terrestrial Surveillance Locations at TTR**

Location	Location Number	Sample Location	Soil Sampling	Replicate*	TLD
Range Operations Center	S-40	Waste Water Monitoring Station	X		
	S-41	"Danger Powerline Crossing" Sign	X		
	S-42	Main Road/Edward's Freeway	X		
	S-43	Southwest Corner of Sandia Corporation, TTR Operation Center	X		
	S-44	Northeast Corner of Sandia Corporation, TTR Operation Center	X		
	S-45	Storage Shelters 03-38 and 03-39	X		
	S-46	Sand Building	X		
	S-47	Generator Storage Area	X		
South Plume Area	S-48	North/South Mellan Airstrip - Antelope Tuff	X	X	
	S-49	North/South Mellan Airstrip - Southwest of S-48	X		
	S-50	North/South Mellan Airstrip - sign post	X		
	S-51	North/South Mellan Airstrip – Northeast of S-50	X		
	S-52	Northeast of Northwest/Southeast Mellan Airstrip	X		
Various On-Site	S-01	Antelope Lake Area Fence, Cultural Area Sign			X
	S-02	North/South Mellan Airstrip (TLD at South fence post)	X		X
	S-03	TLD at Clean Slate 2	X	X	X
	S-04	TLD at Clean Slate 3	X		X
	S-09	Roller Coaster Decon	X	X	X
	S-10	Brownes Road/Denton Freeway	X		X
	S-13	Area 3 between Bldg 100 and Caution Sign			X
	S-14	Area 3 CP Southwest side of fence			X
	S-15	Moody Ave. 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 - Metal Scrap Pile	X		
	S-39	Mellan Hill - North	X		
	S-53	Main Road/Lake Road SE	X		

NOTES: TTR = Tonopah Test Range  
TLD = Thermoluminescent Dosimeter

\* In addition to single samples taken for each location, two replicated samples are collected for internal checks on comparability of sampling and analysis.

the perimeter sampling locations is shown in Appendix A, Figure A-7. All perimeter locations are in areas which Sandia does not control access.

#### 4.1.5 Radiological Parameters and Results

Soil is the only terrestrial medium sampled at TTR. There are no bodies of water other than the playa lakes – dry lake beds with only occasional standing

water. Vegetation is scarce. Soil samples are collected to ascertain the presence of air-deposited pollutants or contaminants that have been transported and deposited as a result of surface water runoff. Samples are collected from the top two inches of soil using a hand trowel. The 2009 analytical results are found in Appendix B of this report and are summarized in this section. The detailed statistical analyses are documented in the *Tonopah Test Range Data Analysis in Support of the Annual Site Environmental Report, 2009* (SNL 2010b).

Location	Location Number	Sample Location	Soil Sampling	Replicate*	TLD
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	X
	P-12	TLD at "US Gov't Property" Sign	X		X
	P-34	O & M Complex - Owan Dr. Post	X		
	P-35	Cactus Springs (north fence post)	X		
	P-36	On-Base Housing (NE fence line)	X		
	P-37	On-Base Housing (guard station)	X		

**NOTES:** TTR = Tonopah Test Range  
TLD = Thermoluminescent Dosimeter  
\* In addition to single samples taken for each location, two replicated samples are collected for internal checks on comparability of sampling

Radiological parameters include gamma-emitting radionuclides, plutonium and uranium and described below:

- 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 (as fallout from historical nuclear weapons testing). Other gamma-emitters of interest at 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 TTR. One of the indicators of the presence of weapons-grade plutonium is radionuclide Americium-241. Isotopic plutonium analysis is sometimes 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 due to past testing conducted at TTR. Total uranium analysis is used to measure all uranium isotopes present in a sample. A total uranium measurement may trigger an isotope-specific analysis to determine the possible source of uranium (i.e., natural, man-made, enriched, or depleted).
- External gamma radiation exposure rates – Thermoluminescent dosimeters (TLD) are used to measure ambient gamma exposure rates. Several natural gamma radiation sources exist, including cosmic radiation and radioactive materials that exist in geologic materials at TTR. The TLD network was established to determine the regional gamma exposure rate due to natural sources and to determine the impact, if any, of Sandia operations on those levels. The dosimeters are placed on aluminum poles, at a height of approximately one meter, and are exchanged and measured quarterly (January, April, July, and October) at 20 on-site, perimeter, and off-site locations.

### ***Radiological Results***

The results of the statistical analysis revealed that one on-site or perimeter location was both higher than off-site and with an increasing trend (Priority-1). Overall summary statistics for all radiological results are presented in Table 4-5. Americium-241 and Plutonium-239/240 showed two locations (S-51 and S-09) as Priority-2 (higher than off-site). The Priority-2 locations, along with the associated summary statistics, are listed in Table 4-6. One radiological analyte, Americium-241, showed Priority-3 (increasing trend) at S-51. Since it is also higher than off-site, it is categorized as Priority-1 as well. This is discussed below. The radiological analytes (Americium-241 and Plutonium-239/240) are discussed in the section below that lists the locations showing Priority-1/Priority-2 and Priority-3. The Priority-1/Priority-3 location, along with the associated summary statistics, are listed in Table 4-7.

The respective radiological analytes are discussed in the following sections, which list the locations showing either Priority-2 or Priority-3.

#### **Americium-241**

One on-site location (S-51) was identified as Priority-1, since it has an increasing trend and it is higher than off-site. The historical results can be seen in Figure 4-1. It will undergo special additional sampling in 2010 to obtain a better understanding of the Am-241 and Pu-239/240 at this location. One on-site location (S-09) continues to be identified as Priority-2 (higher than off-site). S-09 is located near the Roller Coaster Decon site. The maximum result for this location was recorded in 2000 and is 3.58 picocuries per gram (pCi/g). No other on-site locations were identified as Priority-2. No perimeter location was identified as Priority-2 or Priority-3 (increasing trend).

#### **Plutonium-239/240**

Two on-site locations (S-09 and S-51) continue to be identified as Priority-2 (higher than off-site). Location S-09 is located near the Roller Coaster Decon site and S-51 is in the “South Plume” near the Mellan Airstrip. The maximum result recorded at S-09 in 2003 was 4.92 pCi/g and the maximum recorded at S-51 was 130.0 pCi/g in 2009. No other on-site locations were identified as Priority-2. The location in the “South Plume Area” is expected to have elevated readings. However, this year’s observation justifies additional sampling in 2010 to better understand the

**TABLE 4-5. Summary Statistics for Soil Locations, 2000 – 2009 (All units in pCi/g unless otherwise noted)**

Analyte	Class	Size	Average	Median	Std Dev	Minimum	Maximum
<b>Americium-241</b>	Perimeter	78	0.01388	0.02030	0.0606	-0.23700	0.121
	On-Site	211	0.19674	0.03630	0.6771	-0.23100	4.410
	Off-Site	140	0.01359	0.01730	0.0487	-0.20200	0.125
<b>Cesium-137</b>	Perimeter	78	0.20154	0.16150	0.1547	0.01220	0.885
	On-Site	211	0.25418	0.25200	0.1838	0.00000	0.886
	Off-Site	140	0.22293	0.17550	0.1638	0.00000	0.930
<b>Plutonium-238</b>	Perimeter	16	0.00429	0.00341	0.0079	-0.00559	0.028
	On-Site	76	0.03122	0.00769	0.1361	-0.01020	1.190
	Off-Site	34	0.00277	0.00094	0.0055	-0.00367	0.024
<b>Plutonium-239/240</b>	Perimeter	16	0.01925	0.01600	0.0170	0.00137	0.065
	On-Site	76	2.77812	0.14450	14.9598	-0.00816	130.000
	Off-Site	34	0.01419	0.01095	0.0132	-0.00110	0.054
<b>Plutonium-242</b>	On-Site	5	3.51200	3.49000	0.0319	3.49000	3.560
<b>Uranium</b>	Perimeter	62	0.71906	0.69700	0.1773	0.48300	1.490
	On-Site	185	0.72514	0.70800	0.1524	0.42600	1.510
	Off-Site	112	0.75589	0.69700	0.2053	0.46300	1.550
<b>Uranium-235</b>	Perimeter	78	0.08148	0.07890	0.0580	-0.05920	0.252
	On-Site	211	0.09146	0.08290	0.0621	-0.04500	0.389
	Off-Site	140	0.08478	0.07865	0.0611	-0.09990	0.293
<b>Uranium-238</b>	Perimeter	78	1.15929	1.17000	0.5450	0.00287	2.650
	On-Site	211	1.24369	1.15000	0.5333	0.03240	3.130
	Off-Site	140	1.24534	1.16000	0.5370	0.17800	2.960

NOTES: pCi/g = picocurie per gram  
Std Dev = Standard Deviation

**TABLE 4-6. Summary Statistics for Soil Locations Noted as Priority-1 and Priority-2 (all units in pCi/g unless otherwise noted).**

Analyte	Location	Sample Size	2009 Result	Average	Median	Std Dev	Minimum	Maximum
<b>Americium-241</b>	S-09	10	2.73	1.60	1.09	1.22	0.47	3.58
	S-51*	10	4.27	1.67	0.69	1.98	-0.01	4.41
<b>Plutonium-239/240</b>	S-09	7	11.3	4.67	3.57	3.00	2.77	11.3
	S-51	5	130	29.74	4.87	56.16	0.15	130

NOTES: pCi/g = picocurie per gram  
Std Dev = Standard Deviation  
\* Since S-51 is both higher than off-site and exhibits an increasing trend, it is also designated Priority-1 for Am-241.

