

SANDIA NATIONAL LABORATORIES

2022

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ANNUAL SITE
ENVIRONMENTAL
REPORT

KAUA'I
H A W A I ' I

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United States Department of Energy, National Nuclear Security Administration,
Sandia Field Office, Albuquerque, New Mexico

2022 Annual Site Environmental Report for Sandia National Laboratories, Kaua'i Test Facility, Hawai'i

Prepared by

Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185-1512

for

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

Abstract

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration. The National Nuclear Security Administration's Sandia Field Office administers the contract and oversees contractor operations at the Sandia National Laboratories Kaua'i Test Facility in Hawai'i. Activities at the site are conducted in support of U.S. Department of Energy weapons programs, and the site has operated as a rocket preparation launching and tracking facility since 1962.

The U.S. Department of Energy and its management and operating contractor are committed to safeguarding the environment, assessing sustainability practices, and ensuring the validity and accuracy of the monitoring data presented in this annual site environmental report. This report summarizes the environmental protection, restoration, and monitoring programs in place at Sandia National Laboratories, Kaua'i Test Facility, during calendar year 2022. Environmental topics include cultural resource management, chemical management, air quality, meteorology, ecology, oil storage, site sustainability, terrestrial surveillance, waste management, water quality, wastewater discharge, and implementation of the National Environmental Policy Act. This report is prepared in accordance with and as required by DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting*, and has been approved for public distribution.

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The following individuals provided their time and expertise to support production of this annual report for Sandia National Laboratories, Kaua'i Test Facility, Hawai'i:

Sandia National Laboratories Project Lead/Technical Reviewer

Amy Miller

DOE Project Lead/Technical Reviewer

Janet Forestier

Document Production and Technical Editing

Shirley Coe, Stacie Evelo, Casey Pirtle, Nancy White

Contributing Authors

Jacob Alexander

Penny Avery

Matt Baumann

Kelly Bowles

Benito Casaus

Dave Castillo

Christina Chavez

Evan Fahy

Joe Fontana

Morgan Gerard

Erin Greenlee

Stacy Griffith

Casey Hendricks

Benjamin Henning

Mark Howard

John Kay

Kevin Lambert

Andrez Leyva

Ben Martinez

Amy Miller

Sam Poli

Anita Reiser

Sherry Ricketson

Ryan Sarhan

Che Shu-Nyamboli

Rebecca Ulrich

Doug Vetter

Nora Wintermute

Mark Zuverink

Note to the Reader

This annual site environmental report for Sandia National Laboratories, Kaua'i Test Facility, Hawai'i, presents summary data regarding environmental performance and compliance with environmental standards and requirements. In addition, the U.S. Department of Energy views this document as a valuable tool for maintaining a dialogue with the community about the environmental health of this site and as a commitment to protect our nation's valuable resources. With the goal of continually improving the quality of this annual report and including information that is important to you, you are invited to provide feedback, comments, or questions to:

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

P.O. Box 5400

Albuquerque, NM 87185-5400

Attention: Tami Moore

This Sandia National Laboratories, Kaua'i Test Facility, Hawai'i, annual site environmental report can be found at the following website:

<https://www.sandia.gov/news/publications/environmental-reports/>

Contents

List of Figures	iv
List of Tables	iv
Acronyms and Abbreviations	v
Units of Measure	v
Data Validation Qualifiers	vi
Executive Summary	1
Chapter 1. Introduction to Kauaʻi Test Facility	5
1.1 Purpose	5
1.2 History	6
1.2.1 Sandia National Laboratories	6
1.2.2 Sandia National Laboratories, Kauaʻi Test Facility	6
1.3 Location Description	6
1.4 Demographics	7
1.5 Activities and Facilities	8
1.5.1 Rocket Launches in 2022	8
1.6 Environmental Setting	9
1.6.1 Geology	9
1.6.2 Surface and Groundwater Hydrology	9
1.6.3 Ecology	10
1.6.4 Climate	10
1.7 Overview of the Environmental Management System	10
1.8 Environmental Programs and Focus Areas	10
Chapter 2. Cultural Resource Management Program	13
2.1 Cultural History	14
2.2 Historical Context	14
2.3 Regulatory Criteria	15
2.4 Archaeological Resources	15
2.4.1 Field Methods	15
2.4.2 Program Activities and Results 2022: Archaeological Resources	15
2.5 Historic Buildings	16
2.5.1 Methods	16
2.5.2 Previous Building Surveys, Assessments, and Determinations	16
2.5.3 Program Activities and Results 2022: Historic Buildings	16
Chapter 3. Environmental Programs	17
3.1 National Environmental Policy Act Program	18
3.1.1 Program Activities and Results 2022: National Environmental Policy Act	18
<i>NEPA Compliance</i>	18
<i>NEPA Checklist Reviews</i>	19
3.2 Chemical Information System	19
3.2.1 Program Activities and Results 2022: Chemical Information System	20
3.3 Waste Management Program	20
3.3.1 Program Activities and Results 2022: Waste Management	20
3.4 Air Quality Compliance Program	20
3.4.1 Program Activities and Results 2022: Air Quality Compliance	20
3.5 Meteorology Program	21
3.6 Oil Storage Program	21

Contents

3.6.1	Program Activities and Results 2022: Oil Storage	21
3.7	Terrestrial Surveillance Program	21
3.7.1	Regulatory Criteria.....	21
3.7.2	Sample Locations	22
3.7.3	Field Methods, Analytical Parameters, and Quality Control Procedures.....	23
3.7.4	Sample Result Analysis and Methodology	23
3.7.5	Program Activities and Results 2022: Terrestrial Surveillance	23
	<i>Variances</i>	24
3.8	Water Quality and Environmental Release, Response, and Reporting Programs	24
3.8.1	Program Activities and Results 2022: Water Quality.....	25
	<i>Events Reported to the Hawai'i Environment Department</i>	25
	<i>Events Categorized as a DOE Reportable Occurrence</i>	25
3.8.2	Stormwater Program.....	25
	<i>Program Activities and Results 2022: Stormwater Program</i>	25
3.9	Wastewater Discharge Program	26
3.9.1	Program Activities and Results 2022: Wastewater Discharge	26
Chapter 4. Ecology Program.....		27
4.1	Vegetation	28
4.2	Wildlife.....	30
4.2.1	Birds	30
4.2.2	Mammals	31
4.2.3	Reptiles.....	31
4.3	Federally Listed and State-Listed Threatened and Endangered Species.....	32
4.4	Threatened and Endangered Species Surveys and Migratory Bird Monitoring.....	33
4.4.1	Program Activities and Results 2022: Ecology.....	33
	<i>Hawai'ian Goose</i>	33
	<i>Band-Rumped Storm Petrel, Hawai'ian Petrel, and Newell's Shearwater</i>	33
	<i>Laysan Albatross</i>	34
4.4.2	Pacific Golden Plover	34
Chapter 5. Compliance Summary		35
5.1	Environmental Compliance	36
5.1.1	Federal Requirements	36
	<i>Environmental Planning</i>	36
	<i>Environmental Management System, Site Sustainability, Emergency Planning, and Community</i>	
	<i>Right-to-Know Act</i>	37
	<i>Hazardous Waste and Environmental Restoration</i>	37
	<i>Radiation Protection</i>	38
	<i>Air Quality</i>	39
	<i>Water Quality</i>	39
	<i>Chemical Management</i>	41
	<i>Pollution Prevention</i>	42
	<i>Natural Resources</i>	42
	<i>Cultural Resources</i>	45
	<i>Reporting</i>	47
	<i>Quality Assurance</i>	48
5.1.2	Chemical Inventory and Toxic Release Inventory Reporting	48
5.1.3	Hawai'i State Environmental Requirements	49
5.2	Energy Equity and Environmental Justice	49
5.3	Environmental Management System	49
5.3.1	Site Sustainability Plan	50
5.3.2	Sustainability Awards in 2022	51
5.3.3	Vulnerability Assessment and Resilience Plan.....	51
5.4	Environmental Performance.....	52
5.4.1	Audits, Appraisals, and Inspections in 2022.....	52

Contents

5.4.2	Occurrence Reporting in 2022	53
5.5	Environmental Permit Status	53
Chapter 6.	Quality Assurance	55
6.1	Environmental Monitoring for Quality Assurance	55
6.1.1	Sample Management Office.....	56
6.1.2	Contract Laboratory Selection.....	56
6.1.3	Quality Control for Samples	56
6.1.4	Data Validation and Records Management	57
6.2	Sample Management Office Activities	57
6.2.1	Sample Handling and Analyses.....	57
6.2.2	Laboratory Quality Assurance Assessments and Validation	57
6.2.3	Quality Assurance Audits.....	58
Appendix A.	Terrestrial Surveillance Analytical Results in 2022	59
Appendix B.	Climate Hazard Risks.....	74
Glossary.....	77
References.....	82

List of Figures

Figure 1-1. Kauaʻi Test Facility location on Kauaʻi, Hawaiʻi.....	7
Figure 1-2. Operations at Mount Haleakalā, Maui.....	8
Figure 3-1. Environmental programs at SNL/KTF	17
Figure 3-2. Terrestrial Surveillance Program on-site sampling locations	22
Figure 4-1. Hawaiʻian geese foraging at SNL/KTF, June 2022.....	33
Figure 4-2. Laysan albatross chick at SNL/KTF, May 2022.....	34

List of Tables

Table 3-1. NEPA checklists reviewed in 2022 for projects and activities described in existing NEPA documentation	19
Table 3-2. Categorical exclusions cited by DOE NEPA Compliance Officer in determinations for activities at SNL/KTF in 2022	19
Table 3-3. Summary of metals in soil, 2022.....	23
Table 4-1. Federally listed and state-listed threatened and endangered species potentially occurring or confirmed at SNL/KTF.....	32
Table 5-1. SNL/KTF applicable EPCRA reporting requirements.....	48
Table 5-2. Hawaiʻi Administrative Rules and Hawaiʻi Revised Statutes	49
Table 5-3. Climate hazards and projected annual likelihood and frequencies at SNL/KTF.....	51
Table 5-4. Resilience solutions portfolio for SNL/KTF.....	52
Table 5-5. SNL/KTF environmental permits, 2022.....	53
 Table A-1. Metals results for on-site soil sampling locations, 2022.....	 60
Table B-1. Climate hazard risks by asset and infrastructure type at SNL/KTF	75

Acronyms and Abbreviations

Term	Definition
A	
AD	anno Domini
C	
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D	
DOD	United States Department of Defense
DOE	United States Department of Energy
DOECAP	DOE Consolidated Audit Program
DU	duplicate sample
E	
EEEJ	energy equity and environmental justice
EISA	Energy Independence and Security Act
EPA	United States Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ES&H	Environment, Safety, and Health
H	
HDOH	Hawai'i Department of Health
I	
ISO	International Organization for Standardization

Term	Definition
N	
NEPA	National Environmental Policy Act
NTESS	National Technology & Engineering Solutions of Sandia, LLC
P	
PCB	polychlorinated biphenyl
R	
RCRA	Resource Conservation and Recovery Act
S	
SA	sample
Sandia	Sandia National Laboratories
SARA	Superfund Amendments and Reauthorization Act
SNL/CA	Sandia National Laboratories, California
SNL/KTF	Sandia National Laboratories, Kaua'i Test Facility, Hawai'i
SNL/NM	Sandia National Laboratories, New Mexico
sp.	unknown species, singular
spp.	unknown species, plural
U	
U.S.	United States
USFWS	United States Fish and Wildlife Service

Units of Measure

Unit	Definition
°F	degrees Fahrenheit
kg	kilogram

Unit	Definition
mg	milligram

Data Validation Qualifiers

Laboratory Data Qualifier

Term	Definition
*	A replicate was outside limits.
B	The analyte was detected in the blank.
J	An estimated value, the analyte concentration was above the effective MDL and below the effective PQL.
N	A spike was outside limits.
U	The analyte was absent or below the method detection limit.

Data Validation Qualifier

Term	Definition
J	The associated numerical value was an estimated quantity.
J+	The associated numerical value is an estimated quantity with a suspected positive base.
None	There was no data validation assigned.
U	The analyte was analyzed for but was not detected. The associated numerical value was the sample quantitation limit.
UJ	The analyte was analyzed for but was not detected. The associated value was an estimate and might be inaccurate or imprecise.

Executive Summary



Kaua'i Test Facility

Sandia National Laboratories (hereinafter referred to as Sandia) is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration. This annual site environmental report was prepared in accordance with and as required by DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting*, and is approved for public release. The U.S. Department of Energy (DOE) and its management and operating contractor for Sandia are committed to safeguarding the environment, continually assessing sustainability practices, and ensuring the validity and accuracy of the monitoring data presented here. This report summarizes the environmental protection, restoration, and monitoring programs in place for Sandia National Laboratories, Kaua'i Test Facility (SNL/KTF) during calendar year 2022.

Environmental Management System

Sandia management takes environmental stewardship seriously. A robust Environmental Management System was established in 2005 as part of this commitment. This system ensures a systematic approach to identifying environmental aspects, setting environmental objectives, and monitoring environmental performance. Designed to meet the requirements of the globally recognized International Organization for Standardization (ISO) 14001:2015 standard, the Environmental Management System is ISO 14001:2015 certified at SNL/NM and SNL/CA. While operations at SNL/KTF are required to comply with the environmental management system requirements, operations have not been included in the ISO 14001:2015 certification due to the limited scale of operations there. The Environmental Management System is Sandia's primary platform for implementing the environmental management programs that help achieve annual site sustainability goals. Greenhouse gas emissions were identified as a significant aspect for SNL/KTF operations in fiscal year 2022.

Site Sustainability

Sandia defines sustainability practices and goals in a site sustainability plan. The annual site sustainability plan provides a roll-up of sustainability data from all primary Sandia sites including SNL/KTF. Highlights of Sandia's sustainability performance status in 2022 that apply to SNL/KTF include exceeding the goal to increase consumption of clean and renewable electric energy; improving MAN-004, *Sandia National Laboratories/New Mexico Design Standards Manual*; and promoting sustainable acquisition and procurement through modifications, training, and education efforts completed on the ecomedes tool.

Environmental Performance

DOE assesses environmental management through measures, indicators and data and collectively reports on all Sandia sites as part of an overall performance evaluation. During the most recent environmental performance evaluation, Sandia received an overall rating of very good. There were no DOE-reportable occurrences at SNL/KTF in 2022.

All environmental monitoring in 2022 was conducted in accordance with program-specific plans that contain applicable quality assurance elements and meet appropriate federal, state, and local requirements for conducting sampling and analysis activities.

Environmental Programs at Sandia National Laboratories, Kaua'i Test Facility

Air Quality Compliance Program. Program personnel support compliance with air quality regulations. Sandia has air quality permits at SNL/KTF and, in 2022, emissions from permitted sources complied with permitted limits. Two monitoring reports for the two diesel-fired power generators operating under a Noncovered Source Permit were submitted to the State of Hawai'i for 2022 operations within required timelines. The highest total combined operating hours for the generators for a rolling 12-month period was 483.4 hours, which occurred from December 2021 to November 2022.

Chemical Information System. In 2022, chemical containers at SNL/KTF were tracked in the Chemical Information System along with information about any related chemical hazards.

Cultural Resource Management Program. Cultural Resource Management Program personnel review and document potential impacts on archaeological sites and historic properties. In 2022, one project at SNL/KTF was reviewed through a NEPA checklist. This project had ground-disturbing activities, which required an archaeologist to monitor all the planned work. Permitted, local Hawai'ian archaeologists who met the State of Hawai'i archaeological monitoring requirements completed the archaeological monitoring on-site. No proposed work in 2022 affected any previously identified historic properties or historic districts.

Ecology Program. Ecology Program personnel conduct project assessments to ensure compliance with wildlife regulations and laws and to support land use decisions at SNL/KTF. In 2022, in accordance with the Endangered Species Act and the Migratory Bird Treaty Act, contracted biologists performed routine wildlife surveys, nocturnal lighting compliance surveys, pre- and post-launch area surveys, and preconstruction surveys. All nighttime operations adhered to prescribed biological mitigations during the Dark Skies period from September 15 to December 15, 2022. No fallout for band-rumped storm petrels, Hawai'ian petrels, or Newell's shearwaters was reported at SNL/KTF in 2022.

In April 2022, one active Laysan albatross nest containing a single chick was discovered at SNL/KTF in a dense patch of kiawe/koa haole. An active nest buffer was established, and the nest was monitored through successful fledging, which occurred in late July. From November to December 2022, biologists located four Laysan albatross nests containing one egg each along the SNL/KTF

boundary. Active nest buffers were established, and Ecology Program personnel coordinated with Pacific Missile Range Facility Natural Resources personnel to implement appropriate management actions.

No mitigation measures were necessary to protect Pacific golden plovers in 2022, and no nesting attempts were documented for the Hawai'ian goose at SNL/KTF in 2022.

Meteorology Program. On-site meteorological instruments at SNL/KTF are used by Sandia personnel during test periods to characterize ground-level and atmospheric wind conditions. Climatic information is obtained from Pacific Missile Range Facility personnel when needed, and severe weather notifications are issued automatically by the Pacific Missile Range Facility Emergency Operations Center to all SNL/KTF resident personnel.

National Environmental Policy Act Program. Program personnel coordinate with DOE to ensure National Environmental Policy Act compliance and to provide technical assistance in project planning at SNL/KTF. In 2022, program personnel reviewed three proposed projects for NEPA compliance. NEPA Program personnel also supported several upcoming projects that did not start in 2022, including plans to construct a Mission Support Building to replace the current administrative facilities and to negotiate a land use permit with the U.S. Navy. Additionally, NEPA Program personnel supported a casual analysis in 2022 to evaluate a transformer oil spill that occurred in 2021 at SNL/KTF.

Oil Storage Program. Oil storage containers and equipment are managed, operated, and maintained to prevent inadvertent releases to the environment and to comply with applicable regulations. In 2022, oil storage containers and equipment at SNL/KTF consisted of four used oil storage drums, three generator base tanks (two stationary and one mobile), one underground fuel storage tank, one aboveground fuel storage tank, and five oil-filled electrical transformers. There were no reportable oil spills in 2022.

Terrestrial Surveillance Program. Surveillance activities are conducted to analyze surface soil at SNL/KTF approximately every five years. In 2022, soil samples were collected at designated locations. Results indicated several exceedances of historical values and comparison reference values.

Arsenic at sampling location S-13 exceeded established background values, although it was within the historical values. Chromium (total) at sampling location S-13 exceeded the historical maximum values with an estimated value but did not exceed the background range. Magnesium at sampling location S-13 exceeded the historical background values; however, there is no background range for that analyte. Nickel at sampling location S-13 exceeded historical values with an estimated value but did not exceed the background range. Silver was within historical values with an estimated value but exceeded the background range at sampling location S-22.

Waste Management Program. Hazardous waste was generated in 2022 through normal operations at SNL/KTF. The site is classified as a very small quantity generator and does not have a Resource Conservation and Recovery Act permit. Sandia has a hazardous waste generating identification number issued by the Hawai'i State Department of Health on September 23, 1994. SNL/KTF is in compliance with Hawai'i regulations applicable to very small quantity generators of hazardous waste (Hawai'i Administrative Rules, Title 11, chapters 260, 261, 262, and 268). No asbestos-containing materials were removed in 2022.

Water Quality Program. The Water Quality Program includes drinking water, release reporting, stormwater, and wastewater. Drinking water is obtained through the Pacific Missile Range Facility public water system. There are no drinking water or groundwater monitoring wells at SNL/KTF. There were no reportable releases in 2022 at SNL/KTF, none of the three on-site septic tanks were inspected or pumped, and there were no wastewater sampling events in 2022. No construction activities required Construction General Permit coverage during 2022. In summary, there were no water quality compliance issues in 2022.

Chapter 1. Introduction to Kauaʻi Test Facility



Rocket launch at the Kauaʻi Test Facility

OVERVIEW ■ The Kauaʻi Test Facility has been an active rocket-launching facility since 1962. Sandia National Laboratories personnel support a variety of missions at the site, including research and development, operational training, and test and evaluation. Launch projects are conducted for various government agencies and organizations on a noninterference basis.

This annual site environmental report was prepared in accordance with and as required by the U.S. Department of Energy (DOE) per DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting* (DOE O 231.1B, Admin Change 1 2012). This report is made available to the public in electronic form at [Sandia Environmental Reports](#) (Sandia n.d.).

Sandia National Laboratories, hereinafter referred to as Sandia—with the exception of when using an acronym to represent the facility location, Sandia National Laboratories, Kauaʻi Test Facility (SNL/KTF)—is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC (NTESS), a wholly owned subsidiary of Honeywell International Inc., for the DOE National Nuclear Security Administration. Sandia personnel manage and operate the Kauaʻi Test Facility in Hawaiʻi for DOE. The DOE National Nuclear Security Administration Sandia Field Office in Albuquerque, New Mexico, administers the contract and oversees contractor operations.

While most 2022 program activities were performed continuously, they are reported on a calendar-year basis unless otherwise noted (programs based on the fiscal year operate from October 1 through September 30, annually).

1.1 Purpose

Operating since 1949, Sandia's core purpose is to render exceptional service in the national interest. As a Federally Funded Research and Development Center, Sandia operates in the public interest with objectivity and independence, free from organizational conflicts of interest, maintaining core

competencies in missions of national significance. Our principal mission is to deliver on commitments to the nuclear deterrent, nuclear nonproliferation, and critical work for the national security community. Sandia personnel anticipate and resolve emerging national security challenges and inform the national debate for which technology policy is critical to preserving security and freedom throughout the world. Information about new technologies and accomplishments can be found at [Sandia News](#) (Sandia 2022).

1.2 History

A brief history of Sandia and of operations at SNL/KTF follows. For more details see [Chapter 2](#).

1.2.1 Sandia National Laboratories

On November 1, 1949, Sandia Corporation, a wholly owned subsidiary of Western Electric, began managing and operating Sandia Laboratory. In 1979, Congress recognized the facility as a national laboratory. From 1993 to mid-2017, Sandia Corporation was a wholly owned subsidiary of Martin Marietta (merging with Lockheed Corporation in 1995 to form Lockheed Martin Corporation). In May 2017, the managing and operating contractor changed its name to NTESS, a wholly owned subsidiary of Honeywell International Inc.

At the end of fiscal year 2022, the Sandia workforce (for all sites) comprised approximately 15,530 employees and contractors, with around 15 staff members permanently located at SNL/KTF (Sandia n.d.).

1.2.2 Sandia National Laboratories, Kaua'i Test Facility

SNL/KTF has been an active rocket-launching facility since 1962, predating the establishment of the Pacific Missile Range Facility. Later construction, completed in March 2005, extended the Missile Service Tower to support DOE and the Missile Defense Agency. The most recent construction has been an upgrade of the launch field power system. From 1992 to 2022, SNL/KTF personnel have supported 125 launches from SNL/KTF, the Pacific Missile Range Facility, and other mission assets.

SNL/KTF, located on the island of Kaua'i, exists as a facility within the boundaries of the U.S. Department of Defense Pacific Missile Range Facility.