**TABLE 4-7. Summary Statistics for Soil Locations Noted as Priority-1 and Priority-3 (all units in pCi/g unless otherwise noted.)**

Analyte	Location	Sample Size	Average	Median	Std Dev	Minimum	Maximum
<b>Americium-241</b>	S-51*	10	1.67	0.69	1.98	-0.01	4.41

NOTES: \* Since S-51 is both higher than off-site and exhibits an increasing trend, it is also designated Priority-1.

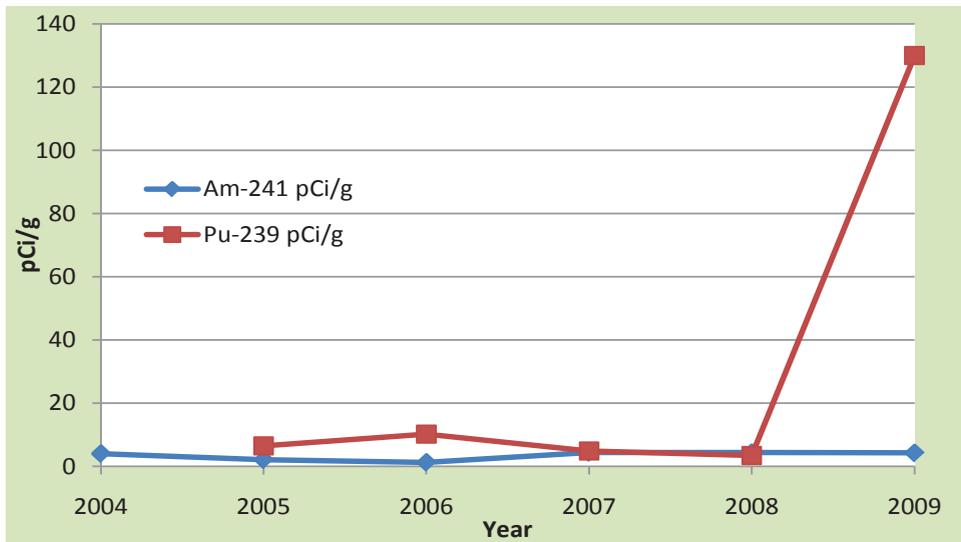


FIGURE 4.1. Historical Pu-239 and Am-241 concentrations at the S-51 site

significance of this single sample. It may simply be attributed to a sample that contained a “hot particle” or a generalized trend of increased mobilization and migration of Plutonium-239/240 at the S-51 site. Additional sampling in 2010 will further investigate this possibility. No perimeter location was identified as Priority-2 (higher than off-site) or Priority-3 (increasing trend).

**TLD Results**

Sampling for 2009 was conducted from January 2009 through January 2010. When a TLD location has a missing quarter, the data is not included in the summary statistics (there were no missing TLDs in 2009). Summary statistics for the past ten years are shown in Table 4-8. On-site and perimeter locations were statistically different from off-site (community) locations. Off-site locations are statistically lower than either on-site or perimeter locations. There is no remarkable difference between any of the annual groupings of the data. Figure 4-2 graphically portrays the TLD results from 2000 through 2009. TLD results and TLD measurements, by quarter and location type, for 2009 are shown in Appendix B.

**4.1.6 Non-Radiological Parameters and Results**

In 2009, soils for locations listed in Tables 4-2, 4-3 and 4-4 were not analyzed for non-radiological constituents since they were sampled in 2008; however, all historical non-radiological soil analyses

were analyzed and reported in a summary report (SNL 2006). Toxic analyte list (TAL) metals analyses are planned every three to five years. The next planned routine sampling will occur in 2013. Although 2009 was not a scheduled year for collection of TAL metals, soil samples were collected in 2009 for lead only at the active TTR Firing Range at the request of the SNL/TTR Range Manager. These sample results are shown in Figure 4-3 and tabulated in Table 4-9. If the Firing Range were to close at some point in the future these results will be considered when determining the final disposition of the firing range.

**4.2 WATER MONITORING**

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

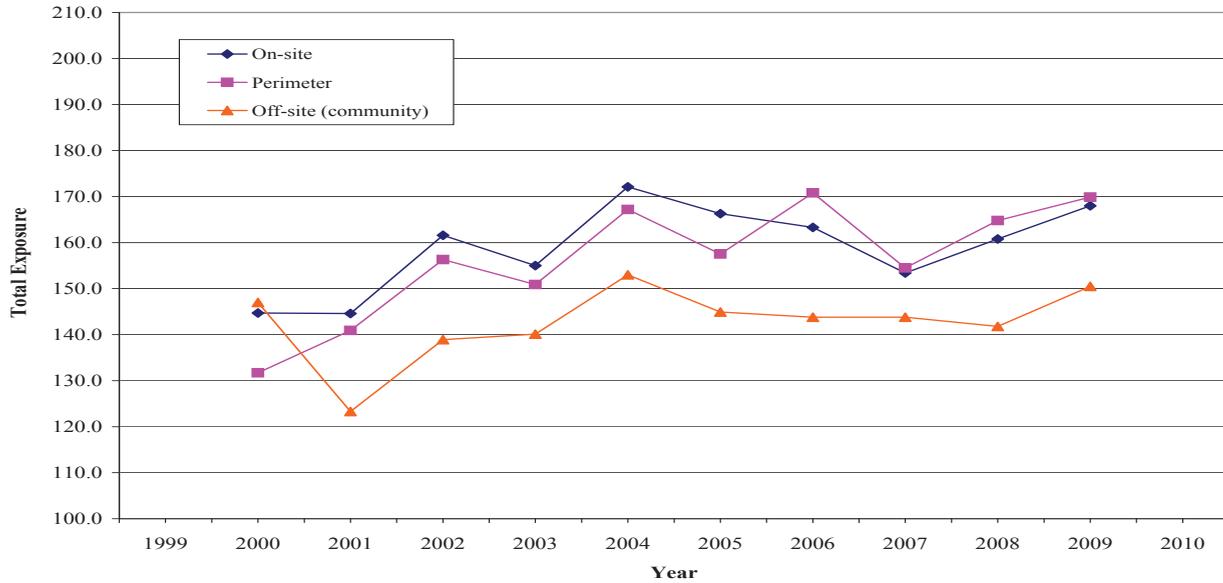
**4.2.1 Production Well Monitoring**

There are three active wells used by TTR: Production Well 6, Well 7, and the Roller Coaster Well. The most active are Production Well 6 and the Roller Coaster Well. Production Well 6, supplies drinking water to the TTR Main Compound in Area 3, and is the only well 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), and there are no regulatory sampling requirements.

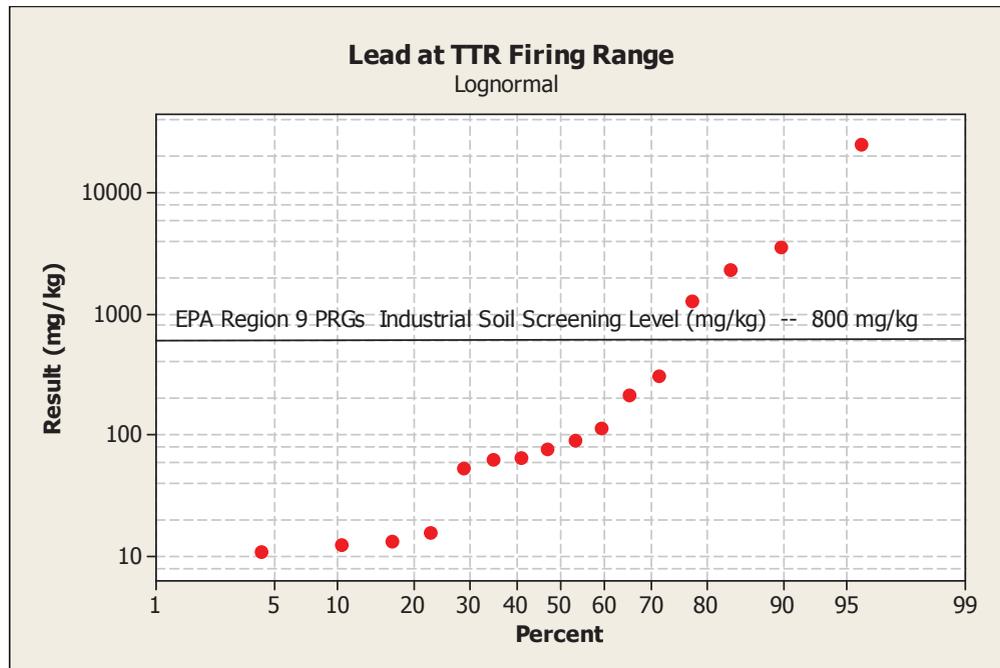
**TABLE 4-8.** Summary Statistics for TLDs by Location Class, 2000 - 2009 (all units in mrem unless otherwise noted)

Location Class	Sample Size	Average	Median	Std Dev	Minimum	Maximum
On-site	100	158.7	158.2	14.6	132.4	228.8
Perimeter	55	156.3	156.6	17.7	100.0	216.0
Off-site (community)	31	142.2	144.8	15.2	105.1	163.2

NOTES: mrem = millirem  
Std Dev = Standard deviation



**FIGURE 4-2.** Tonopah Test Range TLD Exposure, 2000-2009



**FIGURE 4-3.** Tonopah Test Range Firing Range Results

**TABLE 4-9. Lead in Soil at Former Firing Range**

Analyte	Concentration (mg/kg)					NV Soil Concentrations (mg/kg) <sup>1</sup>		EPA Region 9 PRGs Soil Screening Levels (mg/kg) <sup>2</sup>	
	Mean	Std Dev	Minimum	Median	Maximum	Lower Limit	Upper Limit	Residential	Industrial
Lead	2,102	6,320	11	82	25,550	< 10	700	400	800

NOTES: (1) Dragun and Chekiri, Elements in North American Soils, 2005, Hazardous Materials Control Resources Institute, (used Nevada Soils to determine values).  
 (2) EPA Region 9, Regional Screening Levels (EPA 2010a).

All sampling is conducted in accordance with requirements set by the state (State of Nevada 1997). Analytes are sampled at different intervals, as shown in Table 4-10. NDEP currently provides Public Monitoring & Reporting Requirements for each PWS around May of each year.

Sampled parameters included (but were not limited to) Total Coliform, Arsenic, Nitrates, Total Trihalomethanes/Haloacetic Acids, Copper & Lead, Phthalate, and Secondary 13 Samples.

The pH of the raw water is required to be between 6.5 and 7.0 on the pH scale for proper operation of the arsenic removal system.

***Production Well Monitoring Results***

There was one Drinking Water Public Notice issued to Area 3 personnel during 2009. It occurred in August during a water line repair and affected two buildings. A public notice was issued and total coliform samples were collected from the system on two consecutive days with no coliform bacteria detected.

In 2009, all sample results were below the maximum contaminant levels (MCL) established for the substances monitored. However, two of these substances did exceed the maximum contaminant level goals (MCLG) for disinfection by-products for the second year in a row. MCLGs of zero are established for bromodichloromethane (1 µg/L detected) and bromoform (4.9 µg/L detected). Total trihalomethanes (TTHM) and total haloacetic acid (HAA5) results are well below established MCLs. Lead sample 90<sup>th</sup> percentile results (0.018 mg/L) initially exceeded the action level of 0.015 mg/L but on resample are within the established action level limit indicating a 90<sup>th</sup> percentile level of 0.014 mg/L.

State of Nevada NDEP will require annual monitoring of copper and lead until it is determined that lead levels are maintained below a 90<sup>th</sup> percentile level of 0.015 mg/L.

Di (2-Ethylhexyl) Phthalate (DEHP) was not detected in the required 2009 sample. NDEP continues to require TTR to collect annual DEHP samples as it has been periodically detected in past monitoring results.

During 2009, Well 6 produced 833,000 gallons (gal) of water that was chlorinated and sent to the elevated water storage tower. This equals an average monthly production of approximately 70,000 gals during 2009. Daily production during 2009 averaged approximately 2,200 gals.

The arsenic removal system has performed very well since coming back on-line with the CO<sub>2</sub> (pH adjustment) system in June of 2008. All arsenic samples collected during the year were “non-detect for arsenic.”

During 2009 approximately 470,000 gals of water was treated to remove arsenic and sent to the drinking water distribution system. This equates to a monthly average of approximately 40,000 gals and a daily consumption rate of 1,300 gals.

A total of 522 lbs of carbon dioxide (CO<sub>2</sub>) was used during the year for pH adjustment (43 lbs per month or 1.4 lbs per day on average).

We believe approximately 250,000 gals of water was lost due to water line breaks in August and December and/or exercising of the fire hydrants/distributions system.

**TABLE 4-10.** Routine Production Well Monitoring at TTR

Analyte	Sampling Frequency
Total Coliform	Monthly
Arsenic	Monthly
Total Trihalomethanes/Haloacetic Acids (5)	Annually
Di (2-Ethylhexyl) Phthalate (DEHP) <i>also known as</i> Bis(2-ethylhexyl) phthalate	Annually
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/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 compounds  
 VOC = volatile organic compounds  
 SOC = synthetic organic compounds

#### 4.2.2 Water Conservation

The Water Conservation Plan for the Tonopah Test Range complies with State Water Resources Division regulations requiring a water conservation plan for permitted water systems and major water users in Nevada (DOE 1992).

#### 4.2.3 Sewage System and Septic Tank Monitoring

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

The USAF holds the National Pollutant Discharge Elimination System (NPDES) permit for its wastewater discharges. The USAF takes quarterly samples from the headwater end of the lagoon. In the past, Sandia provided quarterly sampling results to USAF for inclusion into their USAF Discharge Monitoring Report (DMR); 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 sample results to the USAF.

Forty-eight hour composite wastewater samples are collected on an annual basis and have the following parameters analyzed:

- Total cyanide (cyanide-containing compounds are not used at TTR)
- Potential of hydrogen (pH)
- Total Suspended Solids (TSS)
- Phenolic Compounds (phenol containing compounds are not used at TTR)
- Chemical oxygen demand (COD)
- Volatile Organic Compounds (VOC)
- Semi-volatile Organic Compounds (SVOC)
- Metals (arsenic, cadmium, chromium, copper, nickel, silver, zinc, lead, selenium, and mercury)
- Total Petroleum Hydrocarbons (TPH)
- Oil and grease
- Tritium, gamma spectroscopy, gross alpha/beta

All analytical results for wastewater sampled at Area 3 were within regulatory limits in 2009.

#### Septic Tank Systems

Septic tank systems are sampled as needed. There are now seven septic systems located on-site, which are owned by DOE/NNSA at TTR. These seven active septic tanks are used in remote locations and

are maintained by the TTR Facilities group. The sewage from these locations flows into septic tanks and associated drain fields. None of these systems required maintenance, sampling, or pumping in 2009. All other remaining septic systems have been closed or are undergoing closure and are being addressed by the ER Project.

#### 4.2.4 Storm Water Monitoring

Currently, Sandia has no requirement to perform storm water monitoring at TTR. All storm water issues and monitoring are managed by the USAF.

### 4.3 Radiological Air Monitoring

Air Quality Compliance (AQC) at TTR is met by adherence to specific permit conditions and local, state, and federal air regulations. Ambient air quality monitoring is not currently required at TTR. Ambient air monitoring was last conducted in 1996 to ascertain the level of radiological constituents in the air as discussed below.

Sandia operations at 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 re-suspension 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 re-suspension.

#### *NESHAP*

NESHAP, 40 CFR 61, Subpart H, National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities, has set a maximum of 10 millirems per year (mrem/yr) for all combined air emission pathway sources from any DOE/NNSA facility. Although the dose calculated from the Clean Slate sites is many times less than this standard, there was a question of whether the sites would require continuous radiological air monitoring.

The 1995 NESHAP report for TTR reported 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 1996). 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 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 1997). The dose assessment result from the continuous monitoring was 0.024 mrem/yr. This was about four times less than the 0.1 mrem/yr threshold cutoff for which continuous monitoring would be required by the EPA.

The average air concentration in curies per cubic meter (Ci/m<sup>3</sup>) were measured as follows:

Americium-241.....	4.1 x 10 <sup>-18</sup> Ci/m <sup>3</sup>
Plutonium-238.....	1.6 x 10 <sup>-18</sup> Ci/m <sup>3</sup>
Plutonium-239/240.....	9.5 x 10 <sup>-19</sup> Ci/m <sup>3</sup>

Although an annual calculated dose assessment is not required for the site, Sandia continues to produce an annual NESHAP report for TTR (SNL 2010).

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 4-11 summarizes these dose assessment results. Future 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.

### 4.4 Non-Radiological Air Emissions

TTR's Class II Air Quality Permit requires emission reports from significant non-radionuclide sources. At TTR, these sources include the portable screen and maintenance shop activities. Maintenance shop activities at TTR include the paint shop, welding shop and carpentry shops. In 2009, there were emissions from the portable screen and activities at the maintenance shop. The portable screen was operated for 28.4 hours during CY 2009, and contributed 0.002 tons of particulate matter (PM) emissions. The maintenance shop activities (painting, welding and woodworking) operated for a combined 477.5 hours or less during CY 2009 and contributed 0.23 tons of emissions (PM, hazardous air pollutants [HAPS] and volatile organic compounds [VOC]).