The SNL/KTF launch field was originally designed to accommodate 40 launchpads, but only 15 pads were constructed. Of these, 11 have had their out-of-use launchers removed over the years. An additional launchpad, Pad 41 (Kokole Point), was constructed at the southern point of the Pacific Missile Range Facility ([Figure 1-1](#)). The Kokole Point launch complex and associated facilities were transferred to the U.S. Navy in 2013; however, Sandia programs may launch from this location on a case-by-case basis for campaign operations. In addition to rocket launchpad sites, facilities include missile and payload assembly buildings, launch operations and data acquisition facilities, maintenance shops, and a trailer dock compound for administration and other office processing.

1.3 Location Description

SNL/KTF is located on the western coast of Kaua'i, Hawai'i. SNL/KTF is a tenant of, and located within, the U.S. Department of Defense (DOD) Pacific Missile Range Facility. There are agricultural fields to the north and east of SNL/KTF with the Pacific Ocean on the northwest and southwest ([Figure 1-1](#)).

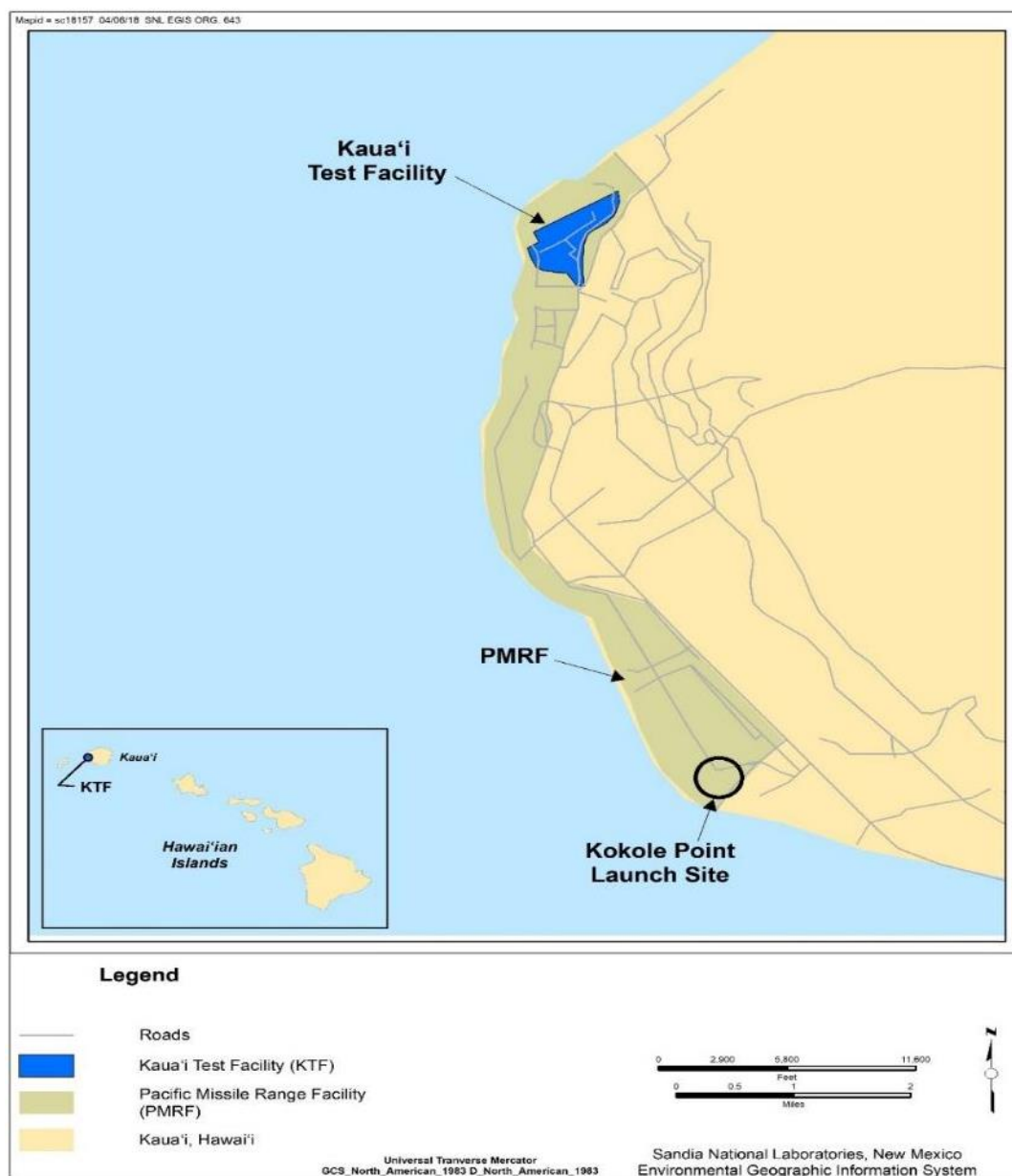


Figure 1-1. Kaua'i Test Facility location on Kaua'i, Hawai'i

1.4 Demographics

There were 15 permanent on-site personnel at SNL/KTF in the first six months of 2022 and 14 permanent personnel in the last six months of 2022. During campaign operations when rocket launches occurred, approximately 200 additional people worked there. The total population of Kaua'i County, Hawai'i was estimated to be 73,810 persons in 2022 (U.S. Census Bureau n.d.).

1.5 Activities and Facilities

SNL/KTF facilities and personnel support a variety of missions, including research and development, operational training, and testing and evaluation. Personnel conduct launch activities for multiple mission partners, other organizations, and government agencies on a noninterference basis. SNL/KTF provides a high-quality integrated facility for conducting a wide range of test operations. These operations support the launch of sounding rocket flight vehicles and payload experiments within a highly dynamic flight environment for component development and flight testing. Resources are available for assembling, testing, and launching instrumented rockets and rocket payloads; receiving, recording, and processing telemetry; and transferring data with remote airborne and ship-borne instrumentation platforms. Operations do not (currently or in the past) involve radioactive materials.

The administrative area of SNL/KTF, known as the Main Compound, and the launch field are located within fenced areas near the North Nohili access road. Inside the compound, several trailers and structures are connected by a network of concrete docks and covered walkways. Most of these facilities are used during mission operations to support customers, defense contractor personnel, and technical staff from Sandia National Laboratories, New Mexico (SNL/NM); general maintenance activities are performed during noncampaign operations. In addition, there are permanent buildings and shelters in the Main Compound and launch field, some of which are in use year-round to support and maintain SNL/KTF facilities.

In addition to operations on Kaua'i, Sandia personnel conducted operations at Mount Haleakalā on the island of Maui (Figure 1-2) from 1962 to 2016. The Sandia facility there consisted of one building and a large structure used for telemetry operations, which provided high-altitude tracking for tests conducted at SNL/KTF. The site is in the process of being transferred to the Federal Aviation Administration (part of the U.S. Department of Transportation). Extensive decontamination and demolition work was done at the site in support of the transfer. The decontamination and demolition activities were completed in 2020, leaving behind two concrete slabs and the large structure to be used by other organizations; the transfer is expected to be completed in 2023 but remains incomplete. Efforts continue to complete the transfer.



Figure 1-2. Operations at Mount Haleakalā, Maui

1.5.1 Rocket Launches in 2022

SNL/KTF personnel supported six rocket launches in 2022. The launches included the following:

- April 9, 2022, Missile Defense Agency, ARAV-Q, FEM-01
- June 29, 2022, U.S. Army Space and Missile Defense Command, AUR, JFC-1
- November 9, 2022, Missile Defense Agency, MRBM-T4-E6, JFTM-07 Event 1

- November 15, 2022, Missile Defense Agency, MRBM-T4-E7, JFTM-07 Event 2
- November 18, 2022, Missile Defense Agency, SRBM-T4-B42, JFTM-07 Event 4
- November 20, 2022, Missile Defense Agency, MRBM-T4-E8, JFTM-07 Event 3

1.6 Environmental Setting

Kauaʻi is the oldest, northernmost, and fourth-largest island of the main island chain within the volcanic Hawaiʻian Archipelago. Kauaʻi's varied geographic and topographic features include Waimea Canyon, the Na Pali Coast cliffs, the twin peaks of an old volcano (Mount Kawaikini and Mount Waiʻaleʻale, with 5,243 foot and 5,148 foot elevations, respectively), the Alakaʻi Swamp, the flat-lying coastal Mana Plain, and the Barking Sands dune field (DOE/AL 1992).

Kauaʻi is the oldest, northernmost, and fourth-largest island of the main island chain within the volcanic Hawaiʻian Archipelago.

The low-lying coastal Mana Plain flanks the western slope of the island, forming gentle slopes from the volcanic uplands to the coastal margin (U.S. Navy 2010). The area is relatively flat, ranging in elevation from approximately 5 to 20 feet above mean sea level. Beach dunes parallel to the Pacific Ocean rise above the launch field to a maximum elevation of approximately 100 feet above mean sea level.

1.6.1 Geology

Kauaʻi consists of a single massive shield volcano, located at the island's center, which built up from the sea floor by many thousands of thin flows of basaltic lava. The volcanic deposits are now deeply eroded and partly veneered with subsequent volcanic flows. Volcanic rocks exposed on the western half of the island are the oldest and are composed of Pliocene basaltic flows of the Waimea Volcanic Series (U.S. Navy 2010).

Toward the end of the growth of the shield volcano, a period of collapse, faulting, erosion, and subsequent volcanism affected the original surface. The collapse created a broad caldera that is 10 to 12 miles across. Erosion has since destroyed the original surface, and the Alakaʻi Swamp occupies slightly dissected remnants.

The rocks of Kauaʻi are all volcanic except for minor amounts of sediment derived from the volcanic rocks by erosion and a narrow, discontinuous fringe of calcareous reef and beach deposits (MacDonald, Davis and Cox 1960). The Mana Plain is composed of a wedge of terrestrial and marine sediment (alluvium, lagoon, beach, and dune deposits) that overlie the volcanic basement (DOE/AL 1992).

1.6.2 Surface and Groundwater Hydrology

There are no natural surface water drainages on SNL/KTF, as the sand at the surface is too permeable for rainwater to accumulate and travel laterally (DOE/AL 1992).

The three geologic units (volcanic bedrock, alluvium, and dune deposits) underlying SNL/KTF constitute three different but hydraulically connected aquifers. The groundwater from all three units tends to be brackish, not potable, and is not suitable for irrigation (DOE/AL 1992). No groundwater wells are located on SNL/KTF.

1.6.3 Ecology

A description of the ecological setting—including vegetation types, wildlife, protected species, and threatened and endangered species—at the Pacific Missile Range Facility and SNL/KTF is detailed in [Chapter 4](#).

1.6.4 Climate

The climate at SNL/KTF is typical of maritime subtropical islands with an average daily temperature range of 84°F to 66°F. August is the warmest month of the year, with daytime highs averaging 87°F and lows averaging 69°F. January is the coolest month, with daytime highs averaging 79°F and lows averaging 62°F. The region is strongly influenced by the Pacific subtropical high-pressure system. There are two main seasons in tropical and subtropical areas: a wet season and a dry or windy season.

SNL/KTF is located on the lee side of the island, which reduces the amount of annual rainfall as compared to the eastern and mountainous areas of Kauaʻi. The lee side exhibits more arid conditions, with an average annual rainfall of approximately 23 inches. The wet season generally starts in October and extends into March. June to August are the driest months of the year with an average of less than one inch of rain recorded for each month (Western Regional Climate Center n.d.).

Winds are mostly from easterly directions on Kauaʻi. The northeast and southeast trade winds generally blow between 15 and 25 miles per hour. This global subtropical trade wind pattern occasionally becomes disrupted in the winter when cool, wet systems approach the island from the west or northwest. Relative humidity ranges from 60 to 70 percent in the summer to near 80 percent during the wet season. Direct hits from typhoons or hurricanes are rare in the Hawaiʻian Islands, though damage from nearby storms may occur. The most destructive hurricane to hit Kauaʻi was Hurricane Iniki in September 1992.

1.7 Overview of the Environmental Management System

Sandia integrates environmental protection with its missions through the Environmental Management System. The Environmental Management System is a set of interrelated elements used to establish policy and environmental objectives that enable Sandia personnel to reduce environmental impacts and increase operating efficiency through a continuing cycle of planning, implementing, evaluating, and improving processes. The scope of Sandia's Environmental Management System encompasses all activities, products, and services that have the potential to interact with the environment at all of Sandia's numerous locations.

Sandia has established environmental programs at SNL/KTF (listed in the next section) that are instrumental in the implementation, maintenance, and continual improvement of the Environmental Management System at this site. For more information on the Environmental Management System, see [Section 5.3](#).

1.8 Environmental Programs and Focus Areas

The following chapters and sections detail the current environmental programs and focus areas at SNL/KTF:

- Cultural Resource Management Program ([Chapter 2](#))
- National Environmental Policy Act Program ([Section 3.1](#))
- Chemical Information System ([Section 3.2](#))
- Waste Management Program ([Section 3.3](#))
- Air Quality Compliance Program ([Section 3.4](#))

Introduction to Kaua'i Test Facility

- Meteorology Program ([Section 3.5](#))
- Oil Storage Program ([Section 3.6](#))
- Terrestrial Surveillance Program ([Section 3.7](#))
- Water Quality Programs ([Section 3.8](#))
- Ecology Program ([Chapter 4](#))

In addition, a summary of compliance efforts is provided in [Chapter 5](#), and [Chapter 6](#) details how quality assurance is implemented for environmental monitoring and sampling at SNL/KTF.



Laysan albatross (*Phoebastria immutabilis*) with egg

Chapter 2. Cultural Resource Management Program



Revetment between administrative compound and launch field, Kaua'i Test Facility
(Photo by Joseph M. Bonaguidi)

OVERVIEW ■ Cultural Resource Management Program personnel coordinate cultural resource compliance, including review of archaeological sites and historic buildings. Actions that could affect cultural resources adversely are analyzed initially in a National Environmental Policy Act checklist review. DOE is responsible for ensuring that impacts on cultural resources are assessed and appropriate actions are taken to mitigate those impacts.

The Cultural Resource Management Program is focused primarily on long-term preservation and protection of cultural resources and cultural resource compliance to ensure that the heritage of Sandia operating areas and their landscapes are maintained. Long-term preservation and protection practices also ensure that data are available to make proper land use decisions and to assist with environmental planning. Cultural resources are places and physical evidence of past human activity: a site, an object, a landscape, a structure, or a natural feature of significance to a group of people traditionally associated with it.

The Cultural Resource Management Program is focused on two main cultural resource categories: archaeological resources and historic buildings.

Approximately six archaeological surveys were conducted between 1976 and 2022 at SNL/KTF. Monitoring of all construction activities is required in the areas from Kekaha to the south and Polihale to the north of the Pacific Missile Range Facility as well as in intermediate areas.

In 2006, the Sandia historian conducted a survey of the SNL/KTF built environment. No final report with recommendations was completed; however, the survey and context provided by that

survey is used to support consultations at SNL/KTF. None of the buildings or structures involved in undertakings since have been determined to be eligible for the National Register of Historic Places.

2.1 Cultural History

Three major historical periods are used to define traditions on Kauaʻi: Pre-Contact Period (circa AD 450–1778) to Early Historic Period (AD 1778–1800), Contact Period (AD 1778–1850), and Mahele Period (AD 1830–1870).

Much of the knowledge regarding traditional land use patterns at SNL/KTF is based on what was recorded at the time of, and shortly after, Western contact. Early records (such as journals kept by travelers and missionaries) documented Hawaiʻian traditions from that time, and archaeological investigations have assisted with understanding the past. Kauaʻi consists of six *moku* (land divisions that section off portions of the island): Kona, Puna, Koʻolau, Haleleʻa, Napali, and Waimea (Moffat and Fitzpatrick 1995). *Ahupuaʻa* (smaller land divisions within the moku) incorporate the natural resources necessary for traditional subsistence strategies. SNL/KTF is located in the ahupuaʻa of Waiawa, which is in the Kona moku of Kauaʻi.

A moku is a land division that sections off portions of the island.

Previous archaeological work outside of SNL/KTF but at nearby Barking Sands on the Mana Plain led to the identification of prehistoric habitation and multiple types of features made by and utilized by humans (i.e., a fire pit, bedrock mortars, and shelters). Archaeological and historical records of the area revealed that Native Hawaiʻians used five environmental zones during traditional (Contact and Mahele) times in the western region of Kauaʻi: coastal and beach dunes, marshlands, cliff slopes, valleys, and upper mountain slopes. Archaeological studies along the coast and further inland revealed habitation, religious sites, and agricultural sites that date from AD 1120–1310 (Sweeney 1994).

2.2 Historical Context

Private plane pilots used a pasture near Barking Sands, Kauaʻi, as a landing field in the 1920s. In 1928, the Territorial Aeronautical Commission had the area surveyed and took control of the field. One of three landing fields on Kauaʻi, the Barking Sands Landing Field (also identified as Mana Airport), was intended as a stopover for transpacific flights.

Prior to United States involvement in World War II, the military improved and expanded the facilities at Barking Sands. Both the U.S. Army and the U.S. Navy used the site during the war, acquiring additional land and building up the facilities.

The U.S. Air Force took over Barking Sands in 1948, renaming it Bonham Air Force Base. In 1954, Bonham Air Force Base was declared excess, although no disposal action was taken. In 1962, the Atomic Energy Commission obtained permission for Sandia to use space at Bonham to set up a rocket-launching facility in support of the Operation Dominic nuclear test series based in the Pacific at Christmas and Johnston islands. Sandia engineers surveyed the site and planned for 40 launchpads. Subsequently, the U.S. Navy leased the Bonham Air Force Base, which was then transferred from the U.S. Air Force to the U.S. Navy in 1966. It is now known as the Pacific Missile Range Facility, a 7.5-mile-long, 0.5-mile-wide strip of coastal land.

Meant to be temporary, Sandia's site was used to launch diagnostic rockets to support analysis of Operation Dominic's high-altitude nuclear shots. Sandia personnel were able to launch instrumentation rockets simultaneously with small rockets launched from Johnston Island 700 miles away.

Sandia operations on Kauaʻi were expected to end after Operation Dominic. However, when ratifying the 1963 Limited Test Ban Treaty, the U.S. Congress placed conditions—safeguards—on its approval. The United States needed to maintain a readiness to resume atmospheric nuclear testing should another nation break the treaty or should the United States have another imperative for these tests. As part of the support for this Readiness Program, Sandia maintained the test range on Kauaʻi, establishing a permit with the U.S. Navy to continue using the SNL/KTF site at the Pacific Missile Range Facility. The readiness requirement was dropped in the 1970s, but Sandia’s well-established rocket-launching capabilities remained in demand at SNL/KTF.

2.3 Regulatory Criteria

Ensuring compliance with federal and state requirements supports the long-term preservation and protection of cultural resources, prevents mission delays, and maintains trust and a strong relationship with DOE and the Hawaiʻi State Historic Preservation Division. See [Chapter 5](#) for details on state and federal requirements related to cultural resources.

2.4 Archaeological Resources

The Sandia archaeological staff assists Sandia personnel and DOE in maintaining compliance with the National Historic Preservation Act, Section 106 (PL 89-665 1966) requirements. This ensures that (1) cultural resources and their historic and cultural heritage are preserved and protected and (2) data are available to make appropriate land use and environmental planning decisions at SNL/KTF.

Sandia’s archaeological staff reviews National Environmental Policy Act (NEPA) checklists that involve land disturbances and provides recommendations for monitoring field activities to avoid an adverse effect on archaeological resources. The archaeological staff make site eligibility recommendations for inclusion in the National Register of Historic Places. Additionally, the archaeological staff ensures that local, native Hawaiʻian cultural resource management personnel who are permitted by the state perform any archaeological work.

2.4.1 Field Methods

Local archaeological personnel who hold state-required permits to conduct archaeological work in Hawaiʻi at SNL/KTF are contracted to monitor all work that will disturb land. In addition, the contracted archaeological personnel provide recommendations regarding the potential effect of proposed undertakings on prehistoric and historic properties. These include recommendations regarding a site’s eligibility for nomination to the National Register of Historic Places for Cultural Properties and Historic Preservation and project mitigation.

The contracted archaeological personnel write reports of findings and associated documentation and provide them to the Sandia archaeological staff for review. The reports and associated documents are then provided to DOE, including a consultation letter addressed to the Hawaiʻi State Historic Preservation Officer, for review and use in consultation.

2.4.2 Program Activities and Results 2022: Archaeological Resources

In 2022, the Sandia archaeological staff reviewed one NEPA checklist for an outdoor project, which included launch and facility operations. The project had ground-disturbing activities, which required an archaeologist to monitor all the work. Permitted, local Hawaiʻian archaeologists who met the State of Hawaiʻi archaeological monitoring requirements completed the archaeological monitoring on-site. Sandia archaeological staff regularly communicated and coordinated throughout the year with SNL/KTF personnel regarding ongoing activities and mission support, providing guidance to avoid inadvertent impacts to cultural resources while not delaying operations.

2.5 Historic Buildings

Since 2006, environmental planning and cultural resource management at SNL/KTF have included historic building assessments and compliance with National Historic Preservation Act, Section 106 requirements. The Sandia historian conducts historic building assessments and makes recommendations to DOE regarding National Register of Historic Places eligibility for SNL/KTF properties.

2.5.1 Methods

Sandia's historian reviews project details, reviews existing photographs of and documents about the facilities involved, conducts any additional research in the archives and building drawings collection to understand a property's past and current role in SNL/KTF operations, and evaluates a building's history. Note is made of any previous assessments and resulting determinations as to a property's eligibility for the National Register of Historic Places.

If there are any questions regarding proposed work and its potential impact on a property or properties, the historian discusses the matter with the project owner and the NEPA specialist. The project owner may submit renderings of the anticipated appearance of the property after work is completed, and the historian may suggest alternate locations, materials, or methods to avoid adverse effects on the property.

Once a property is understood in context, the historian makes a recommendation as to whether it is eligible for inclusion in the National Register of Historic Places, summarizing past determinations and any subsequent changes to the property. The historian also makes a recommendation as to whether proposed work will have an adverse effect on any historic properties or districts, including the property where the work is occurring. Information regarding the property, photographs, maps, a description of the proposed work, any impacts, and the overall recommendation on eligibility are captured on a Hawai'i Historic Resources Inventory form. The historian's recommendation and any indication of a need for further action are captured in the NEPA checklist subject matter expert review. The Historic Resources Inventory form and a consultation letter addressed to the Hawai'i State Historic Preservation Officer are submitted to DOE for review and use in consultation. When DOE consults, the historian submits the requisite documentation to the Hawai'i Cultural Resource Information System.

2.5.2 Previous Building Surveys, Assessments, and Determinations

The Sandia historian conducted a historic building survey of SNL/KTF in 2006. This survey serves as the basis for understanding the properties at the site and for generating Hawai'i Historic Resources Inventory forms as properties face renovation or demolition. No site-wide assessment or historic context statement (providing the framework for evaluating a property for historic significance) exists. No sitewide consultation has occurred.

For each project undertaken since 2006—including minor repair activities, large-scale renovations, and demolition—DOE, in consultation with the Hawai'i State Historic Preservation Office, has determined that the properties involved are not eligible for the National Register of Historic Places. This is largely because the SNL/KTF property has undergone significant modification (and removal) of key early facilities and no longer represents its historic Cold War and Readiness Program activities.

2.5.3 Program Activities and Results 2022: Historic Buildings

No projects affecting the built environment were undertaken in 2022. No documentation was prepared, and no consultations with the Hawai'i State Historic Preservation Officer were undertaken.