**TABLE 4-11.** Calculated Dose Assessment Results for On-Site Receptor

<b>Dose to Receptor</b>	<b>Location</b>	<b>1997 Measured Dose*</b>	<b>NESHAP Standard</b>	<b>Natural Background</b>
On-site Receptor (EDE to the MEI)	Airport TTR Area	0.024 mrem/yr (0.00024 mSv/yr)	10 mrem/yr (0.1 mSv/yr)	250 mrem/yr <sup>1</sup>

**NOTES:** \*Dose calculated from continuous monitoring February 1996 to February 1997.

EDE = effective dose equivalent

MEI = maximally exposed individual

mrem/yr = millirem per year

mSv/yr = millisievert per year

TTR = Tonopah Test Range

<sup>1</sup> Natural background is estimated at 250 mrem/yr nationwide.

# ASER for the Kauai Test Facility

Kauai Test Facility (KTF) is a government owned, contractor operated laboratory. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates KTF for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). KTF is operated as a rocket preparation, launching, and tracking facility for DOE/NNSA, as well as in support of other U.S. military agencies. The DOE/NNSA, Sandia Site Office (SSO) in Albuquerque, New Mexico administers the contract and oversees contractor operations at the site. KTF exists as a facility within the boundaries of the U.S. Department of Defense (DoD) Pacific Missile Range Facility (PMRF). KTF is located on the island of Kauai at the north end of the PMRF, near Nohili Point (Figure 5-1). This Annual Site Environmental Report (ASER) summarizes data and the compliance status of environmental protection and monitoring programs at KTF for Calendar Year (CY) 2009. This report was prepared in accordance with DOE Order 450.1A, *Environmental Protection Program* (DOE 2008) and DOE Manual 231.1A, *Environment, Safety, and Health Reporting* (DOE 2007).

## 5.1 Facilities and Operations

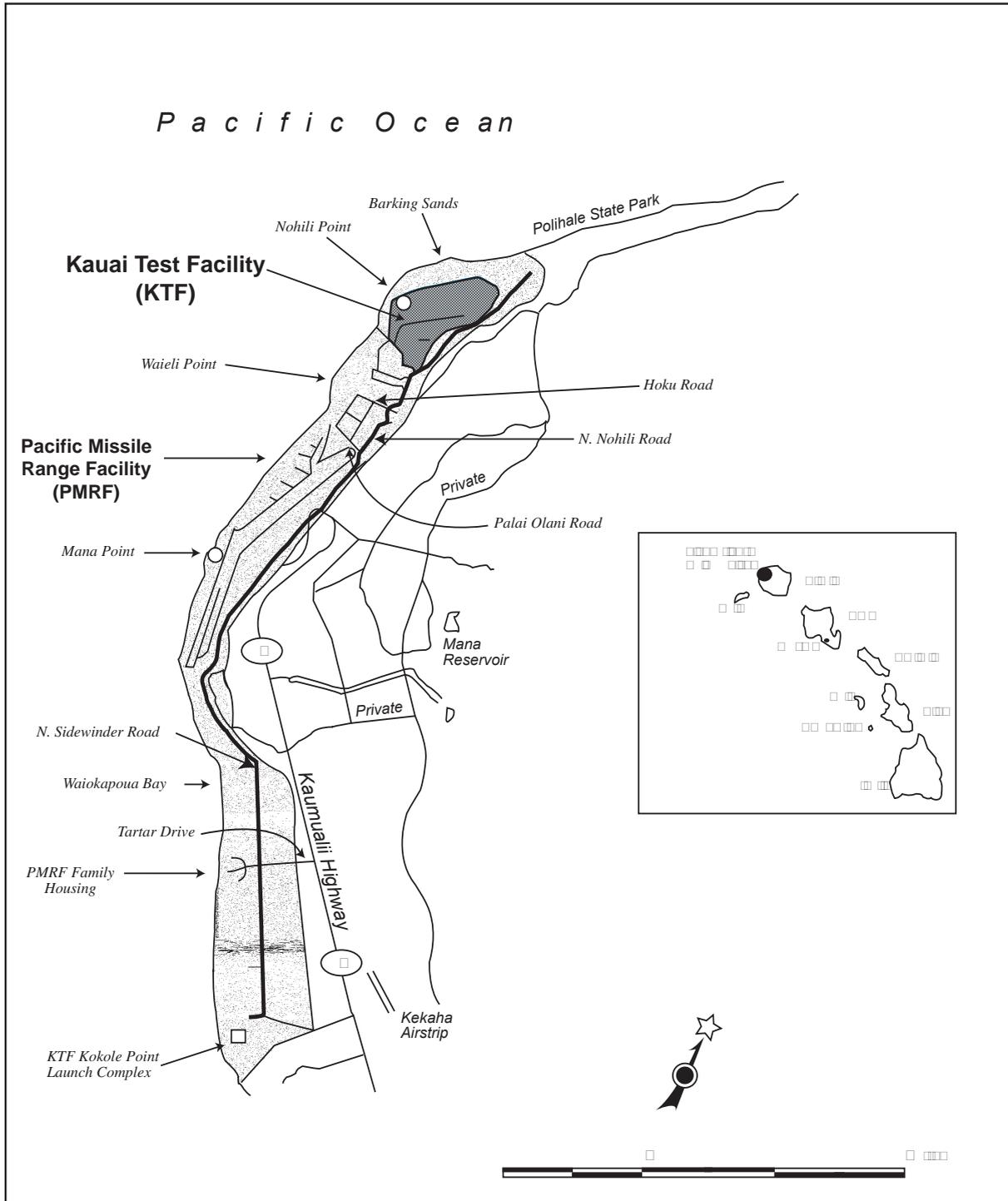
KTF has been an active rocket launching facility since 1962. The KTF and Remote Range Interfaces Department, under Sandia, manages and conducts rocket launching activities at KTF. The site is primarily used for testing rocket systems with scientific and technological payloads, advanced development of maneuvering re-entry vehicles, scientific studies of atmospheric and exoatmospheric phenomena, and Missile Defense Agency (MDA) programs. Nuclear devices have never been launched from KTF.

The first facilities at 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 (MST) to support DOE and MDA. From 1992 to 2009 there have been 45 launches.

The KTF launcher field was originally designed to accommodate 40 launch pads, but only 15 pads were constructed. Of these, 11 have had their launchers removed. Beyond the implementation of portions of the original plan, two additional launch pads were constructed: Pad 41 at Kokole Point and Pad 42 (the MST launch pad). The launcher field site has a number of permanent facilities used to support rocket operations. In addition to rocket launch pad sites, KTF facilities include missile assembly areas, data acquisition and operations facilities, a maintenance shop, and a trailer compound for administration and technical support personnel. Other features at KTF include extensive radar tracking and worldwide radio communication access to other DoD facilities.

The administrative area of KTF, known as the Main Compound, is located within a fenced area near the North Nohili access road from PMRF. Inside the fenced compound, a number of trailers and vans are connected together with a network of concrete docks and covered walkways. The majority of these temporary facilities are used during operational periods to support the field staff at KTF. During non-operational periods, general maintenance continues and dehumidifiers remain in operation (to protect equipment). Additionally, there are a number of permanent buildings and remote sites, most of which are in use year round to support and maintain KTF facilities:

- Mount Haleakala, Maui
- Kahilli Peak, Lihue-Koloa Forest Reserve, Kauai



**FIGURE 5-1.** Map of the Pacific Missile Range Facility (PMRF) and the Adjacent Area (The Kauai Test Facility [KTF] is to the north, near Nohili Point)

## 5.2 2009 Rocket Launches

There were seven rocket launches from KTF in 2009. The launches were covered by the KTF Environmental Assessment (EA), published in July 1992 (DOE 1992a) and the U.S. Navy, Hawaii Range Complex EIS (DoD 2008):

- AEGIS TBMD , FTM-17, FTX-06, July 30, 2009, (2 launches)
- AEGIS TBMD, JFTM-3 Events 1a,1b, October 13, 2009, (2 launches)
- AEGIS TBMD, FTX-06, Events 2, 3, October 16, 2009 (2 launches)
- AEGIS TBMD, JFTM-3 Event 3, October 27, 2009

## 5.3 Demographics

There are 15 permanent on-site personnel at KTF. During operational periods when rocket launches occur, an additional 15 to 130 persons from the U.S. mainland are brought to KTF (DOE 1992a). The closest population center to KTF is the town of Kekaha (population 3,300), which is eight miles from the site.

## 5.4 Compliance Summary

The list of regulations and statutes on page 5-4 provides an overview of the compliance status for Sandia operations at KTF in 2009. Table 5-1 lists the applicable permits in place at KTF.

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

CERCLA, also known as “Superfund,” addresses areas of past spills and releases. KTF has no current Environmental Restoration (ER) areas located on-site.

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

### *Superfund Amendments and Reauthorization Act (SARA)*

The SARA Title III amended CERCLA requirements for reportable quantity (RQ) releases and chemical inventory reporting as directed by the Emergency Planning and Community Right-to-Know Act (EPCRA), Sections 311 and 312. All required information has been submitted to the State of Hawaii. There were no reportable releases at KTF under EPCRA or CERCLA in 2009. Table 5-2 lists SARA Title III reporting requirements.

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

RCRA and the Hawaii Revised Statutes regulate the generation, transportation, treatment, storage, and disposal of hazardous chemical waste and non-hazardous solid wastes. Applicable regulations are listed in Chapter 6. Sandia generates some hazardous waste through normal operations at KTF; is classified as a “small quantity generator,” and is subject to the applicable requirements.

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

The FFCA 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 KTF do not generate mixed waste and Sandia currently has no mixed waste stored on site, therefore these requirements are not applicable.

### *National Environmental Policy Act (NEPA)*

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. Additionally, if a proposed action is determined to have environmentally “significant” impacts, the agency must prepare an environmental assessment (EA) or an environmental impact statement (EIS) before making an irrevocable commitment of resources or funding. Although a major objective of NEPA is to preserve the environment for future

## Major Environmental Regulations & Statutes Applicable to KTF

Regulation/Statute	Description	Where to go for more information
Clean Air Act (CAA) and CAA Amendments (CAAA)	Provides standards to protect the nation's air quality	<a href="http://www.epa.gov/air/caa/">http://www.epa.gov/air/caa/</a>
Clean Water Act (CWA)	Provides general water quality standards to protect the nation's water sources and byways	<a href="http://www.epa.gov/region09/water/">http://www.epa.gov/region09/water/</a>
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Provides federal funding for cleanup of inactive waste sites on the National Priorities List (NPL) and mandates requirements for reportable releases of hazardous substances	<a href="http://www.epa.gov/lawsregs/laws/cercla.html">http://www.epa.gov/lawsregs/laws/cercla.html</a>
Cultural Resources Acts	Includes various acts that protect archeological, historical, religious sites, and resources	<a href="http://recreation.usgs.gov/env_guide/cultural.html">http://recreation.usgs.gov/env_guide/cultural.html</a>
Endangered Species Act (ESA)	Provides special protection status for federally listed endangered or threatened species.	<a href="http://www.epa.gov/lawsregs/laws/esa.html">http://www.epa.gov/lawsregs/laws/esa.html</a>
Executive Orders (EO)	Several EOs provide specific protection for wetlands, floodplains, environmental justice in minority and low-income populations, and encourages greening the government through leadership in EM	<a href="http://www.archives.gov/federal-register/executive-orders/disposition.html">http://www.archives.gov/federal-register/executive-orders/disposition.html</a>
Federal Facility Compliance Act (FFCA)	Directs federal agencies regarding environmental compliance	<a href="http://www.hss.energy.gov/nuclearsafety/env/policy/">http://www.hss.energy.gov/nuclearsafety/env/policy/</a>
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Controls the distribution and use of various pesticides	<a href="http://www.epa.gov/lawsregs/laws/fifra.html">http://www.epa.gov/lawsregs/laws/fifra.html</a>
Migratory Bird Treaty Act (MBTA) of 1918	Prevents the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts, and nests	<a href="http://www.fws.gov/migratorybirds/RegulationsPolicies/treatlaw.html#mbta">http://www.fws.gov/migratorybirds/RegulationsPolicies/treatlaw.html#mbta</a>
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Specifies standards for radionuclide air emissions and other hazardous air releases under the CAA	<a href="http://www.epa.gov/radiation/neshaps/">http://www.epa.gov/radiation/neshaps/</a>
National Environmental Policy Act (NEPA)	Requires federal agencies to review all proposed activities so as to include environmental aspects in agency decision-making	<a href="http://nepa.energy.gov/">http://nepa.energy.gov/</a>
Resource Conservation and Recovery Act (RCRA)	Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks (USTs).	<a href="http://www.epa.gov/lawsregs/laws/rcra.html">http://www.epa.gov/lawsregs/laws/rcra.html</a>
Safe Drinking Water Act (SDWA)	Enacts specific health standards for drinking water sources	<a href="http://www.epa.gov/safewater/sdwa/sdwa.html">http://www.epa.gov/safewater/sdwa/sdwa.html</a>
Superfund Amendments and Reauthorization Act (SARA)	SARA, Title III, also known as the Emergency Planning and Community-Right-to-Know Act (EPCRA), mandates communication standards for hazardous materials over a threshold amount that are stored or used in a community	<a href="http://www.epa.gov/lawsregs/laws/epcra.html">http://www.epa.gov/lawsregs/laws/epcra.html</a>
Toxic Substance Control Act (TSCA)	Specifies rules for the manufacture, distribution, and disposal of specific toxic materials such as asbestos and polychlorinated biphenyls (PCBs)	<a href="http://www.epa.gov/compliance/civil/tscaindex.html">http://www.epa.gov/compliance/civil/tscaindex.html</a>

**TABLE 5-1. Permits in Place at KTF**

Type	Permit Number	Date Issued	Expiration Date	Regulatory Agency
Non-covered Source Permit (NSP) (two stand-by diesel generators)	NSP 0429-01-N	April 30, 2004	April 29, 2009	State of Hawaii
Resource Conservation and Recovery Act (RCRA)	HI-0000-363309	Sept. 23, 1994	Not specified	EPA Region IX and Hawaii Dept. of Health
Underground Storage Tank (UST) (2,500)	Not applicable	Sept. 13, 1991	Indefinite	EPA Region IX and Hawaii Dept. of Health

**NOTE:** In 1999, there was a change in reporting fuel throughput from annual reporting to biannual reporting to the State of Hawaii.  
 KTF = Sandia National Laboratories, Kauai Test Facility  
 EPA = U.S. Environmental Protection Agency  
 UST = Underground Storage Tank  
 The Non-covered Source Permit update was issued on March 3, 2009 (SNL 2010d).

**TABLE 5-2. 2009 SARA Title III (or EPCRA) Reporting Requirements Applicable to KTF**

Section	SARA Title III Section Title	Requires Reporting?		Description
		Yes	No	
302 - 303	Notification/ Plans	✓		Sandia Corporation submits an annual report listing chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 Appendix B, location of the chemicals and emergency contacts. The report is prepared for the DOE/NNSA/SSO, which distributes it to the required entities.
304	Emergency Notification		✓	No RQ releases of an EHS, or as defined under CERCLA occurred.
311-312	MSDSs/ Chemical Purchase Inventory Report	✓		There are two “Community Right-to-Know” reporting requirements: (a) KTF completes the EPA Tier II forms for all hazardous chemicals present at the facility at any one time in amounts equal to or greater than 10,000 lbs and for all EHSs present at the facility in an amount greater than or equal to 500 lbs or the Threshold Planning Quantity, whichever is lower; (b) KTF provides MSDSs for each chemical entry on a Tier II form unless it decides to comply with the EPA’s alternative MSDS reporting, which is detailed in 40 CFR Part 370.21.
313	Toxic Chemical Release Forms		✓	Sandia Corporation is below the reporting threshold in 2009 for producing a TRI Report for KTF operations.

**NOTES:** RQ = reportable quantity  
 KTF = Sandia National Laboratories, Kauai Test Facility  
 EPA = U.S. Environmental Protection Agency  
 SARA = Superfund Amendments and Reauthorization Act  
 EPCRA = Emergency Planning and Community Right-to-Know Act  
 MSDS = Material Safety Data Sheets (gives relevant chemical information)  
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act  
 DOE/NNSA/SSO = U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office  
 TRI = Toxic Release Inventory

generations, the law does not require an agency to choose a course of action with the least environmental impacts. Sandia National Laboratories, New Mexico (SNL/NM) coordinates NEPA compliance at KTF with DOE/NNSA/SSO.

#### ***Endangered Species Act (ESA)***

The ESA 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. The ESA is addressed under the NEPA Program and Ecology Program. If potentially significant impacts to sensitive species or habitats are found as a result of the proposed action, an EA or an EIS must be prepared.

Table 5-3 lists all threatened and endangered state and federal listed species occurring on the island of Kauai.

#### ***Cultural Resources Acts***

Three primary cultural resources acts applicable at KTF are as follows:

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

At KTF, cultural resources compliance is coordinated through the NEPA Program. Actions that could adversely affect cultural resources are initially analyzed in a NEPA review.

#### ***Migratory Bird Treaty Act (MBTA) of 1918***

The 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 accorded to species listed as threatened and endangered, most birds are protected under the MBTA of 1918, as amended. At KTF, the MBTA is coordinated with NEPA reviews and the Ecology Program.

#### ***Environmental Compliance Executive Orders (EO)***

The primary EOs related to environmental compliance at KTF are as follows (for additional information on these EOs see Section 2.1.14):

- 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, *Leadership in Environmental, Energy, and Economic Performance*

DOE directives applicable to KTF can be found in Chapter 6 of this report.

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

Ambient air quality is regulated by Hawaii Administrative Rules (HAR), Title 11, Chapter 59 under the jurisdiction of the Hawaii Department of Health, Clean Air Branch. Currently, there are no facilities at KTF that require federal air permits or compliance with the New Source Performance Standards (NSPS), Prevention of Significant Deterioration (PSD), or 40 CFR 61, National Emission Standards for Hazardous Air Pollutants (NESHAP). Within the boundaries of PMRF, no federal air emission permits are held either by DOE for KTF, or by DoD for PMRF. However, the two electrical generators at KTF are permitted for operation by the State of Hawaii under a “Non-covered Source Permit (NSP)” (SNL 2010d).

Rocket launches are mobile sources and do not require any reporting of reportable quantity (RQ) releases.

#### ***Clean Water Act (CWA)***

There were no compliance issues with respect to any state or federal water pollution regulations in 2009.