Chapter 3. Environmental Programs



Island of Kaua'i

OVERVIEW ■ Sandia personnel take the responsibility of protecting the environment seriously. Numerous program teams monitor the environment and perform activities at SNL/KTF to help prevent pollution and conserve natural resources.

Sandia personnel providing services for SNL/KTF take the responsibility of protecting the environment seriously. Personnel demonstrate this responsibility every day by striving to minimize the adverse environmental impacts of the work done. Environmental Program subject matter experts are responsible for knowing and understanding federal, state, and local requirements for their programs. Presidential executive orders and DOE guidance documents are also used to establish program criteria.

The current environmental programs and focus areas presented in [Figure 3-1](#).



Figure 3-1. Environmental programs at SNL/KTF

3.1 National Environmental Policy Act Program

NEPA Program personnel provide technical assistance to ensure that Sandia operations and activities are reviewed for NEPA compliance at all Sandia sites, including SNL/NM; SNL/KTF; Sandia California (SNL/CA); the Tonopah Test Range in Nevada; and other remote locations. For all proposed projects and activities, project owners must complete a NEPA checklist using the online NEPA Module application. A NEPA checklist is an internal form that NEPA Program personnel use to review proposed projects and activities for compliance with NEPA.

After reviewing a NEPA checklist, NEPA Program personnel also determine whether proposed projects and activities have been evaluated in existing NEPA documentation. In addition, other relevant environmental program subject matter experts review proposed projects and activities to identify any applicable environmental permitting and/or other requirements for the proposed work and then communicate this to project managers. Project managers are required to ensure that all environmental requirements are met.

A NEPA checklist is forwarded to DOE for review when a proposed project or activity reflects any of the following:

- The proposed project or activity is not covered by existing NEPA documentation.
- The proposed project or activity is outside the scope of an existing land-use permit.
- The proposed project or activity is at a location that is not owned by DOE or permitted to Sandia.

DOE will make a NEPA determination, which describes whether further analysis is required for the proposed action. If it is determined that projects or activities do not have a significant effect on the human environment, then the work may be categorically excluded from requirements for an environmental assessment or environmental impact statement. Projects or activities that have not been reviewed in existing NEPA documents or do not qualify for a categorical exclusion from NEPA requirements per 10 CFR 1021, *National Environmental Policy Act Implementing Procedures* (10 CFR 1021), do require new or additional NEPA analyses, which may result in the need for a new environmental assessment, a new environmental impact statement, or documentation to supplement an existing environmental impact statement or environmental assessment.

DOE/EA-2089, *Site-Wide Environmental Assessment, Sandia National Laboratories, /Kauai Test Facility* (DOE/NNSA 2019), evaluated the impacts of Sandia operations for continued operations at SNL/KTF.

3.1.1 Program Activities and Results 2022: National Environmental Policy Act

NEPA Compliance

In calendar year 2022, NEPA Program personnel participated in process improvement activities with the DOE Sandia Field Office. These activities led to Sandia Field Office and Sandia NEPA Program personnel aligning terminology, roles and responsibilities, and both short- and long-term process improvements.

In addition to reviewing checklists and supporting process improvement activities, NEPA Program personnel worked to improve Environmental Program outreach and support at SNL/KTF. This resulted in enhanced project planning, such as tracking long-lead requirements and verifying that all environmental requirements were met before beginning work. NEPA Program personnel also supported several upcoming projects that did not start in 2022, including plans to construct a Mission Support Building to replace the current administrative facilities and to negotiate a land use

permit with the U.S. Navy. Additionally, NEPA Program personnel supported a casual analysis in 2022 to evaluate a transformer oil spill that occurred in 2021 at SNL/KTF (Sandia 2022).

NEPA Checklist Reviews

In 2022, NEPA Program personnel reviewed three NEPA checklists for new and ongoing activities at SNL/KTF. Of these checklists, two described activities and operations that were analyzed in previously published NEPA documents (Table 3-1). The third checklist described activities and/or operations that had not been previously analyzed in existing NEPA documents and was sent to the NEPA Compliance Officer at the Sandia Field Office for review and determination. The Sandia Field Office NEPA Compliance Officer cited two categorical exclusions in their determination for the third checklist (Table 3-2).

Table 3-1. NEPA checklists reviewed in 2022 for projects and activities described in existing NEPA documentation

NEPA Document Title	Documents Cited in Sandia Determinations	Number of Citations
Final Site-Wide Environmental Impact Statement for Sandia New Mexico (1999)	EA DOE/EA-2089	1
Quality Assurance Review of Previously Determined Activities	Various	1

Table 3-2. Categorical exclusions cited by DOE NEPA Compliance Officer in determinations for activities at SNL/KTF in 2022

Categorical Exclusions	Number of Citations
B1.24 Transfer of structures/residential, commercial, industrial use	1
B1.25 Transfer of land/habitat preservation, wildlife management	1

Note: Some determinations cited multiple categorical exclusions.

3.2 Chemical Information System

The Chemical Information System is a comprehensive chemical information tool used across all Sandia sites to track workplace chemical and biological containers by location. The primary drivers for the Chemical Information System are state and federal regulations, including the Emergency Planning and Community Right-to-Know Act. The Chemical Information System compiles information concerning chemical hazards and appropriate protective measures for Emergency Management Operations, other Environment, Safety, and Health (ES&H) programs, and the workforce.

SNL/KTF uses the Chemical Information System to track and manage chemicals; the system provides the chemical or product name, its location and quantity, and information about who is responsible for the chemical. Chemical hazards are reported on safety data sheets, and the Chemical Information System currently contains more than 127,000 safety data sheets in its library for use by any Sandia site. This electronic inventory helps chemical users and their managers assess and manage workplace hazards. Easy access to this inventory facilitates availability searches. It also improves the ability to share chemicals and thus reduces sources, which minimizes chemical purchases and waste disposal expenses.

A pre-procurement module, ChemPro, is used to request permission for new chemical purchases. The system runs a series of queries, comparing the requested purchasing information to regulatory limits, and determines whether the requested chemical and volume is approved for use and storage

in the specified location. If approved, the requestor is given a chemical approval number, which must be provided to the chemical vendor as part of the purchasing process. ChemPro allows for proactive environmental and safety planning.

3.2.1 Program Activities and Results 2022: Chemical Information System

In 2022, chemical containers were tracked along with information about any related chemical hazards listed in the Chemical Information System.

3.3 Waste Management Program

Operations at the site generate common office and household solid waste and SNL/KTF is also classified as a very small quantity generator of hazardous waste. Personnel follow applicable requirements for solid waste and hazardous waste. United States Environmental Protection Agency (EPA) Region 9 and the Hawai'i State Department of Health issued a hazardous waste generator identification (HI-0000-363309) to Sandia on September 23, 1994.

At SNL/KTF, compliance with the Toxic Substances Control Act involves management of polychlorinated biphenyls (PCBs) and asbestos. The transformers at SNL/KTF have been tested and are free of PCBs. Asbestos abatement-related activities are conducted in accordance with applicable regulatory requirements as needed. The SNL/NM asbestos management team conducted a comprehensive asbestos survey in July 2008. One hundred and ten cubic yards of asbestos-containing materials were identified at SNL/KTF.

3.3.1 Program Activities and Results 2022: Waste Management

Some hazardous waste was generated through normal operations at SNL/KTF in 2022. No asbestos-containing materials were removed in 2022.

3.4 Air Quality Compliance Program

As required, the 2022 Annual Emissions Report for air emissions was submitted to the State of Hawai'i (DOE/NNSA 2022). The annual fee was submitted to the State of Hawai'i for 2022 as required by the Noncovered Source Permit. All operations at SNL/KTF complied with permitted operating limits.

The two diesel-fired power generators at SNL/KTF are permitted for operation by the State of Hawai'i under a Noncovered Source Permit (Hawaii DLNR 2015). These generators are subject to the provisions of the following federal regulations (the specific requirements of these standards are detailed in special conditions within the permit):

- 40 CFR 60, *Standards of Performance for New Stationary Sources*, Subpart A, "General Provisions" (10 CFR 60 2016)
- 40 CFR 60, *Standards of Performance for New Stationary Sources*, Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines"

Rocket launches are considered mobile sources of air emissions, and rocket launch emissions are included in the review against Toxic Release Inventory reporting thresholds.

3.4.1 Program Activities and Results 2022: Air Quality Compliance

The two monitoring reports for the Noncovered Source Permit were submitted to the State of Hawai'i for 2022 operations within required timelines (DOE/NNSA 2022). The highest total

combined operating hours for a rolling 12-month period was 483.4 hours, which occurred in the period from December 2021 to November 2022.

3.5 Meteorology Program

Sandia personnel operate on-site meteorological instruments at SNL/KTF which are used during test periods to characterize ground-level and atmospheric wind conditions. Additionally, climatic information, representative of SNL/KTF, is obtained from Pacific Missile Range Facility personnel, and severe weather notifications are issued automatically by the Pacific Missile Range Facility Emergency Operations Center to all SNL/KTF resident personnel.

3.6 Oil Storage Program

Oil Storage Program personnel support regulatory compliance associated with the management, operation, and maintenance of oil storage containers and equipment at SNL/KTF. Aboveground oil storage containers at SNL/KTF operate under the *Pacific Missile Range Facility Spill Prevention, Control, and Countermeasure Plan* (U.S. Navy 2017) as required by 40 CFR 112, *Oil Pollution Prevention*. The *Pacific Missile Range Facility Spill Prevention, Control, and Countermeasure Plan* describes the oil storage facilities at SNL/KTF and the mitigation controls in place to prevent inadvertent discharges of oil.

The SNL/KTF inventory of oil storage containers and equipment operating under the Pacific Missile Range Facility Spill Prevention, Control, and Countermeasure Plan include:

- One portable diesel fuel generator base tank (192 gallons)
- One stationary aboveground diesel fuel storage tank (10,000 gallons)
- Two stationary diesel fuel generator base tanks (300 gallons each)
- Four 55-gallon drums used for collecting and storing oil
- Five in-service oil-filled electrical transformers

In addition to aboveground oil storage containers at SNL/KTF, a single underground gasoline storage tank (2,500 gallons) is maintained on-site and is subject to regulation under the Hawai'i Administrative Rules, Title 11, Chapter 280.1, *Underground Storage Tanks* (HAR-11.280.1 2021). The underground storage tank is permitted with the Hawai'i State Department of Health. The tank leak detection system equipment is inspected and functionally tested annually in accordance with requirements.

3.6.1 Program Activities and Results 2022: Oil Storage

In 2022, the required annual inspection and testing of the underground storage tank system was performed, and no issues or concerns were identified.

3.7 Terrestrial Surveillance Program

Terrestrial Surveillance Program personnel collect environmental media (soil) samples at SNL/KTF approximately every five years. Environmental surveillance began at SNL/KTF in 1994 and continued in 1999, 2002, 2007, 2012, 2018, and 2022.

3.7.1 Regulatory Criteria

The Terrestrial Surveillance Program is designed to address DOE O 458.1 Admin Change 4 (Ltd Chg), *Radiation Protection of the Public and the Environment* (DOE O 458.1 Chg 4 (LtdChg) 2020), which establishes standards and requirements to protect the public and the environment from undue risk

from radiation associated with radiological activities under DOE control. SNL/KTF operations do not (currently or in the past) involve radioactive materials; therefore, radiological constituents are not analyzed. As a best management practice, soil samples are analyzed for metals at site-specific locations.

The Terrestrial Surveillance Program is also designed to satisfy Sandia's Environmental Management System objectives. Reporting is done in accordance with DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting* (DOE O 231.1B, Admin Change 1 2012).

3.7.2 Sample Locations

The on-site sampling locations (Figure 3-2) are in areas of known contamination and areas of potential release (sites with current outdoor testing activities). There are no off-site sampling locations. The sample media consists of surface soil (less than two inches deep).

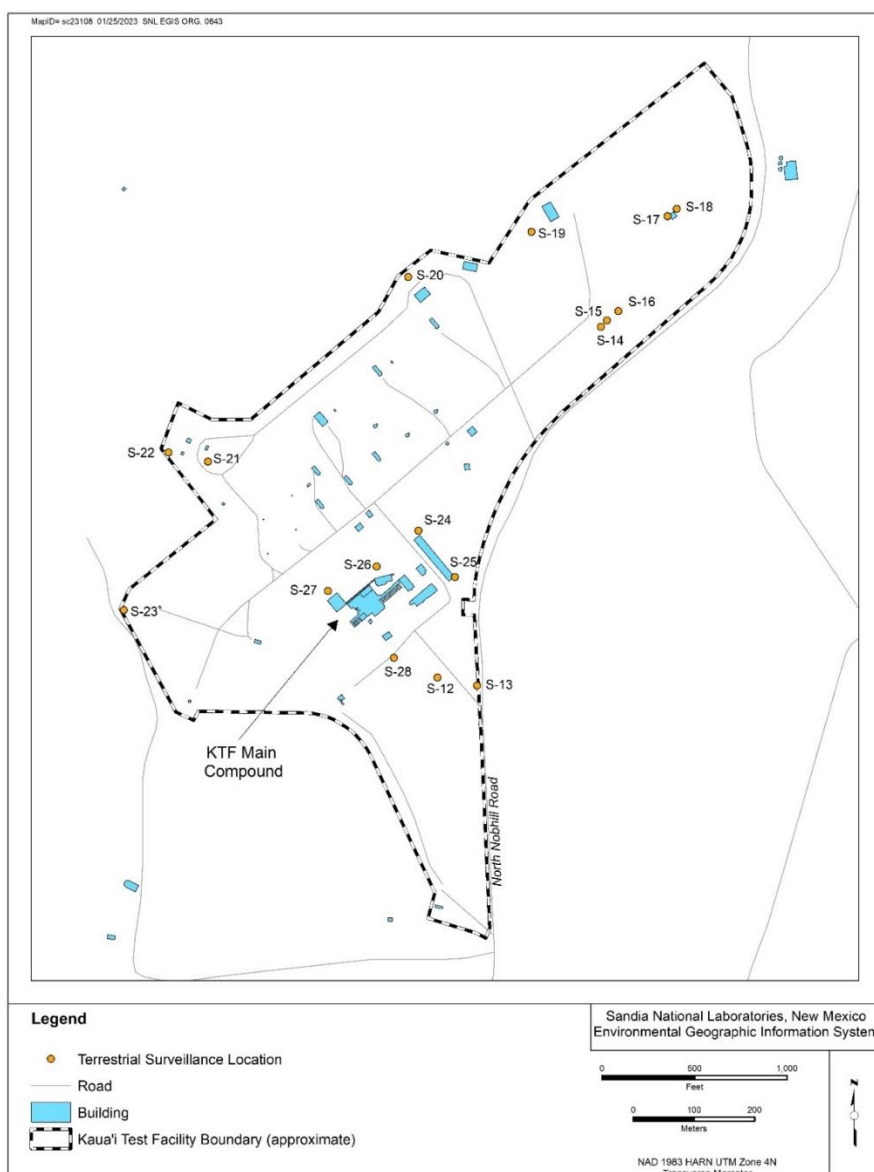


Figure 3-2. Terrestrial Surveillance Program on-site sampling locations

3.7.3 Field Methods, Analytical Parameters, and Quality Control Procedures

All samples were collected in accordance with applicable field operating procedures for soil, sediment, and vegetation sampling activities and with the *Quality Assurance Project Plan for Terrestrial Surveillance at Sandia National Laboratories, New Mexico* (Sandia 2022).

Soil is loose, unconsolidated mineral or organic materials on the immediate surface of the earth that support plant growth. *Sediment* is particles or aggregates derived from rocks, soil, or biological material that are subsequently transported and deposited. *Vegetation* is plant life or the total plant cover of an area.

A contract laboratory analyzed all samples in accordance with applicable EPA analytical methods. All chemical data were reviewed and qualified in accordance with *Data Validation Procedure for Chemical and Radiochemical Data* (Sandia 2020). Samples were analyzed for the following metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Field quality control samples were collected and included duplicate environmental samples. These samples were prepared in accordance with applicable field operating procedures. Laboratory quality control samples are prepared and analyzed as specified in [Chapter 6](#).

3.7.4 Sample Result Analysis and Methodology

Sample results from 2022 were compared with results from previous sampling in 2012 and 2018. Data from these three sampling events were analyzed by the same contract laboratory with a standard data quality control process specified in the contract, and the analytical results have been through a third-party validation process in accordance with the standard data qualification protocol. Statistical analyses were not performed due to the time gap of approximately five years between sampling events; this gap is too large to produce meaningful results.

In addition to historical comparisons, analytical results for metals in soil samples may be compared to Hawai'i Department of Health (HDOH) natural background concentrations of metals in soil (Hawai'i Department of Health 2017).

3.7.5 Program Activities and Results 2022: Terrestrial Surveillance

The 2022 Terrestrial Surveillance Program activities at SNL/KTF included soil sampling in August at 17 on-site designated locations ([Figure 3-2](#)). [Table 3-3](#) provides a summary of the analytical results with respect to the site historical values and the HDOH natural background concentrations of metals in soil. The analytical results for metals for the 2022 sampling event are provided in [Appendix A](#), "Terrestrial Surveillance Analytical Results in 2022."

Table 3-3. Summary of metals in soil, 2022

Analyte	Results Status	HDOH Natural Background Concentration Range ^a (mg/kg)
Aluminum	Within historical values, no background available	—
Antimony	All nondetect	0.004–2.4
Arsenic	Within historical values, S-13 exceeded background with 51.2 mg/kg	0.3–50
Barium	Within historical values and background range	4.5–926

Analyte	Results Status	HDOH Natural Background Concentration Range ^a (mg/kg)
Beryllium	Within historical values and background range	0.05–3.8
Cadmium	Within historical values and background range	0.02–17
Calcium	Within historical values, no background available	—
Chromium (total)	Maximum historical value at S-13 with 113 J mg/kg, within background range	8.52–3,180
Cobalt	Within historical values and background range	0.69–113
Copper	Within historical values and background range	2.4–450
Iron	Within historical values, no background available	—
Lead	Within historical values and background range	0.76–73
Magnesium	Maximum historical value at S-13 with 72,700 mg/kg, no background available	—
Manganese	Within historical values, no background available	—
Nickel	Maximum historical value at S-13 with 604 J mg/kg, within background range	21–767
Potassium	Within historical values, no background available	—
Selenium	Within historical values and background range	0.24–12
Silver	Within historical values, S-22 exceeded background with 2.21 J+ mg/kg	0.02–1.5
Sodium	Within historical values, no background available	—
Thallium	All nondetect	< 0.25–15
Vanadium	Within historical values and background range	0.25–1,090
Zinc	Within historical values and background range	3.6–1,200

^a Hawai'i Department of Health, 2017.

— = not available

J = The associated numerical value was an estimated quantity.

J+ = The associated numerical value was an estimated quantity with a suspected positive bias.

Arsenic at S-13 exceeded established HDOH background values, although it was within the historical values. Chromium (total) at S-13 exceeded the historical maximum values with an estimated value but did not exceed the HDOH background range. Magnesium at S-13 exceeded the historical background values; however, there is no HDOH background range for that analyte. Nickel at S-13 exceeded historical values with an estimated value but did not exceed the HDOH background range. Silver was within historical values with an estimated value but exceeded the HDOH background range at S-22.

Variances

There were no variances from planned activities in 2022.

3.8 Water Quality and Environmental Release, Response, and Reporting Programs

Water quality-related programs at SNL/KTF ensure compliance with local, state, and federal requirements. There are no drinking water or groundwater monitoring wells at SNL/KTF. All drinking water at SNL/KTF is supplied by the Pacific Missile Range Facility public water system.

SNL/KTF Environmental Release, Response, and Reporting Program personnel are contacted in the event of any spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping,

leaching, dumping, or disposing of material into the environment, which may include (but is not limited to) soil, water, air, and drain systems. A set of procedures provides specific instructions for reporting an environmental release and for developing an accurate report. Environmental Release, Response, and Reporting Program personnel implement the procedures for and document all aspects of an environmental release and report on chemical use to ensure compliance with federal, state, and local reporting requirements.



Kaua'i fishing boat at sunset

3.8.1 Program Activities and Results 2022: Water Quality

Events Reported to the Hawai'i Environment Department

In 2022, no releases occurred that required reporting to the Hawai'i Hazard Evaluation and Emergency Response Office (see [Section 3.6](#)).

Events Categorized as a DOE Reportable Occurrence

In 2022, no releases to the environment were reported to outside agencies that met the criteria for DOE-reportable occurrences under DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information* (DOE O 232.2A, Chg 1 (MinChg) 2017) (see [Chapter 5](#) and [Section 3.6](#)).

3.8.2 Stormwater Program

Stormwater runoff at SNL/KTF is directed into four area drains with pumping systems. Stormwater permits, inspections, and sampling are not required for normal operations.

Program Activities and Results 2022: Stormwater Program

New construction activities that exceed one acre of soil disturbance require permitting under the Construction General Permit. No construction activities required permit coverage during 2022.

3.9 Wastewater Discharge Program

Activities at SNL/KTF produce only sanitary sewage, which is directed into three DOE-owned and state-registered septic tanks; all the tanks are currently in use and do not impact any protected waters. The first septic tank was built in 1965 and was replaced in 2004. Two additional septic tanks were built in 1990 to serve other areas. The septic tank systems are pumped periodically and are inspected by licensed, state-certified contractors.

Wastewater is the spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter.

3.9.1 Program Activities and Results 2022: Wastewater Discharge

During 2022, none of the septic tank systems were inspected or pumped. There were no wastewater sampling events in 2022.

Chapter 4. Ecology Program



Raccoon butterflyfish (*Chaetodon lunula*)

OVERVIEW ■ Ecology Program personnel help operations comply with wildlife regulations and laws by providing biological evaluations and surveys in support of site activities. Ecological data is collected on plants and wildlife to support documentation, land use decisions, and ecological and wildlife awareness campaigns to ensure safe work environments and sustainable decision-making strategies.

Ecology Program personnel support site activity and project compliance with wildlife and vegetation requirements by conducting biological evaluations and coordinating surveys. Ecological compliance promotes conservation through the protection of native wildlife and their habitats. Ecology Program personnel provide oversight for contractor biologists.

The introduction of non-native species coupled with human development across the Hawaiʻian Islands' small footprint has made many island species disproportionately rare compared to continental species. Numerous species on the island of Kauaʻi are protected by the Endangered Species Act. Many of these are forest species for whom SNL/KTF provides little or no suitable habitat. These species would not likely occur at SNL/KTF; however, their historical or future occurrence at SNL/KTF cannot be ruled out. Other species listed as endangered or threatened are known to occur in the general SNL/KTF area and have been recorded on-site occasionally. An *endangered species* is any species that is in danger of extinction throughout all or a significant portion of its range. A *threatened species* is any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. The lowlands of Kauaʻi are home to other endemic, indigenous, and migratory birds, which are all protected under the Migratory Bird Treaty Act. Species that are protected under the Endangered Species Act and the Migratory Bird Treaty Act are presented in [Section 4.3](#).

In 2014, the U.S. Navy prepared a biological assessment (U.S. Navy 2014) of the potential for Pacific Missile Range Facility infrastructure, operations, and maintenance to affect species listed as endangered or threatened (DOE/NNSA 2019). The infrastructure and activities conducted at

SNL/KTF were included. The assessment was submitted to the United States Fish and Wildlife Service (USFWS) with a request for formal consultation. The USFWS issued a biological opinion in September 2014.

In 2018, the biological assessment for the effects of base-wide infrastructure, operations, and maintenance was revised and submitted to the USFWS due to exceeding the maximum allowable take for the Newell's shearwater (*Puffinus newelli*) (U.S. Navy 2018). The USFWS issued a biological opinion for the Pacific Missile Range Facility (USFWS 2018) and for SNL/KTF as a tenant. These biological opinions contain measures to minimize the take on Newell's shearwater caused by artificial lighting and collisions with communication towers.

The National Nuclear Security Administration submitted a biological evaluation for launch activities at SNL/KTF in June 2021 (DOE/NNSA/SFO 2021). This evaluation reviewed potential impacts on protected species resulting from SNL/KTF launch activities. The USFWS response concurred with the determination that a proposed project may affect but is not likely to affect species listed as endangered or threatened in the area adversely when specified avoidance and minimization measures are implemented (USFWS 2021).

In February 2022, Pacific Missile Range Facility and the U.S. Navy resubmitted their final biological assessment for effects of base infrastructure, operations, and maintenance at PMRF sites on Kaua'i. The assessment included specific SNL/KTF actions (U.S. Navy 2022).

An ecological compliance program document was developed in 2013 for SNL/KTF to describe procedures that SNL/KTF personnel would take to address potential impacts from operations and activities on protected species that are known to occur in the area. All mitigation measures and terms and conditions from USFWS biological opinions are incorporated in this ecological compliance document. This document is revised periodically to ensure that all conservation actions and compliance processes are current.

4.1 Vegetation

Evolving on an isolated subtropical archipelago, the native plants of the Hawai'ian Islands are both unique and diverse. Kaua'i is the oldest of the main Hawai'ian islands and contains many endemic plant species. A vast portion of the western side of Kaua'i, from Waimea to Polihale, once contained an expansive wetland habitat. This region, known as the Mana Plain, was drained and converted to agricultural lands in the early 1900s. With this drastic transformation, the introduction of numerous invasive plant species shaped the current landscape of the Mana Plain where SNL/KTF is located. Some aquatic habitats can still be found in the form of man-made ditches and reservoirs.

Seven vegetation types are recognized on the undeveloped portions of the Pacific Missile Range Facility, which includes SNL/KTF: kiawe (*Prosopis pallida*)/koa-haole (*Leucaena leucocephala*) scrub, a`ali`i (*Dodonaea viscosa*)-nama (*Nama sandwicensis*) scrub, pohinahina (*Vitex rotundifolia*), naupaka (*Scaevola sericea*) dune, strand, drainage-way wetlands, and ruderal (plant species that are first to colonize disturbed areas) vegetation. Kiawe/koa-haole and a`ali`i-nama scrub are the dominant vegetation types in the undeveloped portions of the Pacific Missile Range Facility and SNL/KTF. Kiawe/koa-haole is the dominant vegetation type present in the relatively undisturbed areas of the sand dunes associated with SNL/KTF and Polihale State Park as well as along the cliff face in a restricted easement area. Because of off-highway vehicle restrictions, sand dune-related vegetation within the Pacific Missile Range Facility and SNL/KTF boundaries is less disturbed than vegetation in Polihale State Park. A well-developed native strand community exists along the shoreline. Common plants that inhabit the sandy beach habitat on Kaua'i include beach naupaka, pohinahina, pohuehue (*Ipomea pes-caprae*), milo (*Thespesia populnea*), and hau (*Hibiscadelphus distans*).

The composition of the kiawe/koa-haole vegetation community can vary from pure stands of kiawe to pure stands of koa-haole or any combination of the two. The kiawe trees often attain a height of 45 feet or more. The understory is commonly koa-haole except where the kiawe trees form a canopy. The height of the koa-haole depends to a large degree on the presence or absence of the kiawe trees. Ground cover varies and may consist of pure stands of Guinea grass (*Panicum maximum*), lantana (*Lantana camara*), or clove basil (*Ocimum gratissimum*). However, the most common ground cover is mixed forbs (herbaceous flowering plants that are not a grass) and grasses.

The majority of SNL/KTF is occupied by an open, woody scrub or a ruderal community of plants that is mowed regularly. The open scrub community is comprised mostly of introduced species, although there are some Hawai'ian taxa to be found along the roads. These are worthy of mention because, even in such highly disturbed areas as roadways, the native plants can and do persist. Taken together, the open scrub communities occupy most of the land area at SNL/KTF.



Cove in Kaua'i

Two wetlands areas exist along parts of the coastline west of SNL/KTF. The USFWS has classified these areas as Marine System, Subtidal Subsystem, Reef Class, Coral Subclass, and Subtidal. There is also a wetlands area to the south of SNL/KTF along Nohili Ditch, which is classified as Riverine System, Lower Perennial Subsystem, Open Water/Unknown Bottom Class, Permanent, Non-Tidal, and Excavated. There is potential for aquatic vegetation types and accompanying waterbird species to be present on or near SNL/KTF property during wet periods. Ditches along the eastern edge of SNL/KTF and several reservoirs on the Mana Plain, including the Mana Base Pond near the entrance to the Pacific Missile Range Facility, serve as waterbird habitats and sanctuaries.

Two federally listed plant species have been observed north of, but not on, the Pacific Missile Range Facility. Ohai (*Sesbania tomentosa*), a spreading shrub, is a federally endangered species that has been observed in the sand dunes to the north of the Pacific Missile Range Facility in Polihale State Park and could potentially occur at SNL/KTF. Lau'ehu (*Panicum niibauense*), an endangered species of rare grass, has been observed near Queens Pond, also north of the Pacific Missile Range Facility (Sandia 2020). Unoccupied critical habitat for lau'ehu has been established to the north and west of SNL/KTF.

Using the USFWS Information for Planning and Consultation tool, seven additional federally listed plant species have been identified as potentially present around SNL/KTF: 'awikiwiki (*Canavalia pubescens*), awiwi (*Schenkia sebaeoides*), Carter's panicgrass (*Panicum fauriei* var. *carteri*), dwarf naupaka (*Scaevola coriacea*), ihi (*Portulaca villosa*), popolo (*Solanum nelsonii*), and pu'uka'a (*Cyperus trachysanthos*). These plant species are associated with coastal beach, coastal dune, coastal shrubland, and/or cliff seep habitats found near sea level. While some of these habitats exist outside the SNL/KTF boundary, none of the seven species listed here have been documented at SNL/KTF.

4.2 Wildlife

Evolutionary isolation has resulted in distinctive wildlife found only on the Hawai'ian archipelago. The birds, mammals, and reptiles that have been observed and documented at and near SNL/KTF are the result of Kaua'i's unique biogeography combined with the introduction of many exotic species.

.....
An exotic species, which may be invasive or noninvasive, is not native to the environment.
.....

4.2.1 Birds

More than 50 species of birds have been identified in the general Pacific Missile Range Facility area, although not specifically at SNL/KTF. Endemic species include: Hawai'ian coot (*Fulica alai*), Hawai'ian duck (*Anas wyvilliana*), Hawai'ian gallinule (formerly Hawai'ian moorhen) (*Gallinula galleta sandwicensis*), Hawai'ian petrel (*Petrodroma sandwichensis*), Hawai'ian short-eared owl (*Asio flammeus sandwichensis*), Hawai'ian stilt (*Himantopus mexicanus knudseni*), and Newell's shearwater. Common introduced (non-native) species include the African silverbill (*Euodice cantans*), common myna (*Acridotheres tristis*), house sparrow (*Passer domesticus*), Java sparrow (*Lonchura oryzivora*), red-crested cardinal (*Paroaria coronata*), and zebra dove (*Geopelia striata*). Past wildlife surveys of birds and mammals conducted at SNL/KTF found 20 species of birds throughout the facility.

Bird species protected under the Migratory Bird Treaty Act that have been observed at SNL/KTF include the black-crowned night heron (*Nycticorax nycticorax*), brown noddy (*Anous stolidus*), great frigatebird (*Fregata minor*), Laysan albatross (*Diomedea immutabilis*), and ruddy turnstone (*Arenaria interpres*). The Laysan albatross uses the lawn-like ruderal vegetation areas for courtship and nesting. Up to six pairs of Laysan albatross have been observed in the SNL/KTF area. Other species known to exist within or near SNL/KTF are band-rumped storm petrel (*Oceanodroma castro*), Pacific golden plover (*Pluvialis fulva*), sanderling (*Calidris alba*), wandering tattler (*Heteroscelus incanous*), and wedge-tailed shearwater (*Puffinus pacificus chlororhynchus*). Migratory Bird Treaty Act protected barn owls (*Tyto alba*) are also present on and around SNL/KTF but are an introduced species.

Five of the bird species observed at SNL/KTF are federally listed as endangered: Hawai'ian coot, Hawai'ian duck, Hawai'ian gallinule, Hawai'ian petrel, and Hawai'ian stilt. In addition, Newell's shearwater and the Hawai'ian goose, both recorded at SNL/KTF, are federally listed as threatened. These species all have special protections under the Endangered Species Act as administered by the USFWS.

The Hawai'ian coot, Hawai'ian duck, Hawai'ian gallinule, and Hawai'ian stilt use wetlands habitat (such as the Nohili Ditch system, ditch systems along the eastern edge of SNL/KTF, and several reservoirs on the Mana Plain) for breeding, nesting, and feeding.

In 2019, the Hawai'ian goose status changed from endangered to threatened. The Hawai'ian goose is encountered frequently and regularly nests at the Pacific Missile Range Facility Main Base. SNL/KTF

lacks preferred nesting habitat for the Hawaiʻian goose; however, because of crowding, there is a potential for species movement onto the facility. In addition, nonbreeding individuals are observed occasionally.

The Newell's shearwater is a pelagic (open sea) species that once nested on all the major Hawaiʻian Islands. However, it has become extinct on the islands of Hawaiʻi, Maui, Molokai, and Oahu due to the introduction of the mongoose in the late 1800s. Kauaʻi provides the last Hawaiʻian habitat for this federally listed threatened species.

Newell's shearwaters nest during the spring and summer months (April to November) in the interior mountains of Kauaʻi. Nestlings leave the breeding grounds in October and November, departing by themselves shortly after nightfall and heading for the open ocean, guided by the reflection of moonlight on the water. Being inexperienced and naturally attracted to bright lights, they have a tendency to collide with trees, utility lines, buildings, and automobiles. The most critical period when Newell's shearwaters might have flight accidents is one week before and one week after the new moon in October and in November.

The Hawaiʻian petrel may traverse the area from their nesting grounds to the sea. Fledging of the Hawaiʻian petrel occurs in October, slightly earlier than for the Newell's shearwater.

Mitigation measures that have been implemented to minimize fallout for the Newell's shearwater also benefit other protected seabirds that are susceptible to disorientation from artificial lighting.

4.2.2 Mammals

Thirteen species of mammals are known to occur on the island of Kauaʻi. Eleven of these species are exotic (Tomich 1986). Past surveys found mammal species such as feral dogs (*Canis lupus familiaris*), feral cats (*Felis catus*), and small rodents (*Muroidea* spp.) within SNL/KTF. Feral dogs are known to roam the areas around SNL/KTF. At least four species of rodents are expected to be present at SNL/KTF: house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), Pacific rat (*Rattus exulans*), and roof rat (*Rattus rattus*). Feral pigs (*Sus scrofa*) are common across the Hawaiʻian islands and are regularly encountered on the Pacific Missile Range Facility and SNL/KTF. Introduced mammal species pose a serious threat to native wildlife, particularly birds. Hawaiʻi's native wildlife did not evolve with mammalian predators and therefore have few defensive traits.

The Hawaiʻian hoary bat (*Aeorestes semotus*) is protected under the Endangered Species Act as an endangered species. The species is most common in regions between sea level and 4,000 feet that receive 20 to 90 inches of rain per year. This bat roosts alone or with dependent young in native and non-native trees, typically more than 4.6 meters tall (Amlin and Siddiqi 2015). The Hawaiʻian hoary bat has been recorded at the Pacific Missile Range Facility, and it is known to feed offshore and to occur at the Polihale State Park north of SNL/KTF.

The Hawaiʻian monk seal (*Monachus schauinslandi*) is protected under the Marine Mammal Protection Act, is protected as an endangered species under the Endangered Species Act, and is one of two mammals endemic to Hawaiʻi. Hawaiʻian monk seals use sandy beaches to give birth and use vegetation behind beaches for shelter. Hawaiʻian monk seals are only occasionally reported around the main Hawaiʻian Islands (USFWS 2018), although they have been observed at the Pacific Missile Range Facility beaches (Traverse Group, Inc., The 1988).

4.2.3 Reptiles

Of the five species of marine turtles listed on the Endangered Species Act that may occur near SNL/KTF, only one is commonly encountered. Currently, no listed terrestrial reptiles or amphibians are expected to occur in the vicinity of SNL/KTF.

The Pacific green sea turtle (*Chelonia mydas*) is protected under the Endangered Species Act as threatened. The species inhabits pelagic habitat as juveniles and benthic (deep sea) habitat around all the Hawai‘ian Islands as adults. Adult turtles are known to rest along ledges and in caves and to forage in shallow intertidal and subtidal waters around the main islands. The turtles use sandy beaches for nesting during the summer months. Hatchlings emerge between July and October. Pacific green sea turtles occasionally nest at the southern end of the Pacific Missile Range Facility and north of Kokole Point (Balazs, Forsyth and Kam 1987).

A benthic habitat is in the deep sea, and a pelagic habitat is in the open sea.

Pacific green sea turtles are known to use Barking Sands coastal waters for foraging and beaches for basking routinely. Pacific green sea turtles are commonly observed basking on the beach and in the waters at the Nohili Ditch outfall, often referred to as the Turtle Cove area. Green turtles have been documented nesting at Barking Sands frequently in recent years with nine confirmed nests laid between 2015 and 2020. Nests have been observed on the southern coast of Barking Sands and the beach near the southern end of the airfield. There is no shoreline within the SNL/KTF boundary.

The leatherback and hawksbill turtles are relatively rare, and while there are no known reports of these species nesting near the Pacific Missile Range Facility, they have been reported in the open waters off Kaua‘i.

4.3 Federally Listed and State-Listed Threatened and Endangered Species

The purpose of the Endangered Species Act is to protect all animal, plant, and insect species that are federally listed as threatened or endangered. [Table 4-1](#) includes federally listed and state-listed threatened and endangered species that potentially occur or are confirmed to occur at SNL/KTF (Sandia 2020).

Table 4-1. Federally listed and state-listed threatened and endangered species potentially occurring or confirmed at SNL/KTF

Common Name	Scientific Name	Federal and State Status
Birds		
Band-rumped storm petrel	<i>Oceanodroma castro</i>	Endangered
Hawai‘ian black-necked stilt	<i>Himantopus mexicanus knudseni</i>	Endangered
Hawai‘ian coot	<i>Fulica americana alai</i>	Endangered
Hawai‘ian duck	<i>Anas wyvilliana</i>	Endangered
Hawai‘ian common gallinule	<i>Gallinula galeata sandvicensis</i>	Endangered
Hawai‘ian goose	<i>Branta sandvicensis</i>	Threatened
Hawai‘ian petrel	<i>Pterodroma sandwichensis</i>	Endangered
Newell’s Townsend’s shearwater	<i>Puffinus auricularis newelli</i>	Threatened
Short-tailed albatross	<i>Phoebastria albatrus</i>	Endangered
Mammals		
Hawai‘ian hoary bat	<i>Lasiurus cinereus semotus</i>	Endangered
Hawai‘ian monk seal	<i>Neomonachus schauinslandi</i>	Endangered
Reptiles		
Pacific green sea turtle	<i>Chelonia mydas</i>	Threatened

Common Name	Scientific Name	Federal and State Status
Plants		
‘awikiwiki	<i>Canavalia pubescens</i>	Endangered
Awiwi	<i>Schenkia sebaeoides</i>	Endangered
Carter’s panicgrass	<i>Panicum fauriei</i> var. <i>carteri</i>	Endangered
Dwarf naupaka	<i>Scaevola coriacea</i>	Endangered
Ihi	<i>Portulaca villosa</i>	Endangered
Lau‘ehu	<i>Panicum niihauense</i>	Endangered
Ohai	<i>Sesbania tomentosa</i>	Endangered
Popolo	<i>Solanum nelsonii</i>	Endangered
Pu‘uka‘a	<i>Cyperus trachysanthos</i>	Endangered

4.4 Threatened and Endangered Species Surveys and Migratory Bird Monitoring

Ecology Program personnel oversee ecological compliance activities that minimize impacts to protected species and their habitats and ensure regulatory compliance.

4.4.1 Program Activities and Results 2022: Ecology

In accordance with the Endangered Species Act and the Migratory Bird Treaty Act, contracted biologists performed compliance support activities in 2022.

Hawai‘ian Goose

Hawai‘ian goose observations are documented by contracted biologists during routine and nonroutine compliance support activities. Hawai‘ian geese were observed sporadically throughout the year, with the highest number of observations occurring during the flocking season in June. No nesting attempts were documented at SNL/KTF in 2022 (Figure 4-1).



Figure 4-1. Hawai‘ian geese foraging at SNL/KTF, June 2022

Band-Rumped Storm Petrel, Hawai‘ian Petrel, and Newell’s Shearwater

Contracted biologists conducted quarterly patrols to evaluate exposed light shielding requirements for the prevention of seabird disorientation. Additionally, it was confirmed that nighttime operations adhered to prescribed biological mitigations during the Dark Skies period from September 15 to December 15, 2022. No fallout was reported at SNL/KTF in 2022.

Laysan Albatross

Laysan albatross observations are documented by contracted biologists during routine and nonroutine compliance support activities. Laysan albatrosses were observed during most of the year except August to October, which is when they are out at sea. Sightings of Laysan albatrosses are significant because the species is currently classified as “Near Threatened” by the International Union for Conservation of Nature and ongoing monitoring provides useful local population information.

In April 2022, one active Laysan albatross nest containing a single chick was discovered at SNL/KTF in a dense patch of kiawe/koa-haole. An active nest buffer was established, and the nest was monitored through successful fledging, which occurred in late July (Figure 4-2).



Figure 4-2. Laysan albatross chick at SNL/KTF, May 2022

From November to December 2022, biologists located four Laysan albatross nests containing one egg each along the SNL/KTF boundary. Active nest buffers were established, and Ecology Program personnel coordinated with Pacific Missile Range Facility Natural Resources personnel to implement appropriate management actions. The U.S. Navy’s Bird/wildlife Aircraft Strike Hazard program addresses wildlife hazards at the Pacific Missile Range Facility, and the commanding officer maintains a Migratory Bird Permit for Pacific Missile Range Facility Barking Sands. SNL/KTF personnel cooperate with Pacific Missile Range Facility Natural Resources personnel for all Bird/wildlife Aircraft Strike Hazard management activities. The four eggs were relocated off-site, away from U.S. Navy airstrips, to alleviate wildlife hazards while promoting the persistence of native wildlife.

4.4.2 Pacific Golden Plover

Unlike the Hawai’ian goose and Laysan albatross, Pacific golden plovers are primarily present on Kaua’i seasonally. Most Pacific golden plovers return to SNL/KTF in winter months from arctic tundra breeding locations. This species was observed on-site from September through April with the largest number of observations in November. No mitigation measures were necessary to protect Pacific golden plovers in 2022.

Chapter 5. Compliance Summary



Sunset in Hawai'i

OVERVIEW ■ Sandia personnel are required to comply with federal, state, and local environmental statutes, regulations, executive orders, and DOE directives. Regular audits, appraisals, and inspections identify areas for improvement as well as noteworthy practices.

Sandia personnel are required to comply with federal, state, and local environmental requirements, including DOE directives and presidential executive orders. As part of this compliance, personnel adhere to strict reporting and permitting requirements.

All operations and activities, including those that are part of environmental programs, are performed in accordance with the ES&H policy, which includes the following statement:

Sandia integrates environment, safety and health throughout the lifecycle of its operations to ensure the:

- Protection of Members of the Workforce by providing a safe and healthful workplace.
- Protection of the environment by preventing or minimizing pollution and waste, pursuing sustainable resource use, and protecting biodiversity and ecosystems.
- Protection of the public through the prevention or minimization of releases of hazardous materials.
- Compliance with applicable ES&H requirements, including contractual requirements.
- Establishment, measurement, and monitoring of ES&H objectives to enhance performance and drive continual improvement.

An integrated safety management system incorporates safety into management and work practices at all levels so that missions are accomplished while protecting the worker, the public,

and the environment. Thus management of safety functions becomes an integral part of mission accomplishment and meets requirements outlined by DOE. The following five core functions guide the integration of safety into all work practices: define the scope of work, analyze the hazards, develop and implement hazard controls, perform work within controls, and provide feedback and continuous improvement.

5.1 Environmental Compliance

The management and operating contract, also referred to as the Prime Contract, for Sandia serves as the overarching agreement between the DOE National Nuclear Security Administration and the management and operating contractor. The Prime Contract requires the management and operating contractor to comply with specific DOE directives as well as applicable federal, state, and local requirements for the management and operation of Sandia.

The National Nuclear Security Administration, a semiautonomous agency within the U.S. Department of Energy, is responsible for enhancing national security through the military application of nuclear science.

5.1.1 Federal Requirements

The Prime Contract requires compliance with federal requirements, including applicable federal laws and regulations as well as specific DOE directives. The significant federal requirements that pertain to environmental protection and management are presented below along with the compliance approach and compliance activities.

Environmental Planning

National Environmental Policy Act of 1969

The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. § 4321 et seq. 1969) is a planning tool that requires federal agencies to assess the impacts of proposed actions on the human and natural environment prior to making decisions.

The Council on Environmental Quality (40 CFR 1500-1508 2005) is the agency responsible for implementing NEPA through issuing guidance and interpreting regulations that implement NEPA procedural requirements. DOE codified its NEPA implementing procedures in 10 CFR 1021, *National Environmental Policy Act* (10 CFR 1021 2011).

Personnel use the NEPA module (an online tool that uses a checklist format) to document proposed actions and activities and assess them for potential environmental consequences and impacts. When projects or activities appear to be outside the scope of existing NEPA documentation, a new NEPA checklist is prepared and forwarded to DOE for review and determination.

[Section 3.1](#) provides information on NEPA activities in 2022.

Compliance activities:

- Ensure that potential environmental impacts have been assessed adequately
- Coordinate NEPA assessments with DOE personnel
- Inform project owners of environmental requirements

Environmental Management System, Site Sustainability, Emergency Planning, and Community Right-to-Know Act

DOE O 436.1, Departmental Sustainability

DOE O 436.1, *Departmental Sustainability* (DOE O 436.1 2011), places environmental management systems and site sustainability at the forefront of environmental excellence. This order requires development of a site sustainability plan to identify contributions toward meeting DOE sustainability goals and an environmental management system for a continuing cycle of planning, implementing, evaluating, and improving processes to achieve environmental goals.

Personnel comply with this order through implementation of an environmental management system, which is third-party certified to ISO 14001: 2015 (ISO 14001:2015 2015) at SNL/NM and SNL/CA (the primary operating locations).