A National Pollutant Discharge Elimination System (NPDES) permit is not required due to the lack of significant storm water runoff discharging into “Waters of the U.S.” as defined in 40 CFR 122.

**TABLE 5-3. Threatened and Endangered Species Potentially Occurring on KTF**

Common Name	Scientific Name	Federal Status	State of HI Status
<b>PLANTS</b>			
Kuawawaenohu	<i>Alsinidendron lychnoides</i>	Endangered	Endangered
Kuawawaenohu	<i>Alsinidendron viscosum</i>	Endangered	Endangered
No common name	<i>Astelia waialealae</i>	Candidate	Candidate
No common name	<i>Bonamia menziesii</i>	Endangered	Endangered
Olulu	<i>Brighamia insignis</i>	Endangered	Endangered
No common name	<i>Canavalia napaliensis</i>	Candidate	Candidate
No common name	<i>Canavalia pubescens</i>	Candidate	Candidate
Awiji	<i>Centaurium sebaeoides</i>	Endangered	Endangered
No common name	<i>Chamaesyce eleanoriae</i>	Candidate	Candidate
No common name	<i>Chamaesyce halemanui</i>	Endangered	Endangered
No common name	<i>Chamaesyce remyi</i> var. <i>kauaiensis</i>	Candidate	Candidate
No common name	<i>Chamaesyce remyi</i> var. <i>remyi</i>	Candidate	Candidate
No common name	<i>Charpentiera densiflora</i>	Candidate	Candidate
Haha	<i>Cyanea asarifolia</i>	Endangered	Endangered
Haha	<i>Cyanea eleeleensis</i>	Candidate	Candidate
Haha	<i>Cyanea kuhihewa</i>	Candidate	Candidate
Haha	<i>Cyanea pseudofauriei</i>	Candidate	Candidate
Haha	<i>Cyanea recta</i>	Threatened	Threatened
Haha	<i>Cyanea remyi</i>	Endangered	Endangered
Haha	<i>Cyanea rivularis</i>	Endangered	Endangered
Haha	<i>Cyanea salicina</i>	Threatened	Threatened
Haha	<i>Cyanea undulata</i>	Endangered	Endangered
Pu`uka`a	<i>Cyperus trachysanthos</i>	Endangered	Endangered
Mapele	<i>Cyrtandra cyaneoides</i>	Endangered	Endangered
Mapele	<i>Cyrtandra kealiae</i> ssp. <i>kealiae</i>	Threatened	Threatened
Mapele	<i>Cyrtandra oenobarba</i>	Candidate	Candidate
No common name	<i>Delissea niuhauensis</i> ssp. <i>kauaiensis</i>	Endangered	Endangered
No common name	<i>Delissea rhytidosperra</i>	Endangered	Endangered
No common name	<i>Diellia pallida</i>	Endangered	Endangered
No common name	<i>Dryopteris tenebrosa</i>	Candidate	Candidate
Na`ena`e	<i>Dubautia imbricata</i> ssp. <i>imbricata</i>	Candidate	Candidate
Na`ena`e	<i>Dubautia latifolia</i>	Endangered	Endangered
Na`ena`e	<i>Dubautia pauciflorula</i>	Endangered	Endangered
Na`ena`e	<i>Dubautia plantaginea</i> ssp. <i>magnifolia</i>	Candidate	Candidate
Na`ena`e	<i>Dubautia waialealae</i>	Candidate	Candidate
`Akoko	<i>Euphorbia haeleeleana</i>	Endangered	Endangered
Heau	<i>Exocarpos luteolus</i>	Endangered	Endangered
Mehamehame	<i>Flueggea neowawraea</i>	Endangered	Endangered
No common name	<i>Gardenia remyi</i>	Candidate	Candidate
No common name	<i>Geranium kauaiense</i>	Candidate	Candidate
No common name	<i>Gouania meyenii</i>	Endangered	Endangered
Awiji	<i>Hedyotis cookiana</i>	Endangered	Endangered
Awiji	<i>Hedyotis fluviatilis</i>	Candidate	Candidate
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>hammerae</i>	Endangered	Endangered
Ischaemum, Hilo	<i>Ischaemum byrone</i>	Endangered	Endangered
Aupaka	<i>Isodendron laurifolium</i>	Endangered	Endangered
Aupaka	<i>Isodendron longifolium</i>	Threatened	Threatened
No common name	<i>Joinvillea ascendens</i> ssp. <i>ascendens</i>	Candidate	Candidate
Koki`o	<i>Kokia kauaiensis</i>	Endangered	Endangered
Kamakahala	<i>Labordia helleri</i>	Candidate	Candidate
Kamakahala	<i>Labordia lydgatei</i>	Endangered	Endangered
Kamakahala	<i>Labordia pumila</i>	Candidate	Candidate
Kamakahala	<i>Labordia tinifolia</i> var. <i>wahiawaensis</i>	Endangered	Endangered

**TABLE 5-3. Threatened and Endangered Species Potentially Occurring on KTF (continued)**

Common Name	Scientific Name	Federal Status	State of HI Status
No common name	<i>Lagenifera erici</i>	Candidate	Candidate
No common name	<i>Lagenifera helenae</i>	Candidate	Candidate
No common name	<i>Lobelia niihauensis</i>	Endangered	Endangered
No common name	<i>Lysimachia daphnoides</i>	Candidate	Candidate
No common name	<i>Lysimachia venosa</i>	Candidate	Candidate
Alani	<i>Melicope degeneri</i>	Candidate	Candidate
Alani	<i>Melicope haupuensis</i>	Endangered	Endangered
Alani	<i>Melicope knudsenii</i>	Proposed Endangered	Proposed Endangered
Alani	<i>Melicope pallida</i>	Proposed Endangered	Proposed Endangered
Alani	<i>Melicope paniculata</i>	Candidate	Candidate
Alani	<i>Melicope puberula</i>	Candidate	Candidate
No common name	<i>Munroidendron racemosum</i>	Endangered	Endangered
Kolea	<i>Myrsine fosbergii</i>	Candidate	Candidate
Kolea	<i>Myrsine linearifolia</i>	Threatened	Threatened
Kolea	<i>Myrsine mezii</i>	Candidate	Candidate
ʻAiea	<i>Nothocestrum latifolium</i>	Candidate	Candidate
ʻAiea	<i>Nothocestrum peltatum</i>	Endangered	Endangered
No common name	<i>Oligadenus periens</i>	Endangered	Endangered
Lau ʻehu	<i>Panicum niihauense</i>	Endangered	Endangered
Makou	<i>Peucedanum sandwicense</i>	Threatened	Threatened
No common name	<i>Phyllostegia knudsenii</i>	Endangered	Endangered
No common name	<i>Phyllostegia wawrana</i>	Endangered	Endangered
No common name	<i>Pittosporum napaliense</i>	Candidate	Candidate
ale	<i>Plantago princeps</i> var. <i>anomala</i>	Endangered	Endangered
ale	<i>Plantago princeps</i> var. <i>longibracteata</i>	Endangered	Endangered
No common name	<i>Platanthera holochila</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
Loʻulu	<i>Pritchardia hardyi</i>	Candidate	Candidate
Loʻulu	<i>Pritchardia napaliensis</i>	Endangered	Endangered
Loʻulu	<i>Pritchardia viscosa</i>	Endangered	Endangered
No common name	<i>Psychotria grandiflora</i>	Candidate	Candidate
No common name	<i>Psychotria hobdyi</i>	Candidate	Candidate
Kaulu	<i>Pteralyxia kauaiensis</i>	Endangered	Endangered
No common name	<i>Ranunculus mauiensis</i>	Candidate	Candidate
No common name	<i>Remya kauaiensis</i>	Endangered	Endangered
No common name	<i>Remya montgomeryi</i>	Endangered	Endangered
Maʻoliʻoli	<i>Schiedea apokremmos</i>	Endangered	Endangered
No common name	<i>Schiedea attenuata</i>	Candidate	Candidate
No common name	<i>Schiedea haupuensis</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 spergulina</i> alt. Var. <i>leiopoda</i>	Endangered	Endangered
No common name	<i>Schiedea spergulina</i> alt. Var. <i>spergulina</i>	Threatened	Threatened
Lauhilihi	<i>Schiedea stellarioides</i>	Endangered	Endangered
ʻAiakeakua, popolo	<i>Solanum sandwicense</i>	Endangered	Endangered
No common name	<i>Spermolepis hawaiiensis</i>	Endangered	Endangered
No common name	<i>Stenogyne campanulata</i>	Endangered	Endangered
No common name	<i>Stenogyne kealiae</i>	Candidate	Candidate
No common name	<i>Viola helenae</i>	Endangered	Endangered
Nani waiʻaleʻale	<i>Viola kauaensis</i> var. <i>wahiawaensis</i>	Endangered	Endangered
Dwarf iliau	<i>Wilkesia hobdyi</i>	Endangered	Endangered
No common name	<i>Wollastonia fauriei</i>	Endangered	Endangered
No common name	<i>Wollastonia micrantha</i> var. <i>exigua</i>	Endangered	Endangered
No common name	<i>Wollastonia micrantha</i> var. <i>micrantha</i>	Endangered	Endangered
No common name	<i>Wollastonia waimeaensis</i>	Endangered	Endangered
No common name	<i>Xylosma crenatum</i>	Endangered	Endangered
Aʻe	<i>Zanthoxylum hawaiiense</i>	Endangered	Endangered