While operations at SNL/KTF are required to comply with the environmental management system requirements, operations have not been included in the ISO 14001:2015 certification due to the limited scale of operations there.

This order also specifies requirements for compliance with Emergency Planning and Community Right-to-Know Act (EPCRA) requirements.

DOE O 436.1, *Departmental Sustainability* (DOE O 436.1 2011), was in effect during 2022, the time period covered by this annual site environmental report. This order was superseded by DOE O 436.1A in 2023 (DOE O 436.1A 2023).

See [Table 5-1](#) for EPCRA reporting requirements.

Compliance activities:

- Follow environmental management system requirements, including identification of the environmental aspects and impacts of activities
- Establish and implement procedures and processes
- Establish and implement an annual site sustainability plan for Sandia locations including SNL/KTF
- Evaluate operations to identify continuous improvement opportunities
- Fulfill emergency planning and reporting requirements

Hazardous Waste and Environmental Restoration

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and amended in 1986

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. § 9601 1980), and amended in 1986, establishes liability compensation, cleanup, and emergency response requirements for inactive hazardous waste sites. In addition, CERCLA requires federal facilities to report hazardous substance spills to the National Response Center and perform any necessary response action.

The EPA recommended continued reevaluation for environmental contamination at SNL/KTF due to ongoing activities at the launch facility there (EPA 1996).

The Superfund Amendments and Reauthorization Act (SARA) Title III of 1986 (42 U.S.C. § 9601 1986) establishes additional reporting requirements that are addressed in [Table 5-1](#).

Compliance activities:

- Environmental restoration sites have been closed through the regulatory process
- See [Table 5-1](#) for compliance activities

Federal Facility Compliance Act of 1992

The Federal Facility Compliance Act of 1992 (42 U.S.C. § 6961 1992) 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 mixed wastes that do not meet the applicable hazardous waste treatment standards.

SNL/KTF operations do not generate mixed waste, and no mixed waste is currently stored on-site.

Compliance activities:

- No activities are associated with this requirement

Resource Conservation and Recovery Act, enacted in 1976, as amended

The Resource Conservation and Recovery Act (RCRA), enacted in 1976 (42 U.S.C. § 6901 et seq. 1976), as amended, sets forth the framework for managing nonhazardous and hazardous solid waste, including the hazardous waste component of mixed waste.

SNL/KTF operations generate less than 100 kg of hazardous waste through normal operations each month, which equates to very small-quantity generator status.

[Section 3.3](#) provides information on waste management.

Compliance activities:

- Adhere to the manifest and pre-transport requirements in 40 CFR 262, *Standards Applicable to Generators of Hazardous Waste* (40 CFR 262 2021), as incorporated and amended in the Hawai'i Administrative Rules, Title 11, Section 262-1, "Hazardous Waste Management" (HAR-11-262.1 2017)
- Minimize waste via recycling and material recovery
- Collect and screen material and waste in preparation for shipment to off-site facilities for recycling, storage, treatment, or disposal

Radiation Protection

Atomic Energy Act of 1954

The Atomic Energy Act of 1954 (42 U.S.C. § 2011 1954) specifies proper management of source, special nuclear, and byproduct material. DOE has the authority to manage operations based on applicable statutes, federal regulations, and DOE directives.

SNL/KTF operations do not (currently or in the past) involve radioactive materials (see [Section 1.5](#) and [Section 3.7](#)).

Compliance activities:

- No activities are associated with this requirement

DOE O 458.1 Chg 4 (LtdChg), Radiation Protection of the Public and the Environment

DOE O 458.1, *Radiation Protection of the Public and the Environment* (DOE O 458.1 Chg 4 (LtdChg) 2020), establishes requirements to protect the public from undue radiation exposure, demonstrate compliance with public dose limits from air pathways, control releases of radioactive discharges, control radioactive waste, protect drinking water and groundwater, protect biota, control the release of property with residual radioactivity, and manage radiation-related records.

The Terrestrial Surveillance Program activities at SNL/KTF are conducted as a best management practice. The Terrestrial Surveillance Program is driven by DOE O 458.1, yet operations there do not involve radioactive materials (see [Section 3.7](#)).

Compliance activities:

- Sample and analyze soil for metals as a best management practice

Air Quality

Clean Air Act of 1970, as amended

The Clean Air Act of 1970 (42 U.S.C. § 7401 1970), as amended, governs the management of nonradiological emissions with compliance achieved through adherence to the conditions of permits and applicable regulations.

[Section 3.4](#) provides information on air quality compliance.

Compliance activities:

- Confirm that planned stationary sources of air pollutants (e.g., equipment) and potential emission from operations meet applicable local and federal requirements
- Maintain documentation that confirms that sources are in compliance with regulations and/or permitted operating conditions
- Submit monitoring reports, annual emissions inventories, and other compliance assurance documentation to regulatory agencies

Water Quality

Clean Water Act of 1972 and amendments

The Clean Water Act of 1972 (33 U.S.C. § 1251 1977) and amendments establishes a permitting structure and regulatory direction to protect the “waters of the United States” by restoring and maintaining the chemical, physical, and biological integrity of United States waters; protecting fish, wildlife, and recreation; and reducing pollutant discharges.

There are no drinking water or groundwater monitoring wells at SNL/KTF.

Compliance activities:

- Monitor three state-registered septic tanks and perform periodic septic tank inspections
- Pump septic tanks as needed
- Gain and comply with a stormwater permit for new

<p>Sanitary sewer discharge is monitored at three on-site state-registered septic tanks.</p> <p>Stormwater permits, inspections, and sampling are not required for normal operations. However, new construction activities that exceed one acre of soil disturbance require permitting under the Construction General Permit, which is administered by the State of Hawai‘i, Department of Health, Clean Water Branch. When needed, stormwater pollution prevention plans are developed and include control measures, site inspections, and annual reporting requirements.</p> <p>See Section 3.8 for more information on water quality programs.</p>	<p>construction activities exceeding one acre of soil disturbance</p> <ul style="list-style-type: none"> • Implement a stormwater pollution prevention plan to prevent unpermitted discharges, conduct inspections, and complete annual reporting requirements
<p>Energy Independence and Security Act of 2007, Section 438</p> <p>The Energy Independence and Security Act (EISA) of 2007 (42 U.S.C. § 17001 2007), Section 438, requires federal agencies to manage stormwater runoff from federal development projects for the protection of water resources.</p> <p>Sandia projects planned through the NEPA process (see “National Environmental Policy Act of 1969”) are assessed for EISA § 438 applicability. Site planning, design, construction, and maintenance strategies are applied to maintain or restore predevelopment site hydrology.</p> <p>See Section 3.8 for more information on water quality programs.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Identify projects that require EISA compliance • Develop drainage plans and design detention features • Conduct inspections and maintain detention features
<p>Oil Pollution Act of 1990 (§ 311)</p> <p>The Oil Pollution Act of 1990 (§ 311) (33 U.S.C. § 40 1990) establishes requirements for the prevention of, preparedness for, and response to oil discharges at specific non-transportation-related facilities. Implementing regulations are found in 40 CFR 112, <i>Oil Pollution Prevention</i> (40 CFR 112 2011).</p> <p>The Pacific Missile Range Facility has a spill prevention, control, and countermeasure plan (U.S. Navy 2017) in compliance with 40 CFR 112, <i>Oil Pollution Prevention</i> (40 CFR 112 2011). SNL/KTF is covered under the Pacific Missile Range Facility spill prevention, control, and countermeasure plan for all applicable oil storage containers.</p> <p>Section 3.6 provides information on the Oil Storage Program.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Coordinate and cooperate with the Pacific Missile Range Facility Spill Prevention, Control, and Countermeasure Plan, including reporting and responding to a spill • Inspect aboveground oil storage containers routinely • Train oil-handling personnel routinely • Maintain an oil storage container inventory • Incorporate oil spill prevention requirements and practices into processes, procedures, and new container installations

Resource Conservation and Recovery Act, enacted in 1976, as amended

RCRA, enacted in 1976 (42 U.S.C. § 6901 et seq. 1976), as amended, sets forth the framework for managing underground storage tanks to prevent leaks into the environment and contamination of groundwater.

Underground storage tank requirements were added to RCRA as Subtitle I in 1984 and, since 2002, the EPA has authorized the State of Hawai‘i, through the HDOH, to administer and enforce a state-approved program in lieu of the federal program detailed in 40 CFR 280, *Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)* (40 CFR 280 2014).

SNL/KTF personnel operate a single 2,500-gallon underground storage tank containing gasoline.

[Section 3.6](#) provides information on the Oil Storage Program.

Compliance activities:

- Adhere to the applicable requirements in the Hawai‘i Administrative Rules, Title 11, Chapter 11-280.1 “Underground Storage Tanks” (HAR-11.280.1 2021)
- Maintain permit conditions for operation of the underground storage tank system
- Perform required inspections and testing of the underground storage tank system

Safe Drinking Water Act of 1974, as amended

The Safe Drinking Water Act of 1974, as amended (42 U.S.C. § 300f 1974), was established to protect the quality of drinking water in the United States, focusing on all waters actually or potentially designed for drinking use, whether from aboveground or underground sources.

All drinking water at SNL/KTF is supplied by the Pacific Missile Range Facility drinking water system or by a vendor.

Compliance activities:

- No activities are associated with this requirement

America’s Water Infrastructure Act of 2018

America’s Water Infrastructure Act of 2018 (33 U.S.C. § 2201 2018) is intended to improve drinking water and water quality, deepens infrastructure investments, enhances public health and quality of life, increases jobs, and bolsters the economy. The act’s provisions represent changes to the Safe Drinking Water Act.

All drinking water at SNL/KTF is supplied by the Pacific Missile Range Facility drinking water system or by a vendor.

Compliance activities:

- No activities are associated with this requirement

Chemical Management

Emergency Planning and Community Right-to-Know Act of 1986

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 (42 U.S.C. § 11001 et seq. 1986), also known as Title III of the Superfund Amendments and Reauthorization Act, requires reporting of toxic chemicals used and released by federal, state, and local governments and industry.

Chemical hazard information is provided to the community for awareness and enhancement of emergency planning efforts.

See [Table 5-1](#) for more details.

Compliance activities:

- Maintain and report on a chemical inventory
- Report qualifying releases

Federal Insecticide, Fungicide, and Rodenticide Act, enacted in 1910 and amended in 1972

<p>The Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. § 136 1910), enacted in 1910 and amended in 1972, regulates the use of herbicides, rodenticides, and insecticides.</p> <p>EPA regulations and applicable label guidelines are followed.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • No activities are associated with this requirement
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Toxic Substances Control Act, enacted in 1976 and later amended

<p>The Toxic Substances Control Act, enacted in 1976 and later amended (15 U.S.C. § 2601 et seq. 1976), regulates the manufacture, processing, distribution, use, and disposal of specific chemical substances and/or mixtures.</p> <p>Compliance with this act includes managing asbestos and PCBs. There are no transformers containing PCBs at SNL/KTF.</p> <p>Section 3.3 provides information on asbestos management.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Conduct asbestos abatement in accordance with applicable regulatory requirements
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Pollution Prevention

Pollution Prevention Act of 1990

<p>The Pollution Prevention Act of 1990 (42 U.S.C. § 133 1990) declares as national policy that pollution should be prevented or reduced at the source wherever feasible. Source reduction is defined as any practice that decreases the amount of any hazardous substance, pollutant, or contaminant from entering any waste stream or from being released into the environment prior to recycling, treatment, or disposal.</p> <p>A toxic chemical source reduction and recycling report is required for facilities that meet the reporting requirements under EPCRA, Section 313.</p> <p>See “Emergency Planning and Community Right-to-Know Act of 1986.”</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Conduct database queries for chemical purchases annually • Compare environmental releases with EPCRA reporting thresholds • Prepare annual reports and submit them to federal, state, and local regulatory agencies • Follow green purchasing practices
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Natural Resources

Endangered Species Act of 1973, amended in 1982

<p>The Endangered Species Act of 1973, amended in 1982 (16 U.S.C. § 1531 et seq. 1973), provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing the act are the USFWS and the National Marine Fisheries Service. The USFWS maintains a worldwide list of endangered species; species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees.</p> <p>Chapter 4 provides more information on threatened and endangered species that may occur at SNL/KTF.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Collect ecological data. • Provide ecological surveillance for maintenance of regulatory compliance • Consultation with the USFWS as appropriate • Collaborate with the host facility regarding Endangered Species Act efforts
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EO 11988 of 1977, Floodplain Management, as amended

Executive Order, Floodplain Management, (EO 11988 1977), requires federal agencies to consider impacts associated with the occupancy and modification of floodplains; reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains.

Compliance activities:

- Review NEPA checklists to identify impacts on floodplains
- Preserve and protect ecological resources

EO 11990 of 1977, Protection of Wetlands, as amended

Executive Order 11990, Protection of Wetlands, as amended (EO 11990 1977), requires federal agencies to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands.

[Chapter 4](#) provides more information on the Ecology Program.

Compliance activities:

- Review NEPA checklists to identify impacts on wetlands
- Preserve and protect ecological resources

EO 13112 of 1999, Invasive Species

Executive Order 13112, Invasive Species (EO 13112 1999) called upon executive departments and agencies to take steps to prevent the introduction and spread of invasive species, and to support efforts to eradicate and control invasive species that are established. It also created a coordinating body—the Invasive Species Council, also referred to as the National Invasive Species Council—to oversee implementation of the order, encourage proactive planning and action, develop recommendations for international cooperation, and take other steps to improve the federal response to invasive species.

[Chapter 4](#) provides more information on the Ecology Program.

Compliance activities:

- Monitor biota
- Collect ecological data
- Produce mitigation strategies as necessary

EO 13751 of 2016, Safeguarding the Nation from the Impacts of Invasive Species

Executive Order 13751, Safeguarding the Nation from the Impacts of Invasive Species (EO 13751 2016), amended Executive Order 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species.

[Chapter 4](#) provides more information on the Ecology Program.

Compliance activities:

- Monitor biota
- Collect ecological data
- Produce mitigation strategies as necessary

Fish and Wildlife Conservation Act Lacey Act Amendments of 1981

The Fish and Wildlife Conservation Act (16 U.S.C. § 49 1980), enacted in 1980, and the Lacey Act Amendments of 1981 (16 U.S.C. 3371-3378 1981) were established so that wildlife will receive equal consideration with other natural resources regarding maintenance of the ecosystem.

Relevancy to an ecological program is stated in 16 USC 661, *Conservancy*, which states that the purpose as follows: “(1) to provide assistance to, and cooperate with, Federal, State, and public or private agencies and organizations in the development, protection, rearing, and stocking of all species . . . (2) to make surveys and investigations of the wildlife of the public domain.”

[Chapter 4](#) provides more information on the Ecology Program.

Compliance activities:

- Consider Fish and Wildlife Conservation Act compliance when evaluating NEPA checklists

Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act (16 U.S.C. 1361-1421h 1972) established, with limited exceptions, a moratorium on the “taking” of marine mammals in waters or on lands under United States jurisdiction. The act further regulates “takes” of marine mammals on the high seas by vessels or persons under United States jurisdiction. The term *take*, as defined in Section 3 of the act, means “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” “Harassment” was further defined in the 1994 and 2004 amendments to the MMPA. The 1994 amendments provided two levels of harassment: Level A (potential injury) and Level B (potential disturbance).

[Chapter 4](#) provides more information on the Ecology Program.

Compliance activities:

- Consider Marine Mammal Protection Act compliance when evaluating NEPA checklists

Migratory Bird Treaty Act of 1918 (and amendments)

The Migratory Bird Treaty Act of 1918 (16 U.S.C. § 703 et seq. 1918) implemented the 1916 convention for the protection of migratory birds. The original statute implemented the agreement between the United States and Great Britain (for Canada), and later amendments implemented treaties between the United States and Mexico, the United States and Japan, and the United States and Russia. The act prevents the taking, possession, killing, transportation, and importation of migratory birds or their eggs, parts, and nests.

[Chapter 4](#) provides more information on the Ecology Program.

Compliance activities:

- Collect ecological data.
- Provide ecological surveillance for maintenance of regulatory compliance
- Consult with the USFWS as appropriate

Sikes Act of 1960 (PL 86-97), enacted in 1960, and the amendments of 1986 (PL 99-561) and 1997 (PL 105-85 Title XXIX), reauthorized in 2013

The Sikes Act, as amended (PL 105-85 1997), was reauthorized in 2013. The act protects and enhances fish, wildlife, and other natural resources that exist on and are associated with military lands in the United States.

[Chapter 4](#) provides more information on the Ecology Program.

Compliance activities:

- Consider the Sikes Act when evaluating NEPA checklists

Cultural Resources**American Indian Religious Freedom Act, enacted in 1978 and amended in 1994**

<p>The American Indian Religious Freedom Act of 1978, as amended in 1994 (PL 103-344 1994), a federal law and joint resolution of Congress, protects and preserves the traditional religious rights and cultural practices of American Indians, Eskimos, Aleuts, and native Hawaiians.</p> <p>See Chapter 2 for information on the Cultural Resource Management Program.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Conduct cultural resource surveys and monitor all construction activities • Prepare documentation to support planning activities and decisions • Review NEPA checklists to identify impacts on cultural resources. • Support consultation with native Hawaiians
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Archaeological Resources Protection Act, enacted in 1979 and amended in 1988

<p>The Archaeological Resources Protection Act of 1979 (PL 96-95 1979) secures, for the present and future benefit of the American people, the protection of archaeological resources and sites that are on public lands and Indian lands, and fosters increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals. Section 4 of the statute and sections 16.5–16.12 of the regulations describe the requirements that must be met before federal authorities can issue a permit to excavate or remove any archaeological resource on federal or Indian Lands. The curation requirements of artifacts, other materials excavated or removed, and the records related to the artifacts and materials are described in Section 5 of the act. These regulations affect all federally owned or administered archaeological collections.</p> <p>See Chapter 2 for information on the Cultural Resource Management Program.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Develop internal management plans • Conduct cultural resource surveys and monitor all construction activities • Prepare documentation to support planning activities and decisions • Review NEPA checklists to identify impacts on cultural resources
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DOE O 144.1, Department of Energy American Indian Tribal Government Interactions and Policy

<p>DOE O 144.1, <i>Department of Energy American Indian Tribal Government Interactions and Policy</i> (DOE O 144.1 2009), sets forth the principles to be followed by DOE to ensure an effective implementation of a government-to-government relationships with American Indian and Alaska Native tribal governments. This order provides direction to all DOE officials, staff, and contractors regarding fulfillment of trust obligations and other responsibilities arising from DOE actions that may potentially impact American Indian and Alaska Native traditional, cultural, and religious values and practices; natural resources; and treaty and other federally recognized and reserved rights.</p> <p>See Chapter 2 for information on the Cultural Resource Management Program.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Develop internal management plans • Conduct cultural resource surveys and monitor all construction activities • Prepare documentation to support planning activities and decisions • Review NEPA checklists to identify impacts on cultural resources • Support consultation with native Hawaiians
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DOE O 430.1C, Real Property Asset Management

DOE O 430.1C, *Real Property Asset Management* (DOE O 430.1C 2019), establishes an integrated corporate-level, performance-based approach to the life-cycle management of real property assets. It links real property asset planning, programming, budgeting, and evaluation to the multifaceted DOE missions. Successful implementation of this order will enable DOE to carry out stewardship responsibilities and will ensure that facilities and infrastructure are properly sized and in a condition to meet mission requirements today and in the future.

See [Chapter 2](#) for information on the Cultural Resource Management Program.

Compliance activities:

- Develop internal management plans
- Conduct cultural resource surveys and monitor all construction activities
- Survey property to determine eligibility for inclusion in the National Register of Historic Places
- Prepare documentation to support planning activities and decisions
- Review NEPA checklists to identify impacts on cultural resources

DOE P 141.1, Management of Cultural Resources

The purpose of DOE P 141.1, *Management of Cultural Resources* (DOE P 141.1 2011), is twofold: (1) to ensure that all DOE programs and field elements integrate cultural resources management into their missions and activities and (2) to raise the level of awareness and accountability among DOE contractors concerning the importance of DOE cultural resource-related legal and trust responsibilities.

See [Chapter 2](#) for information on the Cultural Resource Management Program.

Compliance activities:

- Develop internal management plans
- Conduct cultural resource surveys and monitor all construction activities
- Survey property to determine eligibility for inclusion in the National Register of Historic Places
- Prepare documentation to support planning activities and decisions
- Review NEPA checklists to identify impacts on cultural resources

National Historic Preservation Act, enacted in 1966 and amended in 2000, Section 106

The National Historic Preservation Act of 1966 (PL 89-665 1966), as amended and codified in 16 U.S.C., *Conservation* (16 U.S.C. 2016), is intended to preserve historical and archaeological sites in the United States. The act sets federal policy for preserving our nation's heritage by establishing a federal government and tribal government partnership, establishing the National Register of Historic Places and National Historic Landmarks Programs, mandating the selection of qualified State Historic Preservation Officers, establishing the Advisory Council on Historic Preservation, charging federal agencies with responsible stewardship, and establishing the role of certified local governments within the states.

Compliance activities:

- Develop internal management plans
- Conduct cultural resource surveys to determine eligibility for inclusion in the National Register of Historic Places
- Prepare documentation to support planning activities and decisions

<p>The National Register of Historic Places (36 CFR 60.22) is authorized by the National Historic Preservation Act of 1966. It is the federal government's official list of districts, sites, buildings, structures, and objects deemed worthy of preservation for their historical significance.</p> <p>See Chapter 2 for information on the Cultural Resource Management Program.</p>	<ul style="list-style-type: none"> • Review NEPA checklists to identify impacts on cultural resources • Monitor all construction activities for impacts on cultural resources
<p>Native American Graves Protection and Repatriation Act, enacted in 1990</p>	
<p>The Native American Graves Protection and Repatriation Act (PL 101-601 1990) developed a systematic process for determining the rights of Indian tribe and Native Hawaiian lineal descendants and their representative organizations to protect certain Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony with which they are affiliated.</p> <p>See Chapter 2 for information on the Cultural Resource Management Program.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Develop internal management plans • Conduct cultural resource surveys and monitor all construction activities • Prepare documentation to support planning activities and decisions • Review NEPA checklists to identify impacts on cultural resources
<p>Reporting</p>	
<p>DOE O 231.1B, Admin Change 1, Environment, Safety and Health Reporting</p>	
<p>DOE O 231.1B, Admin Change 1, <i>Environment, Safety and Health Reporting</i> (DOE O 231.1B, Admin Change 1 2012), ensures that DOE receives information about events that have affected or could adversely affect the health, safety, and security of the public or workers, the environment, the operation of DOE facilities, or DOE credibility. It enhances mission safety and promotes the sharing of effective practices to support continuous improvement and adaptation to change.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Produce an annual site environmental report • Report on environmental program activities, monitoring results, accidental releases, and waste management operations
<p>DOE O 232.2A, Chg1 (MinChg) Occurrence Reporting and Processing of Operations Information</p>	
<p>DOE O 232.2A, Chg1 (MinChg), <i>Occurrence Reporting and Processing of Operations Information</i> (DOE O 232.2A, Chg 1 (MinChg) 2017), requires timely notification to DOE about events that could adversely affect the health and safety of the public or workers, the environment, DOE missions, or DOE credibility.</p> <p>Sandia personnel promote organizational learning through investigation and analysis of reported events and conditions that adversely affect or may adversely affect personnel, the public, property, the environment, or the DOE mission.</p>	<p>Compliance activities:</p> <ul style="list-style-type: none"> • Track all environmental events

Quality Assurance

DOE O 414.1D Change 2 (LtdChg), Quality Assurance

DOE O 414.1D, Change 2 (LtdChg), *Quality Assurance* (DOE O 414.1D, Change 2 (LtdChg) 2020), is intended to achieve quality in all work and ensure that products and services meet or exceed customer requirements and expectations.

All environmental sampling and analyses at SNL/KTF conform to applicable quality assurance plans, sampling plans, and field operations.

[Chapter 5](#) provides information on quality assurance.

Compliance activities:

- Develop quality assurance plans, operating plans, and sampling plans collectively for all Sandia locations
- Provide a statement of work for contract laboratories collectively for all Sandia locations
- Participate in quality assurance audits of all contract laboratories that provide services collectively for all Sandia locations

5.1.2 Chemical Inventory and Toxic Release Inventory Reporting

The chemical inventory report and the toxic release inventory report for SNL/KTF in 2022 were submitted to EPA and the Hawai'i Hazard Evaluation and Emergency Response Office (HEER) and support compliance with EPCRA. The chemical inventory report documents toxic chemicals in use and all chemical purchases.

[Table 5-1](#) lists the EPCRA reporting requirements.

Table 5-1. SNL/KTF applicable EPCRA reporting requirements

Section	EPCRA Section Title	Description	Reporting Required in 2022?
301–303	Emergency Planning	Sections 301–303 of EPCRA require an annual report that lists the inventories of chemicals that are above the reportable threshold planning quantities, including the location of the chemicals and the emergency contacts.	Yes
304	Emergency Notification	Section 304 of EPCRA requires an immediate notification following the accidental release of a reportable quantity of extremely hazardous substances.	No
311–312	Community-Right-to-Know: Toxic Chemical Release Inventory Reporting	Sections 311–312 of EPCRA provide requirements for maintaining safety data sheets for hazardous chemicals and for submitting inventory forms for these chemicals.	Yes
313	Toxic Release Inventory	Section 313 of EPCRA requires that a Toxic Release Inventory report be submitted for facilities that release toxic chemicals listed in SARA Title III over a threshold value.	Yes

Chemical use at SNL/KTF was above the reporting threshold for submitting a toxic release inventory report for lead and lead compounds. In 2022, there were no reportable quantity releases of extremely hazardous substances requiring notification under Section 304 of EPCRA.

5.1.3 Hawai'i State Environmental Requirements

The State of Hawai'i requirements shown in [Table 5-2](#) are applicable to environmental program operations at SNL/KTF.

Table 5-2. Hawai'i Administrative Rules and Hawai'i Revised Statutes

Chapter and Provisions
HAR Title 11, Department of Health
HAR Title 11, Chapter 20, Rules Relating to Potable Water Systems
HAR Title 11, Chapter 58.1, Solid Waste Management Control
HAR Title 11, Chapter 60.1, Air Pollution Control
HAR Title 11, Chapter 62, Wastewater Systems
HAR Title 11, Chapter 280.1, Underground Storage Tanks
HAR Title 11, Chapter 451, State Contingency Plan
HRS Title 12, Conservation and Resources
HRS Chapter 195, Natural Area Reserves System
HRS Title 19, Health
HRS Chapter 128D, Environmental Response Law
HRS Chapter 340E, Safe Drinking Water

Sources:

Hawai'i Administrative Rules (State of Hawaii 2023)

Hawai'i Revised Statutes (State of Hawaii n.d.)

5.2 Energy Equity and Environmental Justice

Making a difference in society, especially in overburdened and underserved communities, has been a key part of Sandia's commitment to deliver exceptional service in the national interest. Sandia's energy equity and environmental justice (EEEJ) efforts focus on (1) improving the health, safety, and resilience of communities and (2) addressing the threat of climate change. Three executive orders address environmental justice: EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, Section 1-1 (EO 12898 1994); EO 14008, *Tackling the Climate Crisis at Home and Abroad*, Section 219 (EO 14008 2021); and EO 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*, Section 402 (EO 14057 2021).

In 2022, personnel began a strategic initiative to map Sandia's EEEJ capabilities; identify gaps and opportunities for future work; develop clear, cohesive, and comprehensive communications that detail capabilities; and provide recommendations to Sandia leadership regarding the future of EEEJ research and development. Information on recent EEEJ-related projects and activities will be gathered during 2023 as a part of this strategic initiative. In 2022, the EEEJ team hosted two internal EEEJ-focused workshops: *Energy Equity and Environmental Justice Workshop* and *Implementing Energy Equity and Environmental Justice into Research and Development Workshop*. More information can be found at [Sandia Energy](#) (Sandia n.d.).

5.3 Environmental Management System

The environmental management system is a continuing cycle of planning, implementing, evaluating, and improving processes to achieve environmental goals. This system facilitates identification of the environmental aspects and impacts of Sandia's activities, products, and services; identification of risks and opportunities that could impact the environment; evaluation of applicable compliance obligations; establishment of environmental objectives; and creation of plans to achieve those objectives and monitor their progress.

DOE O 436.1, *Departmental Sustainability* (DOE O 436.1 2011), provides requirements for managing sustainability practices. This order is implemented through an ISO 14001-certified environmental management system. Sandia National Laboratories received initial ISO 14001:2004 certification in June 2009. In 2015, the site-specific certifications for primary operating locations in New Mexico and California were integrated into a multisite ISO 14001:2004 certification. In 2018, the environmental management system was recertified under the new ISO 14001:2015. Operations at SNL/KTF are required to follow the environmental management system requirements via internal Sandia procedures but have not been included in the ISO 14001:2015 certification due to the limited scale of operations there.

.....
Aspects are any elements of activities, products, or services that can interact with the environment, and *impacts* are any changes in the environment, whether adverse or beneficial, wholly or partially resulting from activities, products, or services.
.....

In January 2018, an environmental management system assessment was conducted to evaluate conformance with ISO 14001:2004 requirements at SNL/KTF.

The environmental management system provides the following benefits:

- Improved environmental performance
- Enhanced compliance with environmental regulations
- Strengthened pollution prevention efforts
- Improved resource conservation
- Increased environmental efficiencies and reduced costs
- Enhanced image with the public, regulators, and potential new hires
- Heightened awareness of environmental issues and responsibilities

For fiscal year 2022, greenhouse gas emissions were identified as a significant aspect for Sandia operations at SNL/KTF. When significant aspects and negative impacts have been identified, environmental objectives—at all operating levels—are established to guide efforts toward minimizing those aspects and impacts.

5.3.1 Site Sustainability Plan

A site sustainability plan is prepared annually and identifies Sandia's combined contributions toward meeting DOE sustainability goals and the broader sustainability program set forth in EO 14008, *Tackling the Climate Crisis at Home and Abroad* (EO 14008 2021). The most recent plan, *Fiscal Year 2023 Site Sustainability Plan* (Sandia, 2022b), describes the performance status of all primary Sandia locations, including SNL/KTF, for fiscal year 2022. Some highlights of Sandia's sustainability performance status in 2022 that apply to SNL/KTF include the following:

- Exceeded the goal to increase consumption of clean and renewable electric energy; purchased renewable energy credits
- Improved MAN-004, *Sandia National Laboratories/New Mexico Design Standards Manual* (Sandia 2022), to increase the number of owned buildings that are compliant with the *Guiding Principles for Sustainable Buildings* (Council on Environmental Quality 2020)
- Promoted sustainable acquisition and procurement through modifications, training, and education efforts completed on the ecomedes tool

5.3.2 Sustainability Awards in 2022

The DOE Sustainability Performance Division sponsors the DOE Sustainability Awards, which recognize outstanding sustainability contributions by individuals and teams at DOE facilities across the country. The awards note excellence in energy, water, and fleet management projects and practices. Each year, environmental management system personnel select nominees from all primary Sandia locations for that year's Environmental Excellence Awards. In 2022, 14 nominations were submitted for the Environmental Excellence Awards. SNL/KTF personnel are encouraged to participate; no nominations were received for SNL/KTF in 2022.

5.3.3 Vulnerability Assessment and Resilience Plan

In fiscal year 2022, Sandia personnel completed a climate vulnerability assessment and resilience plan. The plan assessed anticipated changes in climate by the year 2050 and the climate hazards that would result from such changes ([Table 5-3](#)). The following hazards were projected to be “almost certain” with climate change at SNL/KTF: drought, riverine flooding, and increased precipitation.

Table 5-3. Climate hazards and projected annual likelihood and frequencies at SNL/KTF

Regional Hazards Impacting the Site	Hazard Description	Current Hazard Likelihood	Projected Climate Change Effect	Projected Hazard Likelihood with Climate Change
Coastal flooding		Anticipated	Increase	Likely
Sea level rise		Extremely unlikely	Increase	Unlikely
Strong wind	Wind gusts that are greater than or equal to 58 mph; the only record is that of Hurricane Iniki in 1992	Anticipated	No change	Anticipated
Drought		Likely	Increase	Almost certain
Wildfire		Anticipated	Increase	Likely
Hurricane		Anticipated	Increase	Likely
Riverine flooding	Streams and rivers exceed the capacity of their natural or constructed channels to accommodate water flow	Almost certain	Increase	Almost certain
Precipitation	Daily rainfall totals of greater than or equal to 1 inch	Almost certain	Increase	Almost certain
Tsunami		Extremely unlikely	No change	Extremely unlikely
Heat wave	Kaua'i County mitigation plan definition: conditions that are 10°F above the normal temperature for the island for at least three days	Anticipated	Increase	Likely

The climate vulnerability assessment and resilience plan also assessed potential risks posed by the anticipated climate hazards and recommends solutions to increase resilience at SNL/KTF. Details on climate hazard risks by asset and infrastructure type at SNL/KTF can be found in [Appendix B](#). [Table 5-4](#) displays the resilience solution portfolio identified in the plan. These solutions are focused on addressing resilience planning gaps. Flooding due to coastal flooding, sea level rise, increased precipitation, riverine flooding, and tsunamis are vulnerabilities at SNL/KTF. Additionally, the site's proximity to the ocean makes SNL/KTF vulnerable to high-impact storms and associated flooding.

Table 5-4. Resilience solutions portfolio for SNL/KTF

Solution	Hazards Addressed	Priority Rank (High, Medium, or Low)
Address the flooding issue at the Launch Operations building	Coastal flooding, sea level rise, hurricane, riverine flooding, precipitation, tsunami	High
Harden and reinforce site buildings	Coastal flooding, strong winds, hurricane, tsunami	High
Construct seawalls, floodwalls, and levees	Coastal flooding, sea level rise, hurricane, tsunami	Low
Improve stormwater drainage	Coastal flooding, sea level rise, hurricane, riverine flooding, precipitation, tsunami	High
Develop long-term plan for relocation of site assets	Coastal flooding, sea level rise, hurricane, riverine flooding, tsunami	Low

5.4 Environmental Performance

Sandia environmental performance is measured for all locations as progress toward achieving site environmental objectives, meeting or exceeding compliance, and contributing to corporate and contract performance goals. Results are tracked and reported internally through the ES&H Assurance Dashboard, the management review process, and management reports.

Additionally, criteria for overall Sandia performance evaluation were set forth in the *Fiscal Year (FY) 2022 DOE/NNSA Strategic Performance Evaluation and Measurement Plan (PEMP)* (DOE/NNSA/SFO 2023). Subsequently, the DOE National Nuclear Security Administration Sandia Field Office prepared the *FY22 Performance Evaluation Summary* (DOE/NNSA/SFO 2023), assessing the management and operating contractor performance including environment, health, and safety for October 1, 2021, through September 30, 2022. The performance evaluation is the annual DOE National Nuclear Security Administration report card that ascribes a rating to six key performance goals and an overall rating. Sandia received a rating of excellent in three of the six goals: Mission Execution: Global Nuclear Security; DOE and Strategic Partnership Projects Mission Objectives; and Science, Technology and Engineering. A rating of very good was received in the three remaining categories: Mission Execution: Nuclear Weapons, Mission Enablement, and Mission Leadership. Sandia received an overall rating of very good.

5.4.1 Audits, Appraisals, and Inspections in 2022

Sandia's environmental programs are routinely subjected to audits, appraisals, inspections, and/or verifications by external agencies. The internal audit group may also conduct assessments, including reviews of the implementation of applicable policies, processes, or procedures; evaluations of corrective action validation assessments; and surveillances and walk-throughs. Self-assessments may evaluate performance and compliance and identify deficiencies and opportunities for improvement as well as noteworthy practices and lessons learned. No audits or assessments were performed at SNL/KTF in 2022.

Per DOE, *occurrences* are defined as "events or conditions that adversely affect, or may adversely affect, DOE (including the National Nuclear Security Administration) or contractor personnel, the public, property, the environment, or the DOE mission."

5.4.2 Occurrence Reporting in 2022

Under DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information* (DOE O 232.2A, Chg 1 (MinChg) 2017), the current order for occurrence reporting, *occurrences* are defined as “events or conditions that adversely affect, or may adversely affect, DOE (including the National Nuclear Security Administration) or contractor personnel, the public, property, the environment, or the DOE mission.” Events or conditions meeting the criteria thresholds identified in this order are occurrences. Whereas some environmental releases may not meet DOE O 232.2A Chg1 (MinChg) reporting thresholds, they may still be reportable to outside agencies.

Occurrences that met DOE O 232.2A Chg1 (MinChg) (DOE O 232.2A, Chg 1 (MinChg) 2017) criteria were entered into the DOE Occurrence Reporting and Processing System database. For this annual site environmental report, the Occurrence Reporting and Processing System database was queried for SNL/KTF occurrences in the following reporting criteria groups (as defined by DOE O 232.2A Chg1 [MinChg] (DOE O 232.2A, Chg 1 (MinChg) 2017):

- Group 5, Environmental
- Group 9, Noncompliance Notifications
- Group 10, Management Concerns and Issues (with identified environmental impact)
- Any occurrence that involved a Sandia environmental program

Qualifying occurrences that took place within a building are not provided in this report.

During 2022, no occurrences met the query criteria for reporting in the annual site environmental report. One occurrence did take place on Pacific Missile Range Facility property for a project managed by personnel from SNL/CA. Because this occurrence did not involve SNL/KTF staff or property, it was not reported in this report. For details on this occurrence, see the *2022 Annual Site Environmental Report for SNL/California* at [Sandia Environmental Reports](#) (Sandia n.d.).

5.5 Environmental Permit Status

Environmental permits for SNL/KTF include those for a wastewater system, diesel generators, and an underground storage tank issued by the State of Hawai‘i.

[Table 5-5](#) lists the applicable environmental permits in effect at SNL/KTF in 2022.

Table 5-5. SNL/KTF environmental permits, 2022

Permit Type	Permit Number	Issue Date	Expiration Date	Regulatory Agency
Individual wastewater system	File #4056-SNL, TMK: (4) 1-2-002:013	December 1, 2004	Not applicable	State of Hawai‘i Department of Health
Noncovered source permit (two stand-by diesel generators)	NSP 0429-01-N	September 28, 2015	September 27, 2020 ^a	State of Hawai‘i Department of Health
Underground storage tank (2,500 gallons)	P-2016-064-R1	June 9, 2021	June 8, 2026	State of Hawai‘i Department of Health

^a Renewal application was received by the Hawai‘i Department of Health Clean Air Branch on July 2, 2020.



Rocket launch at SNL/KTF at night

Chapter 6. Quality Assurance



Canyons and waterfall

OVERVIEW ■ Personnel in various programs collect environmental samples and analyze them for nonradiological constituents. Quality control samples are sent to contract laboratories to ensure that the samples meet statistically established control criteria or prescribed acceptance control limits.

Sandia personnel are responsible for implementing quality assurance for operations—as specified in ISO 9001:2015, *Quality Management Systems—Requirements* (ISO 9001:2015 2015); DOE O 414.1D Change 2 (LtdChg), *Quality Assurance*, Attachment 1, “Contractor Requirements Document” (DOE O 414.1D, Change 2 (LtdChg) 2020); and 10 CFR 830, *Nuclear Safety Management*, Subpart A, “Quality Assurance Requirements” (10 CFR 830 2016)—via policy statements and processes, and by executing the actions specified in those policies and processes. Sandia management is responsible for ensuring the quality of the company’s products; for assessing its operations, programs, projects, and business systems; and for identifying deficiencies and effecting continuous improvements.

6.1 Environmental Monitoring for Quality Assurance

Environmental monitoring (which includes sampling) is conducted in accordance with program-specific sampling and analysis plans, work plans, or quality assurance plans, which contain quality assurance elements for all Sandia locations including SNL/KTF. These documents meet applicable federal, state, and local requirements for conducting sampling and analysis activities. Personnel in various programs collect environmental samples and submit them for analysis of nonradiological constituents on a calendar-year basis unless noted otherwise.

Project sampling and analysis plans (or equivalent) include critical elements, such as procedures for collecting samples, preserving and handling samples, controlling samples, controlling laboratory quality, setting required limits of detection, controlling field quality, ensuring health and safety, setting schedules and frequency for sampling, reviewing data, determining data acceptability, and reporting.

6.1.1 Sample Management Office

Sample Management Office personnel provide guidance and sample management support for field activities. However, program leads are responsible for each program's overall adherence to, and compliance with, any sampling and analysis activity performed.

SNL/KTF personnel ship samples directly to off-site laboratories and may use contracted laboratories located in Kaua'i. For example, Terrestrial Surveillance Program soil samples are shipped from SNL/KTF directly to an off-site laboratory when sampling occurs.

6.1.2 Contract Laboratory Selection

All off-site commercial laboratories under contract are selected based on performance objectives, licenses and accreditations, and appraisals (pre-award assessments) as described in the *Quality Assurance Project Plan for the Sample Management Office* (Sandia 2022). All laboratories must employ EPA test procedures whenever possible; when these are not available, other suitable and validated test procedures are applied. Laboratory instruments must be calibrated in accordance with established procedures, methods, and the Sample Management Office Statement of Work for Analytical Laboratories (Sandia 2020). All calibrations and detection limits must be verified before analyzing samples and reporting data. Once a laboratory has passed an initial appraisal and has been awarded a contract, Sample Management Office personnel are responsible for continuously monitoring laboratory performance to ensure that the laboratory meets its contractual requirements during annual audits.

Contracted laboratories perform work in compliance with the Sample Management Office Statement of Work for Analytical Laboratories. Contract laboratories are required to participate in applicable DOE and EPA programs for blind audit check sampling to monitor the overall accuracy of analyses routinely performed on SNL/KTF samples. These contract laboratories are required to participate in the DOE Mixed Analyte Performance Evaluation Program. Contract laboratories also participate in commercial vendor programs designed to meet the evaluation requirements given in the proficiency testing section (Chapter II) of the National Environmental Laboratory Accreditation Conference Standard (NELAC 2009).

6.1.3 Quality Control for Samples

Project-specified quality control samples are submitted to contract laboratories in order to meet project data quality objectives and sampling and analysis plan requirements. Various field quality control samples may be collected to assess the data's quality and final usability. Errors, some of which are unavoidable, can be introduced into the sampling process, including potential contamination of samples in the field or during transportation. In addition, sample results can be affected by the variability present at each sample location.

With each sample batch, laboratory quality control samples are prepared concurrently at defined frequencies and analyzed in accordance with established methods. Contract laboratory personnel determine the analytical accuracy, precision, contamination, and matrix effects associated with each analytical measurement.

Quality control sample results are compared either to statistically established control criteria or to prescribed acceptance control limits. Analytical results generated concurrently with quality control sample results within established limits are considered acceptable. If quality control analytical results exceed control limits, the results are qualified and corrective action is initiated if warranted, as defined in the Sample Management Office Statement of Work for Analytical Laboratories (Sandia 2020). Samples in the analytical batch are then re-analyzed as specified in the statement of work and

contract laboratory procedures. Quality control sample summaries are included in analytical reports prepared by contract laboratory personnel.

6.1.4 Data Validation and Records Management

Sample collection, analysis request and chain of custody documentation, and measurement data are reviewed and validated for each sample collected. Analytical data reported by contract laboratories are reviewed to assess laboratory and field precision, accuracy, completeness, representativeness, and comparability with respect to each program's method of compliance and data quality objectives.

The data are validated at a minimum of three levels:

- The analytical laboratory validates data according to the laboratory's quality assurance plan, standard operating procedures, and client-specific requirements.
- Sample Management Office personnel review the analytical reports, corresponding sample collection, and analysis request and chain-of-custody documentation for completeness and laboratory contract compliance.
- A program lead reviews program objectives, regulatory compliance, and project-specific data quality requirements and then makes the final decision regarding the data's usability and reporting.

In addition to the three minimum validation levels, a technical assistance contractor may validate analytical data under direction of Sample Management Office personnel in accordance with applicable procedures and requirements. The purpose is to identify, through evaluation of supporting documentation, those monitoring results that do not meet the expected precision and accuracy of an analytical method. Terrestrial Surveillance Program data are validated by a technical assistance contractor providing this additional level of quality assurance.

All analytical data packages, analysis request and chain-of-custody documents, and data validation reports are submitted to a Sandia record depository for cataloging and storage in accordance with internal procedures, DOE requirements, and the document control requirements of ISO 9001, *Quality Management*, and ISO 14001, *Environmental Management Systems*.

6.2 Sample Management Office Activities

Sample Management Office activities in 2022 included sample packaging, shipping, and tracking to off-site contracted laboratories by field personnel, and reviewing all data deliverables for compliance with contract and data quality requirements.

6.2.1 Sample Handling and Analyses

In 2022, Sample Management Office personnel processed 68 samples in support of the Terrestrial Surveillance Program and another project at SNL/KTF. Of the 68 samples, 2 were submitted as field and analytical quality control samples to assist with data validation and decision-making.

During 2022, General Engineering Laboratories in Charleston, South Carolina, was employed to analyze soil samples for the Terrestrial Surveillance Program, and Eurofins in St. Louis, Missouri, was employed to analyze soil and sludge samples as part of a best-practice-driven baseline site characterization effort.

6.2.2 Laboratory Quality Assurance Assessments and Validation

Sample Management Office personnel participate in third-party independent assessments and validation of National Environmental Laboratory Accreditation Conference-approved laboratories

for all Sandia locations. Specific checks were made for documentation completeness, proper equipment calibration, proper laboratory practices, and batch quality control data.

6.2.3 Quality Assurance Audits

The Sample Management Office participates in the DOE Consolidated Audit Program (DOECAP), which ensures that subcontracted commercial analytical environmental laboratories are audited on their ability to provide data results that are valid, reliable, and defensible. Commercial laboratories are to use the assessment process provided by one of three approved third-party accrediting bodies unless separate arrangements are made with DOECAP. The accrediting bodies conduct assessments using *DoD/DOE Consolidated Quality Systems Manual (QSM) for Environmental Laboratories* (DoD/DOE 2021) requirements.

In 2022, DOECAP and/or the accrediting bodies conducted assessments at six contracted laboratories, including one that processed samples from SNL/KTF, using *Quality Systems Manual* (DoD/DOE 2021) requirements. The audit reports, laboratory responses, and closure letters are all posted on and tracked through the DOECAP website. Decisions regarding sample distribution to contract laboratories were based on audit information, including corrective actions, if needed.