**TABLE 5-3. Threatened and Endangered Species Potentially Occurring on KTF (concluded)**

Common Name	Scientific Name	Federal Status	State of HI Status
<i>ANIMALS</i>			
<b><i>Mammals</i></b>			
Hawaiian hoary bat	<i>Lasiurus cinereus semotus</i>	Endangered	Endangered
Hawaiian monk seal	<i>Monachus schauinslandi</i>	Endangered	Endangered
<b><i>Birds</i></b>			
Hawaiian duck	<i>Anas wyvilliana</i>	Endangered	Endangered
Hawaiian coot	<i>Fulica americana alai</i>	Endangered	Endangered
Hawaiian gallinule	<i>Gallinula chloropus sandvicensis</i>	Endangered	Endangered
Kauai nuku pu'u	<i>Hemignathus lucidus hanapepe</i>	Endangered	Endangered
Kauai 'akia loa	<i>Hemignathus procerus</i>	Endangered	Endangered
Black-necked stilt	<i>Himantopus mexicanus knudseni</i>	Endangered	Endangered
Kauai 'o'o	<i>Moho braccatus</i>	Endangered	Endangered
Large Kauai thrush	<i>Myadestes myadestinus</i>	Endangered	Endangered
Small Kauai thrush	<i>Myadestes palmeri</i>	Endangered	Endangered
Hawaiian goose	<i>Nesochen sandvicensis</i>	Endangered	Endangered
Short-tailed albatross	<i>Phoebastria albatrus</i>	Endangered	Endangered
No common name	<i>Psittirostra psittacea</i>	Endangered	Endangered
Dark-rumped petrel	<i>Pterodroma phaeopygia sandwichensis</i>	Endangered	Endangered
Newell's shearwater	<i>Puffinus auricularis newelli</i>	Threatened	Threatened
<b><i>Reptiles</i></b>			
Green sea turtle	<i>Chelonia mydas</i>	Threatened	Threatened
Hawksbill turtle	<i>Eretmochelys imbricata</i>	Endangered	Endangered
<b><i>Snails</i></b>			
Newcomb's snail	<i>Erinna newcombi</i>	Threatened	Threatened
<b><i>Arachnids</i></b>			
Kauai cave wolf spider	<i>Adelocosa anops</i>	Endangered	Endangered
<b><i>Insects</i></b>			
Blackburn's sphinx moth	<i>Manduca blackburni</i>	Endangered	Endangered
Kauai pomace fly	<i>Drosophila musaphila</i>	Proposed Endangered	Proposed Endangered
Kauai cave amphipod	<i>Spelaeorchestia koloana</i>	Endangered	Endangered

Oil Storage – There is one underground storage tank (UST) at KTF, which is owned by the DOE. There is also one 10,000 gal aboveground fuel tank inside the Main Compound. Sandia cooperates with the U.S. Navy's (USN) spill control guidelines contained in the *Spill Prevention Control and Countermeasures Plan, Pacific Missile Range Facility* (NAVFAC 2008).

**Safe Drinking Water Act (SDWA)**

The SDWA does not apply directly to Sandia activities at KTF because all drinking water is supplied by the Pacific Missile Range Facility drinking water system or is purchased from commercial suppliers.

**Toxic Substances Control Act (TSCA)**

TSCA regulates the distribution of polychlorinated biphenyls (PCBs) and asbestos. The transformers on the KTF site have been tested and are free of PCBs, and there are no asbestos issues at the site.

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

FIFRA controls the distribution and application of pesticides including herbicides, insecticides, and rodenticides. All pesticide use at KTF follows EPA requirements.

**Releases and Occurrences**

There were no reportable occurrences at KTF in 2009.

**5.5 ENVIRONMENTAL PROGRAM ACTIVITIES**

This section describes three environmental programs:

- NEPA,
- the Environmental Restoration (ER) Project, and
- the Spill Prevention Program.

### *NEPA Program Activities at KTF*

The DOE completed a comprehensive site-wide EA for KTF operations in 1992 (DOE 1992a), which resulted in a Finding of No Significant Impact (FONSI), issued on July 17, 1992. This EA provided NEPA documentation covering all rocket launching activities at KTF.

### *2009 NEPA Documentation*

The SNL/NM NEPA Team completed one DOE NEPA checklist for KTF in 2009, which was transmitted to DOE/NNSA/SSO for review and determination.

### *ER Project Activities*

There are no ER sites at KTF. The three ER sites identified in 1995 were given a Site Evaluation Accomplished (SEA) determination by EPA on September 30, 1996. This confirmed that KTF met all CERCLA requirements and no additional sampling or remediation would be necessary in the three areas. This, however, does not preclude that other environmental sampling activities will take place at KTF.

## **5.6 ENVIRONMENTAL SURVEILLANCE AND MONITORING ACTIVITIES**

### *Wastewater Monitoring*

Sandia activities at KTF produce only sanitary sewage, which is directed into nine wastewater systems—three DOE/NNSA owned septic tanks and six French drains, four with pumping systems located in the LOB parking lot, the paved drive west of the office complex, the paved lot west of the garage, the drive west of the shops, and two on the parking lot east of the office complex—in accordance with Hawaii Underground Injection Control regulations (HAR Title 11, Chapter 23). The two older septic tanks for the Launch Operations Building (LOB) and the Missile Assembly Building (MAB) do not require permits for the State of Hawaii. However, the septic systems are periodically pumped by licensed, state-certified contractors and inspected by state officials. No state inspections were conducted during 2009. 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 KTF. As a best management practice (BMP), KTF personnel have periodically performed sampling. Historically no contaminants have been identified above the reporting limits from these past

sampling events. During CY2009 no sampling of septic tanks was conducted at KTF.

### *Air Emission Monitoring*

Based on recent air monitoring results of the STARS Flight Test Unit 1 (FTU-1) in February 1993 and the CDX rocket launch in the summer of 1992 (SNL 1992), it was determined that rocket launches at KTF were not a significant source of air pollutants. Launches are infrequent and emissions recorded did not exceed federal and 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 KTF that differs in emission substance from the STARS rocket, or air emission requirements change, future monitoring may be considered.

As required by the State of Hawaii, the 2009 Monitoring Report (air emissions) was submitted to the State of Hawaii in February 2010 (SNL 2010d).

The State of Hawaii has waived the 2010 Annual Fee, as indicated in the memo that was submitted to DOE in April 2010. In 2009, the total fuel usage reported to the State of Hawaii was 15,641 gallons (gal) of diesel fuel. Total hours of operation for the permitted generators was 1,701 hours combined. Sandia was in compliance with all air quality regulations in 2009.

### *Meteorological Monitoring*

On-site meteorological instruments are used during test periods to characterize atmospheric transport, dispersion conditions, and stability classes. Due to the infrequency of launches, no formal meteorological monitoring plan is in place for KTF. Climatic information representative of KTF is obtained from PMRF.

### *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 EIS that noise produced from the largest launch would be below maximum acceptable levels (SNL 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.

## **5.7 TERRESTRIAL SURVEILLANCE**

Since sampling at KTF only occurs every five years (last conducted during July 2007), there was no sampling in 2009.

However, a summary report of the entire database for Toxic Analyte List (TAL) metals was prepared to document the current baseline concentrations at the KTF site (SNL 2008).

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- 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*

**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*

## **ACTS & STATUTES**

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- Pollution Prevention Act of 1990 (42 U.S.C. §13101 et seq.)
- Quiet Communities Act of 1978 (42 U.S.C. §4901 et seq.)
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- 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)

## **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>

**TABLE 6-1. State of Nevada Administrative Code (NAC) Applicable to the TTR**

<b>Chapter 444, Sanitation</b>	<b>Applicable Sources or Activities</b>
NAC 444.570 to 444.7499, "Solid Waste Disposal"	<ul style="list-style-type: none"> <li>• Disposal of construction debris</li> <li>• Disposal of routine non-hazardous solid wastes</li> <li>• Disposal of septic sludge</li> </ul>
NAC 444A.005 to 444A.500, "Programs for Recycling"	<ul style="list-style-type: none"> <li>• Recyclables, including waste tires</li> </ul>
<b>Chapter 445A, Water Controls</b>	
NAC 445A.070 to 445A.348, "Water Pollution Control"	<ul style="list-style-type: none"> <li>• Septic tanks</li> <li>• Surface water runoff</li> </ul>
NAC 445A.450 to 445A. 6731, "Public Water Systems"	<ul style="list-style-type: none"> <li>• Production well sampling</li> </ul>
<b>Chapter 445B, Air Controls</b>	
NAC 445B.001 to 445B.3497, "Air Pollution"	<ul style="list-style-type: none"> <li>• Open burning</li> <li>• Hazardous air pollutants from stacks and vents</li> <li>• Disturbance of soils during construction (particulate matter)</li> </ul>
NAC 445B.400 to 445B.774, "Emissions From Engines"	<ul style="list-style-type: none"> <li>• Generators</li> <li>• Mobile sources</li> </ul>
<b>Chapter 504, Wildlife Management and Propagation*</b>	
NAC 504.110 to 504.340, "Wildlife Management Areas"	<ul style="list-style-type: none"> <li>• Road construction</li> </ul>
NAC 504.510 to 504.550, "Alteration of Stream System or Watershed"	<ul style="list-style-type: none"> <li>• Construction activities</li> </ul>
NAC 504.800 to 504.865, "Preservation of Wild Horses"**	<ul style="list-style-type: none"> <li>• General activities on the range in wild horse areas</li> </ul>
<b>Chapter 534, Underground Water and Wells</b>	
NAC 534.010 to 534.500, "Underground Water and Wells"	<ul style="list-style-type: none"> <li>• Drilling, operation, and abandonment of wells</li> </ul>

**NOTES:**

TTR = Tonopah Test Range

\* is regulation provides protection to endangered, threatened, and sensitive species.