No findings for SNL/KTF samples were issued in 2022 in DOECAP assessment reports or other applicable DOE programs.

Appendix A. Terrestrial Surveillance Analytical Results in 2022



The coast of Kaua'i

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Table A-1. Metals results for on-site soil sampling locations, 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-12	Aluminum	7,070	221	485	B	J	SA	SW-846 3050B/6020B
	Antimony	3.17	3.17	19.2	U	None	SA	SW-846 3050B/6010D
	Arsenic	20.1	0.328	0.971		None	SA	SW-846 3050B/6020B
	Barium	8.22	0.0971	0.777		None	SA	SW-846 3050B/6020B
	Beryllium	0.0705	0.0194	0.0971	J	None	SA	SW-846 3050B/6020B
	Cadmium	0.137	0.0194	0.194	J	J+	SA	SW-846 3050B/6020B
	Calcium	221,000	650	1,940		None	SA	SW-846 3050B/6020B
	Chromium	40	0.194	0.583		J	SA	SW-846 3050B/6020B
	Cobalt	12.3	0.0583	0.194		None	SA	SW-846 3050B/6020B
	Copper	9.27	0.0641	0.388		J	SA	SW-846 3050B/6020B
	Iron	13,400	320	971		J	SA	SW-846 3050B/6020B
	Lead	2.46	0.0971	0.388		None	SA	SW-846 3050B/6020B
	Magnesium	23,500	97.1	291	B	None	SA	SW-846 3050B/6020B
	Manganese	300	9.71	48.5		J	SA	SW-846 3050B/6020B
	Nickel	123	0.0971	0.388		J	SA	SW-846 3050B/6020B
	Potassium	300	15.5	58.3		None	SA	SW-846 3050B/6020B
	Selenium	1.75	1.75	4.85	U	None	SA	SW-846 3050B/6020B
	Silver	1.53	0.0958	0.479	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,020	15.5	48.5		None	SA	SW-846 3050B/6020B
	Thallium	0.136	0.136	0.388	U	None	SA	SW-846 3050B/6020B
	Vanadium	16.7	0.291	3.88	N	J	SA	SW-846 3050B/6020B
	Zinc	39.4	0.777	3.88	*	J	SA	SW-846 3050B/6020B
S-13	Aluminum	9,460	88.2	194	B	J	SA	SW-846 3050B/6020B
	Antimony	3.03	3.03	18.3	U	18.3UJ	SA	SW-846 3050B/6010D
	Arsenic	51.2	0.328	0.969		None	SA	SW-846 3050B/6020B
	Barium	13.4	0.0969	0.775		None	SA	SW-846 3050B/6020B
	Beryllium	0.0878	0.0194	0.0969	J	None	SA	SW-846 3050B/6020B
	Cadmium	0.189	0.0194	0.194	J	J+	SA	SW-846 3050B/6020B
	Calcium	138,000	260	775		None	SA	SW-846 3050B/6020B
	Chromium	113	0.194	0.581		J	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-13	Cobalt	38.9	0.0581	0.194		None	SA	SW-846 3050B/6020B
	Copper	12.6	0.064	0.388		J	SA	SW-846 3050B/6020B
	Iron	34,600	128	388		J	SA	SW-846 3050B/6020B
	Lead	2.75	0.0969	0.388		None	SA	SW-846 3050B/6020B
	Magnesium	72,700	38.8	116	B	None	SA	SW-846 3050B/6020B
	Manganese	568	3.88	19.4		J	SA	SW-846 3050B/6020B
	Nickel	604	1.94	7.75		J	SA	SW-846 3050B/6020B
	Potassium	252	15.5	58.1		None	SA	SW-846 3050B/6020B
	Selenium	0.476	0.349	0.969	J	None	SA	SW-846 3050B/6020B
	Silver	0.639	0.0903	0.451	B	J+	SA	SW-846 3050B/6010D
	Sodium	1,800	15.5	48.4		None	SA	SW-846 3050B/6020B
	Thallium	0.136	0.136	0.388	U	None	SA	SW-846 3050B/6020B
	Vanadium	25.2	0.291	3.88	N	J	SA	SW-846 3050B/6020B
	Zinc	42.7	0.775	3.88	*	J	SA	SW-846 3050B/6020B
S-14	Aluminum	8,710	78.9	173	B	J	SA	SW-846 3050B/6020B
	Antimony	3.25	3.25	19.7	U	None	SA	SW-846 3050B/6010D
	Arsenic	7.21	0.293	0.867		None	SA	SW-846 3050B/6020B
	Barium	10.9	0.0867	0.693		None	SA	SW-846 3050B/6020B
	Beryllium	0.0906	0.0173	0.0867		None	SA	SW-846 3050B/6020B
	Cadmium	0.244	0.0173	0.173		J+	SA	SW-846 3050B/6020B
	Calcium	160,000	232	693		None	SA	SW-846 3050B/6020B
	Chromium	99.2	0.173	0.52		J	SA	SW-846 3050B/6020B
	Cobalt	32.6	0.052	0.173		None	SA	SW-846 3050B/6020B
	Copper	21	0.0572	0.347		J	SA	SW-846 3050B/6020B
	Iron	30,000	114	347		J	SA	SW-846 3050B/6020B
	Lead	0.735	0.0867	0.347		None	SA	SW-846 3050B/6020B
	Magnesium	63,800	34.7	104	B	None	SA	SW-846 3050B/6020B
	Manganese	501	3.47	17.3		J	SA	SW-846 3050B/6020B
	Nickel	521	1.73	6.93		J	SA	SW-846 3050B/6020B
	Potassium	298	13.9	52		None	SA	SW-846 3050B/6020B
	Selenium	0.391	0.312	0.867	J	None	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-14	Silver	0.777	0.0986	0.493	B	J+	SA	SW-846 3050B/6010D
	Sodium	1,920	13.9	43.3		None	SA	SW-846 3050B/6020B
	Thallium	0.121	0.121	0.347	U	None	SA	SW-846 3050B/6020B
	Vanadium	22.6	0.26	3.47	N	J	SA	SW-846 3050B/6020B
	Zinc	220	0.693	3.47	*	J	SA	SW-846 3050B/6020B
S-15	Aluminum	9,290	89.6	197	B	J	SA	SW-846 3050B/6020B
	Antimony	3.25	3.25	19.7	U	None	SA	SW-846 3050B/6010D
	Arsenic	7.48	0.333	0.984		None	SA	SW-846 3050B/6020B
	Barium	15.2	0.0984	0.787		None	SA	SW-846 3050B/6020B
	Beryllium	0.11	0.0197	0.0984		None	SA	SW-846 3050B/6020B
	Cadmium	0.144	0.0197	0.197	J	J+	SA	SW-846 3050B/6020B
	Calcium	184,000	264	787		None	SA	SW-846 3050B/6020B
	Chromium	83.7	0.197	0.591		J	SA	SW-846 3050B/6020B
	Cobalt	23.7	0.0591	0.197		None	SA	SW-846 3050B/6020B
	Copper	27.6	0.065	0.394		J	SA	SW-846 3050B/6020B
	Iron	24,300	130	394		J	SA	SW-846 3050B/6020B
	Lead	1.92	0.0984	0.394		None	SA	SW-846 3050B/6020B
	Magnesium	44,300	39.4	118	B	None	SA	SW-846 3050B/6020B
	Manganese	397	3.94	19.7		J	SA	SW-846 3050B/6020B
	Nickel	351	1.97	7.87		J	SA	SW-846 3050B/6020B
	Potassium	396	15.7	59.1		None	SA	SW-846 3050B/6020B
	Selenium	0.422	0.354	0.984	J	None	SA	SW-846 3050B/6020B
	Silver	0.923	0.0986	0.493	B	J+	SA	SW-846 3050B/6010D
	Sodium	1,730	15.7	49.2		None	SA	SW-846 3050B/6020B
	Thallium	0.138	0.138	0.394	U	None	SA	SW-846 3050B/6020B
	Vanadium	22.8	0.295	3.94	N	J	SA	SW-846 3050B/6020B
	Zinc	41.6	0.787	3.94	*	J	SA	SW-846 3050B/6020B
S-16	Aluminum	8,950	89	196	B	J	SA	SW-846 3050B/6020B
	Antimony	2.89	2.89	17.5	U	17.5UJ	SA	SW-846 3050B/6010D
	Arsenic	8.94	0.331	0.978		None	SA	SW-846 3050B/6020B
	Barium	17.5	0.0978	0.783		None	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-16	Beryllium	0.12	0.0196	0.0978		None	SA	SW-846 3050B/6020B
	Cadmium	0.0953	0.0196	0.196	J	J+	SA	SW-846 3050B/6020B
	Calcium	174,000	262	783		None	SA	SW-846 3050B/6020B
	Chromium	87.2	0.196	0.587		J	SA	SW-846 3050B/6020B
	Cobalt	30	0.0587	0.196		None	SA	SW-846 3050B/6020B
	Copper	20.4	0.0646	0.391		J	SA	SW-846 3050B/6020B
	Iron	28,300	129	391		J	SA	SW-846 3050B/6020B
	Lead	0.674	0.0978	0.391		None	SA	SW-846 3050B/6020B
	Magnesium	51,600	39.1	117	B	None	SA	SW-846 3050B/6020B
	Manganese	478	3.91	19.6		J	SA	SW-846 3050B/6020B
	Nickel	447	1.96	7.83		J	SA	SW-846 3050B/6020B
	Potassium	346	15.7	58.7		None	SA	SW-846 3050B/6020B
	Selenium	0.432	0.352	0.978	J	None	SA	SW-846 3050B/6020B
	Silver	0.953	0.0859	0.43	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,190	15.7	48.9		None	SA	SW-846 3050B/6020B
	Thallium	0.137	0.137	0.391	U	None	SA	SW-846 3050B/6020B
	Vanadium	23.2	0.294	3.91	N	J	SA	SW-846 3050B/6020B
	Zinc	33.8	0.783	3.91	*	J	SA	SW-846 3050B/6020B
S-17	Aluminum	10,900	81	178	B	J	SA	SW-846 3050B/6020B
	Antimony	2.98	2.98	18.1	U	None	SA	SW-846 3050B/6010D
	Arsenic	4.52	0.301	0.89		None	SA	SW-846 3050B/6020B
	Barium	43.3	0.089	0.712		None	SA	SW-846 3050B/6020B
	Beryllium	0.231	0.0178	0.089		None	SA	SW-846 3050B/6020B
	Cadmium	0.109	0.0178	0.178	J	J+	SA	SW-846 3050B/6020B
	Calcium	157,000	238	712		None	SA	SW-846 3050B/6020B
	Chromium	45	0.178	0.534		J	SA	SW-846 3050B/6020B
	Cobalt	17.5	0.0534	0.178		None	SA	SW-846 3050B/6020B
	Copper	53.4	0.0587	0.356		J	SA	SW-846 3050B/6020B
	Iron	19,200	117	356		J	SA	SW-846 3050B/6020B
	Lead	0.61	0.089	0.356		None	SA	SW-846 3050B/6020B
	Magnesium	26,200	35.6	107	B	None	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-17	Manganese	379	3.56	17.8		J	SA	SW-846 3050B/6020B
	Nickel	166	0.089	0.356		J	SA	SW-846 3050B/6020B
	Potassium	646	14.2	53.4		None	SA	SW-846 3050B/6020B
	Selenium	0.51	0.32	0.89	J	None	SA	SW-846 3050B/6020B
	Silver	1.19	0.0904	0.452	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,080	14.2	44.5		None	SA	SW-846 3050B/6020B
	Thallium	0.125	0.125	0.356	U	None	SA	SW-846 3050B/6020B
	Vanadium	25.6	0.267	3.56	N	J	SA	SW-846 3050B/6020B
	Zinc	30.9	0.712	3.56	*	J	SA	SW-846 3050B/6020B
S-18	Aluminum	9,610	85.7	188	B	J	SA	SW-846 3050B/6020B
	Antimony	2.99	2.99	18.1	U	None	SA	SW-846 3050B/6010D
	Arsenic	5.21	0.318	0.942		None	SA	SW-846 3050B/6020B
	Barium	73.9	0.0942	0.753		None	SA	SW-846 3050B/6020B
	Beryllium	0.169	0.0188	0.0942		None	SA	SW-846 3050B/6020B
	Cadmium	0.105	0.0188	0.188	J	J+	SA	SW-846 3050B/6020B
	Calcium	179,000	252	753		None	SA	SW-846 3050B/6020B
	Chromium	40.8	0.188	0.565		J	SA	SW-846 3050B/6020B
	Cobalt	16.2	0.0565	0.188		None	SA	SW-846 3050B/6020B
	Copper	33.1	0.0621	0.377		J	SA	SW-846 3050B/6020B
	Iron	16,100	124	377		J	SA	SW-846 3050B/6020B
	Lead	0.658	0.0942	0.377		None	SA	SW-846 3050B/6020B
	Magnesium	26,300	37.7	113	B	None	SA	SW-846 3050B/6020B
	Manganese	309	3.77	18.8		J	SA	SW-846 3050B/6020B
	Nickel	161	0.0942	0.377		J	SA	SW-846 3050B/6020B
	Potassium	923	15.1	56.5		None	SA	SW-846 3050B/6020B
	Selenium	0.441	0.339	0.942	J	None	SA	SW-846 3050B/6020B
	Silver	1.47	0.0907	0.454	B	J+	SA	SW-846 3050B/6010D
	Sodium	4,190	15.1	47.1		None	SA	SW-846 3050B/6020B
	Thallium	0.132	0.132	0.377	U	None	SA	SW-846 3050B/6020B
	Vanadium	17.2	0.282	3.77	N	J	SA	SW-846 3050B/6020B
	Zinc	80.5	0.753	3.77	*	J	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-19	Aluminum	7,880	111	243	B	J	SA	SW-846 3050B/6020B
	Antimony	3.21	3.21	19.5	U	None	SA	SW-846 3050B/6010D
	Arsenic	12.7	0.329	0.973		None	SA	SW-846 3050B/6020B
	Barium	9.98	0.0973	0.778		None	SA	SW-846 3050B/6020B
	Beryllium	0.0687	0.0195	0.0973	J	None	SA	SW-846 3050B/6020B
	Cadmium	0.135	0.0195	0.195	J	J+	SA	SW-846 3050B/6020B
	Calcium	207,000	326	973		None	SA	SW-846 3050B/6020B
	Chromium	76.8	0.195	0.584		J	SA	SW-846 3050B/6020B
	Cobalt	24.8	0.0584	0.195		None	SA	SW-846 3050B/6020B
	Copper	10	0.0642	0.389		J	SA	SW-846 3050B/6020B
	Iron	23,600	161	486		J	SA	SW-846 3050B/6020B
	Lead	0.737	0.0973	0.389		None	SA	SW-846 3050B/6020B
	Magnesium	50,200	48.6	146	B	None	SA	SW-846 3050B/6020B
	Manganese	390	4.86	24.3		J	SA	SW-846 3050B/6020B
	Nickel	390	2.43	9.73		J	SA	SW-846 3050B/6020B
	Potassium	247	15.6	58.4		None	SA	SW-846 3050B/6020B
	Selenium	0.473	0.35	0.973	J	None	SA	SW-846 3050B/6020B
	Silver	1.18	0.0973	0.486	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,240	15.6	48.6		None	SA	SW-846 3050B/6020B
	Thallium	0.136	0.136	0.389	U	None	SA	SW-846 3050B/6020B
	Vanadium	19.9	0.292	3.89	N	J	SA	SW-846 3050B/6020B
	Zinc	31.1	0.778	3.89	*	J	SA	SW-846 3050B/6020B
S-20	Aluminum	4,620	81	178	B	J	SA	SW-846 3050B/6020B
	Antimony	3.06	3.06	18.5	U	18.5UJ	SA	SW-846 3050B/6010D
	Arsenic	5.8	0.301	0.89		None	SA	SW-846 3050B/6020B
	Barium	5.85	0.089	0.712		None	SA	SW-846 3050B/6020B
	Beryllium	0.0617	0.0178	0.089	J	None	SA	SW-846 3050B/6020B
	Cadmium	0.241	0.0178	0.178		J+	SA	SW-846 3050B/6020B
	Calcium	125,000	238	712		None	SA	SW-846 3050B/6020B
	Chromium	34.6	0.178	0.534		J	SA	SW-846 3050B/6020B
	Cobalt	10.5	0.0534	0.178		None	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-20	Copper	9.5	0.0587	0.356		J	SA	SW-846 3050B/6020B
	Iron	10,600	117	356		J	SA	SW-846 3050B/6020B
	Lead	0.45	0.089	0.356		None	SA	SW-846 3050B/6020B
	Magnesium	19,200	35.6	107	B	None	SA	SW-846 3050B/6020B
	Manganese	243	3.56	17.8		J	SA	SW-846 3050B/6020B
	Nickel	125	0.089	0.356		J	SA	SW-846 3050B/6020B
	Potassium	724	14.2	53.4		None	SA	SW-846 3050B/6020B
	Selenium	0.396	0.32	0.89	J	None	SA	SW-846 3050B/6020B
	Silver	1.12	0.0956	0.478	B	J+	SA	SW-846 3050B/6010D
	Sodium	1,310	14.2	44.5		None	SA	SW-846 3050B/6020B
	Thallium	0.125	0.125	0.356	U	None	SA	SW-846 3050B/6020B
	Vanadium	11.6	0.267	3.56	N	J	SA	SW-846 3050B/6020B
	Zinc	30.1	0.712	3.56	*	J	SA	SW-846 3050B/6020B
S-21	Aluminum	7,270	102	223	B	J	SA	SW-846 3050B/6020B
	Aluminum	8,000	107	236	B	J	DU	SW-846 3050B/6020B
	Antimony	3.08	3.08	18.7	U	None	SA	SW-846 3050B/6010D
	Antimony	3.05	3.05	18.5	U	None	DU	SW-846 3050B/6010D
	Arsenic	12.9	0.302	0.893		None	SA	SW-846 3050B/6020B
	Arsenic	13.6	0.319	0.943		None	DU	SW-846 3050B/6020B
	Barium	7.67	0.0893	0.714		None	SA	SW-846 3050B/6020B
	Barium	7.85	0.0943	0.755		None	DU	SW-846 3050B/6020B
	Beryllium	0.0802	0.0179	0.0893	J	None	SA	SW-846 3050B/6020B
	Beryllium	0.0826	0.0189	0.0943	J	None	DU	SW-846 3050B/6020B
	Cadmium	0.123	0.0179	0.179	J	J+	SA	SW-846 3050B/6020B
	Cadmium	0.165	0.0189	0.189	J	J+	DU	SW-846 3050B/6020B
	Calcium	261,000	598	1790		None	SA	SW-846 3050B/6020B
	Calcium	264,000	632	1890		None	DU	SW-846 3050B/6020B
	Chromium	42.5	0.179	0.536		J	SA	SW-846 3050B/6020B
	Chromium	45.7	0.189	0.566		J	DU	SW-846 3050B/6020B
	Cobalt	12.8	0.0536	0.179		None	SA	SW-846 3050B/6020B
	Cobalt	13.9	0.0566	0.189		None	DU	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-21	Copper	7.36	0.0589	0.357		J	SA	SW-846 3050B/6020B
	Copper	7.45	0.0623	0.377		J	DU	SW-846 3050B/6020B
	Iron	15,200	147	446		J	SA	SW-846 3050B/6020B
	Iron	16,400	156	472		J	DU	SW-846 3050B/6020B
	Lead	1.64	0.0893	0.357		None	SA	SW-846 3050B/6020B
	Lead	1.57	0.0943	0.377		None	DU	SW-846 3050B/6020B
	Magnesium	25,300	44.6	134	B	None	SA	SW-846 3050B/6020B
	Magnesium	27,900	47.2	142	B	None	DU	SW-846 3050B/6020B
	Manganese	290	4.46	22.3		J	SA	SW-846 3050B/6020B
	Manganese	317	4.72	23.6		J	DU	SW-846 3050B/6020B
	Nickel	126	0.0893	0.357		J	SA	SW-846 3050B/6020B
	Nickel	141	0.0943	0.377		J	DU	SW-846 3050B/6020B
	Potassium	265	14.3	53.6		None	SA	SW-846 3050B/6020B
	Potassium	263	15.1	56.6		None	DU	SW-846 3050B/6020B
	Selenium	0.488	0.321	0.893	J	None	SA	SW-846 3050B/6020B
	Selenium	0.472	0.34	0.943	J	None	DU	SW-846 3050B/6020B
	Silver	1.54	0.0935	0.467	B	J+	SA	SW-846 3050B/6010D
	Silver	1.4	0.0924	0.462	B	J+	DU	SW-846 3050B/6010D
	Sodium	2,230	14.3	44.6		None	SA	SW-846 3050B/6020B
	Sodium	2,270	15.1	47.2		None	DU	SW-846 3050B/6020B
	Thallium	0.125	0.125	0.357	U	None	SA	SW-846 3050B/6020B
	Thallium	0.132	0.132	0.377	U	None	DU	SW-846 3050B/6020B
	Vanadium	18.8	0.268	3.57	N	J	SA	SW-846 3050B/6020B
	Vanadium	21	0.283	3.77	N	J	DU	SW-846 3050B/6020B
	Zinc	24	0.714	3.57	*	J	SA	SW-846 3050B/6020B
	Zinc	23.4	0.755	3.77	*	J	DU	SW-846 3050B/6020B
S-22	Aluminum	4,270	109	240	B	J	SA	SW-846 3050B/6020B
	Antimony	2.56	2.56	15.5	U	15.5UJ	SA	SW-846 3050B/6010D
	Arsenic	8.38	0.325	0.962		None	SA	SW-846 3050B/6020B
	Barium	21.7	0.0962	0.769		None	SA	SW-846 3050B/6020B
	Beryllium	0.0621	0.0192	0.0962	J	None	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-22	Cadmium	0.091	0.0192	0.192	J	J+	SA	SW-846 3050B/6020B
	Calcium	321,000	644	1920		None	SA	SW-846 3050B/6020B
	Chromium	21.9	0.192	0.577		J	SA	SW-846 3050B/6020B
	Cobalt	4.33	0.0577	0.192		None	SA	SW-846 3050B/6020B
	Copper	42.8	0.0635	0.385		J	SA	SW-846 3050B/6020B
	Iron	8,390	6.35	19.2		J	SA	SW-846 3050B/6020B
	Lead	7.63	0.0962	0.385		None	SA	SW-846 3050B/6020B
	Magnesium	23,800	48.1	144	B	None	SA	SW-846 3050B/6020B
	Manganese	214	4.81	24		J	SA	SW-846 3050B/6020B
	Nickel	35.3	0.0962	0.385		J	SA	SW-846 3050B/6020B
	Potassium	230	15.4	57.7		None	SA	SW-846 3050B/6020B
	Selenium	0.346	0.346	0.962	U	None	SA	SW-846 3050B/6020B
	Silver	2.21	0.0965	0.483	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,090	15.4	48.1		None	SA	SW-846 3050B/6020B
	Thallium	0.135	0.135	0.385	U	None	SA	SW-846 3050B/6020B
	Vanadium	12	0.288	3.85	N	J	SA	SW-846 3050B/6020B
	Zinc	170	0.769	3.85	*	J	SA	SW-846 3050B/6020B
S-23	Aluminum	3,110	107	236	B	J	SA	SW-846 3050B/6020B
	Antimony	2.68	2.68	16.3	U	16.3UJ	SA	SW-846 3050B/6010D
	Arsenic	6.43	0.319	0.943		None	SA	SW-846 3050B/6020B
	Barium	6.96	0.0943	0.755		None	SA	SW-846 3050B/6020B
	Beryllium	0.0255	0.0189	0.0943	J	None	SA	SW-846 3050B/6020B
	Cadmium	0.0815	0.0189	0.189	J	J+	SA	SW-846 3050B/6020B
	Calcium	321,000	632	1890		None	SA	SW-846 3050B/6020B
	Chromium	23.1	0.189	0.566		J	SA	SW-846 3050B/6020B
	Cobalt	3.71	0.0566	0.189		None	SA	SW-846 3050B/6020B
	Copper	5.51	0.0623	0.377		J	SA	SW-846 3050B/6020B
	Iron	7,420	6.23	18.9		J	SA	SW-846 3050B/6020B
	Lead	1.97	0.0943	0.377		None	SA	SW-846 3050B/6020B
	Magnesium	24,700	47.2	142	B	None	SA	SW-846 3050B/6020B
	Manganese	123	0.189	0.943		J	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-23	Nickel	42.5	0.0943	0.377		J	SA	SW-846 3050B/6020B
	Potassium	121	15.1	56.6		None	SA	SW-846 3050B/6020B
	Selenium	0.34	0.34	0.943	U	None	SA	SW-846 3050B/6020B
	Silver	2.13	0.0919	0.46	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,020	15.1	47.2		None	SA	SW-846 3050B/6020B
	Thallium	0.132	0.132	0.377	U	None	SA	SW-846 3050B/6020B
	Vanadium	8.28	0.283	3.77	N	J	SA	SW-846 3050B/6020B
	Zinc	445	0.755	3.77	*	J	SA	SW-846 3050B/6020B
S-24	Aluminum	8,430	107	235	B	J	SA	SW-846 3050B/6020B
	Antimony	2.84	2.84	17.2	U	17.2UJ	SA	SW-846 3050B/6010D
	Arsenic	26	0.318	0.94		None	SA	SW-846 3050B/6020B
	Barium	56.3	0.094	0.752		None	SA	SW-846 3050B/6020B
	Beryllium	0.133	0.0188	0.094		None	SA	SW-846 3050B/6020B
	Cadmium	0.259	0.0188	0.188		J+	SA	SW-846 3050B/6020B
	Calcium	228,000	315	940		None	SA	SW-846 3050B/6020B
	Chromium	46.4	0.188	0.564		J	SA	SW-846 3050B/6020B
	Cobalt	16.1	0.0564	0.188		None	SA	SW-846 3050B/6020B
	Copper	12.2	0.062	0.376		J	SA	SW-846 3050B/6020B
	Iron	18,500	155	470		J	SA	SW-846 3050B/6020B
	Lead	7.89	0.094	0.376		None	SA	SW-846 3050B/6020B
	Magnesium	27,800	47	141	B	None	SA	SW-846 3050B/6020B
	Manganese	366	4.7	23.5		J	SA	SW-846 3050B/6020B
	Nickel	154	0.094	0.376		J	SA	SW-846 3050B/6020B
	Potassium	610	15	56.4		None	SA	SW-846 3050B/6020B
	Selenium	0.432	0.338	0.94	J	None	SA	SW-846 3050B/6020B
	Silver	1.17	0.0926	0.463	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,970	15	47		None	SA	SW-846 3050B/6020B
	Thallium	0.132	0.132	0.376	U	None	SA	SW-846 3050B/6020B
	Vanadium	22	0.282	3.76	N	J	SA	SW-846 3050B/6020B
	Zinc	328	0.752	3.76	*	J	SA	SW-846 3050B/6020B
S-25	Aluminum	7,560	112	247	B	J	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-25	Aluminum	7,370	105	231	B	J	DU	SW-846 3050B/6020B
	Antimony	2.98	2.98	18.1	U	None	SA	SW-846 3050B/6010D
	Antimony	3.15	3.15	19.1	U	None	DU	SW-846 3050B/6010D
	Arsenic	27.2	0.334	0.988		None	SA	SW-846 3050B/6020B
	Arsenic	21.7	1.56	4.62		None	DU	SW-846 3050B/6020B
	Barium	15	0.0988	0.791		None	SA	SW-846 3050B/6020B
	Barium	13	0.0924	0.739		None	DU	SW-846 3050B/6020B
	Beryllium	0.0919	0.0198	0.0988	J	None	SA	SW-846 3050B/6020B
	Beryllium	0.103	0.0924	0.462	J	None	DU	SW-846 3050B/6020B
	Cadmium	0.291	0.0198	0.198		J+	SA	SW-846 3050B/6020B
	Cadmium	0.564	0.0185	0.185		J+	DU	SW-846 3050B/6020B
	Calcium	247,000	331	988		None	SA	SW-846 3050B/6020B
	Calcium	265,000	619	1850		None	DU	SW-846 3050B/6020B
	Chromium	44.4	0.198	0.593		J	SA	SW-846 3050B/6020B
	Chromium	49.1	0.185	0.555		J	DU	SW-846 3050B/6020B
	Cobalt	13.9	0.0593	0.198		None	SA	SW-846 3050B/6020B
	Cobalt	15.5	0.0555	0.185		None	DU	SW-846 3050B/6020B
	Copper	8.35	0.0652	0.395		J	SA	SW-846 3050B/6020B
	Copper	8.5	0.061	0.37		J	DU	SW-846 3050B/6020B
	Iron	15,700	163	494		J	SA	SW-846 3050B/6020B
	Iron	18,100	152	462		J	DU	SW-846 3050B/6020B
	Lead	7.44	0.0988	0.395		None	SA	SW-846 3050B/6020B
	Lead	8.37	0.0924	0.37		None	DU	SW-846 3050B/6020B
	Magnesium	26,400	49.4	148	B	None	SA	SW-846 3050B/6020B
	Magnesium	29,000	46.2	139	B	None	DU	SW-846 3050B/6020B
	Manganese	341	4.94	24.7		J	SA	SW-846 3050B/6020B
	Manganese	365	4.62	23.1		J	DU	SW-846 3050B/6020B
	Nickel	141	0.0988	0.395		J	SA	SW-846 3050B/6020B
	Nickel	151	0.0924	0.37		J	DU	SW-846 3050B/6020B
	Potassium	260	15.8	59.3		None	SA	SW-846 3050B/6020B
	Potassium	185	14.8	55.5		None	DU	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-25	Selenium	0.401	0.356	0.988	J	None	SA	SW-846 3050B/6020B
	Selenium	1.66	1.66	4.62	U	None	DU	SW-846 3050B/6020B
	Silver	1.53	0.0904	0.452	B	J+	SA	SW-846 3050B/6010D
	Silver	1.31	0.0954	0.477	B	J+	DU	SW-846 3050B/6010D
	Sodium	2,440	15.8	49.4		None	SA	SW-846 3050B/6020B
	Sodium	2,330	14.8	46.2		None	DU	SW-846 3050B/6020B
	Thallium	0.138	0.138	0.395	U	None	SA	SW-846 3050B/6020B
	Thallium	0.129	0.129	0.37	U	None	DU	SW-846 3050B/6020B
	Vanadium	19.6	0.296	3.95	N	J	SA	SW-846 3050B/6020B
	Vanadium	22.2	0.277	3.7	N	J	DU	SW-846 3050B/6020B
	Zinc	359	0.791	3.95	*	J	SA	SW-846 3050B/6020B
	Zinc	449	3.7	18.5	*	J	DU	SW-846 3050B/6020B
S-26	Aluminum	8,690	113	249	B	J	SA	SW-846 3050B/6020B
	Antimony	3.08	3.08	18.7	U	None	SA	SW-846 3050B/6010D
	Arsenic	20.3	0.336	0.994		None	SA	SW-846 3050B/6020B
	Barium	15.4	0.0994	0.795		None	SA	SW-846 3050B/6020B
	Beryllium	0.103	0.0199	0.0994		None	SA	SW-846 3050B/6020B
	Cadmium	0.275	0.0199	0.199		J+	SA	SW-846 3050B/6020B
	Calcium	245,000	333	994		None	SA	SW-846 3050B/6020B
	Chromium	50	0.199	0.596		J	SA	SW-846 3050B/6020B
	Cobalt	15	0.0596	0.199		None	SA	SW-846 3050B/6020B
	Copper	8.62	0.0656	0.398		J	SA	SW-846 3050B/6020B
	Iron	18,100	164	497		J	SA	SW-846 3050B/6020B
	Lead	3.22	0.0994	0.398		None	SA	SW-846 3050B/6020B
	Magnesium	25,300	49.7	149	B	None	SA	SW-846 3050B/6020B
	Manganese	351	4.97	24.9		J	SA	SW-846 3050B/6020B
	Nickel	139	0.0994	0.398		J	SA	SW-846 3050B/6020B
	Potassium	254	15.9	59.6		None	SA	SW-846 3050B/6020B
	Selenium	0.499	0.358	0.994	J	None	SA	SW-846 3050B/6020B
	Silver	1.5	0.0935	0.467	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,290	15.9	49.7		None	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-26	Thallium	0.139	0.139	0.398	U	None	SA	SW-846 3050B/6020B
	Vanadium	20.6	0.298	3.98	N	J	SA	SW-846 3050B/6020B
	Zinc	170	0.795	3.98	*	J	SA	SW-846 3050B/6020B
S-27	Aluminum	8,160	112	247	B	J	SA	SW-846 3050B/6020B
	Antimony	2.91	2.91	17.6	U	None	SA	SW-846 3050B/6010D
	Arsenic	15.5	1.67	4.94		None	SA	SW-846 3050B/6020B
	Barium	8.43	0.0988	0.791		None	SA	SW-846 3050B/6020B
	Beryllium	0.0972	0.0198	0.0988	J	None	SA	SW-846 3050B/6020B
	Cadmium	0.189	0.0198	0.198	J	J+	SA	SW-846 3050B/6020B
	Calcium	234,000	331	988		None	SA	SW-846 3050B/6020B
	Chromium	50	0.198	0.593		J	SA	SW-846 3050B/6020B
	Cobalt	15.7	0.0593	0.198		None	SA	SW-846 3050B/6020B
	Copper	9.43	0.0652	0.395		J	SA	SW-846 3050B/6020B
	Iron	16,900	163	494		J	SA	SW-846 3050B/6020B
	Lead	1.56	0.0988	0.395		None	SA	SW-846 3050B/6020B
	Magnesium	27,700	49.4	148	B	None	SA	SW-846 3050B/6020B
	Manganese	322	4.94	24.7		J	SA	SW-846 3050B/6020B
	Nickel	159	0.0988	0.395		J	SA	SW-846 3050B/6020B
	Potassium	258	15.8	59.3		None	SA	SW-846 3050B/6020B
	Selenium	1.78	1.78	4.94	U	None	SA	SW-846 3050B/6020B
	Silver	1.37	0.0882	0.441	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,280	15.8	49.4		None	SA	SW-846 3050B/6020B
	Thallium	0.138	0.138	0.395	U	None	SA	SW-846 3050B/6020B
	Vanadium	20.9	0.296	3.95	N	J	SA	SW-846 3050B/6020B
	Zinc	152	3.95	19.8	*	J	SA	SW-846 3050B/6020B
S-28	Aluminum	10,400	100	221	B	J	SA	SW-846 3050B/6020B
	Antimony	3.26	3.26	19.8	U	None	SA	SW-846 3050B/6010D
	Arsenic	15	1.49	4.42		None	SA	SW-846 3050B/6020B
	Barium	69.1	0.0883	0.707		None	SA	SW-846 3050B/6020B
	Beryllium	0.157	0.0177	0.0883		None	SA	SW-846 3050B/6020B
	Cadmium	0.486	0.0177	0.177		J+	SA	SW-846 3050B/6020B