\*\*Two wild horse units encompass areas within the Nellis Air Force Range:

“Unit 252: at portion of Nye County and those portions of the Nellis Air Force Range as authorized by the United States Department of Defense.”

“Unit 253: at portion of Nye County including those portions of the Nellis Air Force Range as authorized by the United States Department of Defense and the Nevada Test Site as authorized by the United States Department of Energy.” (NAC 504.210, “General Designation of Management Areas and Units”)

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# Glossar?

## A

**Aeroballistics** – The study of the interaction of projectiles or high-speed vehicles with the atmosphere.

**Aerodynamics** – The science that deals with the motion of air and other gaseous fluids and with the forces acting on bodies when they move through such fluids or when such fluids move against or around the bodies.

**Ambient Air** – Any unconfined portion of the atmosphere: open air, surrounding air.

**Americium** – A chemical element, symbol Am, atomic number 95; the mass number of the isotope with the longest half-life is 243.

**Americium-241** – An alpha-ray emitter used as a radiation source in research.

**Asbestos** – A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled. Uses for asbestos-containing material include, but are not limited to, electrical and heat insulation, paint filler, reinforcing agents in rubber and plastics (e.g., tile mastic), and cement reinforcement.

## B

**Benchmarking** – 1. A point of reference from which measurements may be made. 2. Something that serves as a standard by which others may be measured or judged. 3. A standardized problem or test that serves as a basis for evaluation or comparison.

**Best Management Practice (BMP)** – The preferred methods and practices for managing operations.

## C

**Cesium** – A radioactive isotope of cesium used in radiation therapy.

**Chemical Oxygen Demand (COD)** – A measure of the oxygen required to oxidize all compounds, both organic and inorganic, in water.

**Coliform Organism** – Microorganisms found in the intestinal tract of humans and animals. Their presence in water indicates fecal pollution and potentially adverse contamination by pathogens.

## D

**Decontamination** – Removal of harmful substances such as noxious chemicals, harmful bacteria or other organisms, or radioactive material from exposed individuals, rooms and furnishings in buildings, or the exterior environment.

**Demolition** – The act or process of wrecking or destroying, especially destruction by explosives.

**Depleted Uranium** – Uranium having a smaller percentage of uranium-235 than the 0.7% found in natural uranium.

**Diurnal** – 1. Relating to or occurring in a 24-hour period; daily. 2. Occurring or active during the daytime rather than at night: diurnal animals.

**Dose Assessment** – The process of determining radiological dose and uncertainty included in the dose estimate through the use of exposure scenarios, bioassay results, monitoring data, source term information, and pathway analysis.

**Dose Equivalent** – The product of the absorbed dose from ionizing radiation and such factors as account for biological differences due to the type of radiation and its distribution in the body in the body.

## E

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

**Environment, Safety and Health (ES&H)** – A program designed to protect and preserve the environment, and to ensure the safety and health of its employees, contractors, visitors, and the public.

Environmental Assessment (EA) – An environmental analysis prepared pursuant to the National Environmental Policy Act (NEPA) to determine whether a federal action would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Impact Statement – A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions.

Environmental Management – A program designed to maintain compliance with EPA, state, local and DOE requirements.

Environmental Management System – A continuing cycle of planning, evaluating, implementing, and improving processes and actions undertaken to achieve environmental goals.

Environmental Restoration (ER) – A project chartered with the assessment and, if necessary, the remediation of inactive waste sites.

Ephemeral Stream – A stream channel which carries water only during and immediately after periods of rainfall or snowmelt.

## F

Fauna – 1. Animals, especially the animals of a particular region or period, considered as a group. 2. A catalog of the animals of a specific region or period.

French Drain – An underground passage for water, consisting of loose stones covered with earth.

## G

Gamma Spectroscopy – A technique used to detect the emission of gamma radiation from radioactive materials.

Geology – the scientific study of the origin, history, and structure of the earth.

Gross Alpha/Beta Particle Activity – The total radioactivity due to alpha or beta particle emissions as inferred from measurements on a dry sample.

Groundwater – The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs. Because groundwater is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

## H

Herbicides – A chemical pesticide designed to control or destroy plants, weeds, or grasses.

Horst and Graben Topography – A system of mountains and down-dropped fault valleys formed through regional extension.

Hydrology – the science dealing with the properties, distribution, and circulation of water.

## I

Insecticides – A pesticide compound specifically used to kill or prevent the growth of insects.

Integrated Safety Management System (ISMS) – Systematically integrates safety into management and work practices at all levels so that missions are accomplished while protecting the worker, the public, and the environment.

## M

Maximally Exposed Individual (MEI) – the location of a member of the public which receives or has the potential to receive the maximum radiological dose from air emissions of a National Emissions Standards for Hazardous Air Pollutants (NESHAP) radionuclide source.

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; and a hazardous component subject to the Resource Conservation and Recovery Act (RCRA), as amended.

## N

NESHAP – Emissions standards set by EPA for an air pollutant not covered by NAAQS that may cause an increase in fatalities or in serious, irreversible, or

incapacitating illness. Primary standards are designed to protect human health, secondary standards to protect public welfare (e.g. building facades, visibility, crops, and domestic animals).

National Environmental Policy Act (NEPA) – The basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy.

Nitrates – 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 waste waters, sanitary landfills, and garbage dumps.

Nitrites – 1. An intermediate in the process of nitrification. 2. Nitrous oxide salts used in food preservation.

## P

Phenol – Organic compounds that are by-products of petroleum refining, tanning, and textile, dye, and resin manufacturing. Low concentrations cause taste and odor problems in water; higher concentrations can kill aquatic life and humans.

Plutonium – A radioactive metallic element chemically similar to uranium.

Polychlorinated biphenyls (PCB) – “PCB” and “PCBs” are chemical terms limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances that contains such substance. Because of their persistence, toxicity, and ecological damage via water pollution, their manufacture was discontinued in the U.S. in 1976.

Potable Water – Water free from impurities present in quantities sufficient to cause disease or harmful physiological effects.

## 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.

Radionuclide – Radioactive particle, man-made (anthropogenic) or natural, with a distinct atomic weight number. Can have a long life as soil or water pollutant.

Reportable Quantity (RQ) – Quantity of material or product compound or contaminant which when released to the environment is reportable to a regulatory agency.

Rodenticides – A chemical or agent used to destroy rats or other rodent pests, or to prevent them from damaging food, crops, etc.

## S

Semi-volatile organic compounds (SVOC) – Organic compounds that volatilize slowly at standard temperature (20 degrees C and 1 atm pressure).

Solid Waste – Any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities.

Storm Water – Water runoff from rainfall or snowmelt, including that discharged to the sanitary sewer system.

## T

Thermoluminescent Dosimeters (TLD) – A device that monitors both the whole body and skin radiation dose to which a person has been exposed during the course of work. These same devices can also be used to measure environmental exposure rates.

Total Recovered Petroleum Hydrocarbon – A method for measuring petroleum hydrocarbons in samples of soil or water.

Transuranic waste (TRU) – Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92, and a half-life greater than 20 years, in concentrations greater than 100 nCi/g.

Trihalomethanes – A chemical compound containing three halogen atoms substituted for the three hydrogen atoms normally present in a methane molecule. It can occur in chlorinated water as a result of reaction between organic materials in the water and chlorine added as a disinfectant.

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

## U

Underground Storage Tanks (UST) – A single tank or a combination of tanks, including underground pipes connected thereto, which are used to contain an accumulation of regulated substances, such as petroleum products, mineral oil, and chemicals, and the volume of which, including the volume of underground pipes connected thereto, is 10% or more beneath the surface of the ground.

Uranium – A heavy silvery-white metallic element, radioactive and toxic, easily oxidized, and having 14 known isotopes of which U 238 is the most abundant in nature. The element occurs in several minerals, including uraninite and carnotite, from which it is extracted and processed for use in research, nuclear fuels, and nuclear weapons.

## V

Volatile Organic Compounds (VOC) – Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

## W

Waste Management – The processes involved in dealing with the waste of humans and organisms, including minimization, handling, processing, storage, recycling, transport, and final disposal.

Wastewater Effluent – Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

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