Appendix A. Terrestrial Surveillance Analytical Results in 2022

Location	Analyte	Result (mg/kg)	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Laboratory Data Qualifier ^a	Data Validation Qualifier	Sample Type	Analytical Method
S-28	Calcium	259,000	592	1770		None	SA	SW-846 3050B/6020B
	Chromium	46	0.177	0.53		J	SA	SW-846 3050B/6020B
	Cobalt	13.8	0.053	0.177		None	SA	SW-846 3050B/6020B
	Copper	164	0.0583	0.353		J	SA	SW-846 3050B/6020B
	Iron	26,000	146	442		J	SA	SW-846 3050B/6020B
	Lead	6.26	0.0883	0.353		None	SA	SW-846 3050B/6020B
	Magnesium	23,800	44.2	133	B	None	SA	SW-846 3050B/6020B
	Manganese	587	4.42	22.1		J	SA	SW-846 3050B/6020B
	Nickel	97.1	0.0883	0.353		J	SA	SW-846 3050B/6020B
	Potassium	586	14.1	53		None	SA	SW-846 3050B/6020B
	Selenium	1.59	1.59	4.42	U	None	SA	SW-846 3050B/6020B
	Silver	2.19	0.0988	0.494	B	J+	SA	SW-846 3050B/6010D
	Sodium	2,100	14.1	44.2		None	SA	SW-846 3050B/6020B
	Thallium	0.124	0.124	0.353	U	None	SA	SW-846 3050B/6020B
	Vanadium	27.4	0.265	3.53	N	J	SA	SW-846 3050B/6020B
	Zinc	335	3.53	17.7	*	J	SA	SW-846 3050B/6020B

^a Blank cells indicate that the laboratory did not qualify the data.

Laboratory Data Qualifiers

* = A replicate was outside limits.

B = The analyte was detected in the blank.

J = An estimated value, the analyte concentration was above the effective MDL and below the effective PQL.

N = A spike was outside limits.

U = The analyte was absent or below the method detection limit.

Data Validation Qualifiers

J = The associated value was an estimated quantity.

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

None = There was no data validation assigned.

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

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

Sample Type

DU = duplicate sample

SA = sample

Analytical Method

SW-846 (EPA 1986)

Appendix B. Climate Hazard Risks



Hibiscus (Hibiscus sp.)

Appendix B. Climate Hazard Risks

Table B-1. Climate hazard risks by asset and infrastructure type at SNL/KTF

Asset and Infrastructure System Type	Number of Assets	Coastal Flooding	Sea Level Rise	Strong Wind	Drought	Wildfire	Hurricane	Riverine Flooding	Precipitation	Tsunami	Heat Wave
Workforce (e.g., outdoor workers, researchers, or office staff)	1	9.3	None	8.3	9.8	9.3	9.3	9.8	9.8	6.3	9.3
Energy generation and distribution systems	2	8.6	5.3	6.3	None	6.8	9.4	7.8	7.8	5.6	5.8
Buildings, may be broken down by type (e.g., those with critical functions or office buildings)	6	8.8	5.5	6.4	None	6.9	9.8	8.0	8.0	5.7	5.9
IT and telecommunication systems	2	8.6	5.3	6.3	None	6.8	9.3	7.8	7.8	5.6	5.8
Specialized or mission-critical equipment (e.g., lasers, high-performance computers, or particle accelerators)	5	9.0	5.6	6.5	None	7.1	9.9	8.1	8.1	6.0	6.1
Water and wastewater systems	1	8.3	5.0	None	None	6.5	9.3	7.5	7.5	5.3	5.5
Ecology and land preservation	1	9.5	7.5	4.5	10.0	9.5	9.5	10.0	7.5	6.5	9.5
Transportation and fleet infrastructure	1	8.3	5.0	4.5	None	6.5	6.5	8.5	7.5	5.0	5.5

Risk Score and Color Key	
High	≥7
Medium	3.5 ≤ 7
Low	< 3.5
None	Zero calculated risk



Kaua'i, Hawai'i

Glossary



Green sea turtles (*Chelonia mydas*) on a Kaua'i beach

A

abatement The act of reducing the degree or intensity of, or eliminating, pollution.

aboveground storage tank A fixed, stationary, or otherwise permanently installed storage tank that is wholly or partially above the ground surface and used to contain oil of any kind (petroleum, non-petroleum, synthetic, animal, or vegetable).

analyte A substance or chemical constituent undergoing analysis.

appraisal A documented activity performed according to written procedures and specified criteria to evaluate an organization's compliance and conformance with programs, standards, and other requirements contained in orders, laws, and regulations or in other requirements.

aquifer An underground geological formation, or a group of formations, containing water.

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.

aspect Any element of activities, products, or services that can interact with the environment.

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

B

benthic Of, relating to, or occurring in the depths of the ocean.

best management practice The preferred method or practice for managing operations.

biota The animal and plant life of a given region.

biotic Relating to or resulting from living organisms.

C

climate A description of an area's average weather conditions and the extent to which those conditions vary over long time intervals, generally decades or centuries.

contamination The introduction into water, air, or soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use. Also applies to the surfaces of objects, buildings, and various household use and agricultural use products.

corrective action (1) Steps taken to clean up spills. The process includes designing cleanup procedures to guide hazardous waste treatment, storage, and disposal. (2) An action identified to correct a problem or prevent its recurrence.

D

data quality objective A strategic, systematic process for planning scientific data-collection efforts.

decontamination The removal of adverse 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.

discharge Any liquid or solid that flows or is placed onto any land or into any water. This includes precipitation discharges to storm drains, accidental or intentional spilling, and leaking, pumping, pouring, emitting, emptying, or dumping any material or substance onto any land or into any water.

E

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

ecosystem A network of living organisms (e.g., humans, animals, plants, and fungi) and nonliving components (e.g., air, water, mineral soil, buildings, and roads) that interact to comprise an overall environment.

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

environment The sum of all external conditions affecting an organism's life, development, and survival.

environmental assessment An environmental analysis prepared pursuant to 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 NEPA for major projects or legislative proposals that significantly affect the environment. A tool for decision-making, it describes an undertaking's positive and negative effects and cites alternative actions.

environmental management A program designed to maintain compliance with federal, state, and local requirements.

environmental management system A continuing cycle of planning, evaluating, implementing, and improving processes and actions undertaken to achieve environmental goals.

environmental monitoring The collection and analysis of samples or direct measurements of environmental media such as air, water, and soil.

environmental release Any spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping, leaching, dumping, or disposing of material into the environment, which may include (but is not limited to) soil, air, and drain systems.

Environmental Restoration A project chartered with assessing and, if necessary, remediating inactive waste sites.

environmental restoration site Any location on the environmental restoration site list that has been identified as an area that is (or may be) contaminated—either on or beneath the land surface—as a result of operations. Contaminants may be chemicals, radioactive material, or both.

environmental surveillance A program that includes soil and vegetation surveys, water sampling, and analysis in an attempt to identify and quantify long-term effects of pollutants resulting from operations.

environment, safety, and health program A program designed to protect and preserve the environment and to ensure the safety and health of an organization's employees, contractors, visitors, and the public.

exotic species A species, which may be invasive or noninvasive, that is not native to the environment.

F

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

forb An herbaceous flowering plant that is not a grass.

fungicide An agent that destroys fungi or inhibits their growth.

G

geology The scientific study of the Earth's origin, history, and structure.

greenhouse gas emission An air pollutant comprised of an aggregate group of six greenhouse gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride measured as carbon dioxide equivalent.

groundwater The water found beneath the earth's surface in pore spaces and in fractures of rock formations.

H

habitat The place or environment where a plant or animal naturally or normally lives and grows.

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

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

I

impact Any change in the environment, whether adverse or beneficial, wholly or partially resulting from activities, products, or services.

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

integrated safety management system A set of guidelines that 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.

L

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

M

migratory birds All birds listed within the Migratory Bird Treaty Act, 50 CFR 10.13, or which are a mutation or hybrid of any such species, including any part, nest, or egg.

Mixed Analyte Performance Evaluation

Program A DOE quality assurance tool for environmental analytical services. It includes radiological, stable inorganic, and organic constituents (i.e., mixed analytes) in the same single-blind sample for analytical performance evaluation. The samples use various matrices, including soils, water, vegetation, and air filters. Program samples are not a mixed waste.

mixed waste Waste that contains both hazardous waste (as defined by RCRA and its amendments) and radioactive waste (as defined by the Atomic Energy Act and its amendments).

moku A land division that sections off portions of a Hawai'ian island.

N

National Environmental Policy Act The basic national charter for protecting the environment. It establishes policy, sets goals, and provides the means for carrying out the act.

natural resource A resource (actual or potential) supplied by nature.

O

occurrence Events or conditions that adversely affect, or may adversely affect, DOE (including the National Nuclear Security Administration) or contractor personnel, the public, property, the environment, or the DOE mission.

outfall The place where effluent is discharged into receiving waters.

P

pelagic Of, relating to, or living or occurring in the open sea.

pollutant Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

polychlorinated biphenyl A family of highly toxic organic chlorine compounds. Because of their persistence, toxicity, and ecological damage via water pollution, the manufacture of PCBs was discontinued in the United States in 1976.

potable water Water free from impurities present in quantities that are sufficient to cause disease or harmful physiological effects.

Q

quality assurance A system of procedures, checks, audits, and corrective actions to ensure that research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

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

R

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

reportable quantity A quantity of material, product compound, or contaminant that is reportable to a regulatory agency when released to the environment.

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

ruderal The plant species that are first to colonize a disturbed area.

S

Sample Management Office A Sandia office where personnel manage environmental analytical laboratory contracts and assist with processing and tracking samples undergoing chemical and radiochemical analyses performed at these laboratories.

sampling and analysis plan A plan that contains criteria required for conducting sampling activities.

sediment Transported and deposited particles or aggregates derived from rocks, soil, or biological material.

soil All loose, unconsolidated mineral or organic materials on the immediate surface of the earth that support plant growth.

solid waste (1) Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility. (2) Any discarded material—including solid, liquid, semisolid, or contained gaseous material—resulting from industrial, commercial, mining, or agricultural operations or from community activities.

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

surface water Water that has not penetrated much below the surface of the ground.

sustainability Those actions taken to maximize energy and water efficiency; minimize chemical toxicity and harmful environmental releases, particularly greenhouse gas; promote renewable and other clean energy development; and conserve natural resources while sustaining assigned mission activities.

T

threatened or endangered species A species present in such small numbers that it is at risk of extinction.

toxic chemical Any chemical listed in EPA regulations under "Emergency Planning and Community Right-to-Know Act of 1986—Section 313: Guidance for Reporting Toxic Chemicals."

U

underground storage tank A storage tank installed completely below the ground surface, covered with earth, and used to contain oil of any kind (petroleum, non-petroleum, synthetic, animal, or vegetable).

V

vegetation Plant life or the total plant cover of an area.

W

waste management A method for dealing with the waste from humans and organisms, including minimizing, handling, processing, storing, recycling, transporting, and final disposal.

wastewater The spent or used water from a home, community, farm, or industry.

water pollution The presence in water of enough harmful or objectionable material to damage the water's quality.

watershed A region or area bounded peripherally by a divide and draining ultimately to a particular watercourse or body of water.

wetland An area that is saturated by surface water or groundwater, having vegetation adapted for life under those soil conditions, such as swamps, bogs, fens, marshes, and estuaries.

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Kaua'i ocean view

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