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NEW MEXICO ANNUAL SITE ENVIRONMENTAL REPORT

2021

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

2021 Annual Site Environmental Report
for
Sandia National Laboratories, New Mexico

Prepared by
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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 Sandia National Laboratories, New Mexico. Activities at the site support research and development programs with a wide variety of national security missions, resulting in technologies for nonproliferation, homeland security, energy and infrastructure, and defense systems and assessments.

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 and monitoring programs in place at Sandia National Laboratories, New Mexico, during calendar year 2021. Environmental topics include air quality, ecology, environmental restoration, oil storage, site sustainability, terrestrial surveillance, waste management, water quality, 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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Note to the Reader

This Annual Site Environmental Report for Sandia National Laboratories, New Mexico, 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 a commitment to protect our nation's valuable resources. With the goal of continually improving the quality of the contents of this annual report and including information that is important to you, you are invited to provide feedback, comments, or questions to:

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The Sandia National Laboratories, New Mexico, Annual Site Environmental Report can be found at the following website:
http://www.sandia.gov/news/publications/environmental/index.html

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Acronyms and Abbreviations

Term	Definition
A	
ABCWUA	Albuquerque Bernalillo County Water Utility Authority
AD	anno Domini
AIM	Assessment, Inventory, and Monitoring
B	
BC	before Christ
BSG	Burn Site Groundwater
C	
$CaCO_3$	calcium carbonate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFU	colony-forming unit
CGP	Construction General Permit
CINT	Center for Integrated Nanotechnologies
COVID-19	Coronavirus Disease 2019
D	
DE	data excluded
DOE	United States Department of Energy
DOECAP	DOE Consolidated Audit Program
DP	discharge permit
DU	duplicate sample
E	
EB	equipment blank
E. coli	*Escherichia coli*
EISA	Energy Independence and Security Act
EM	equipment malfunction
EPA	United States Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ES&H	Environment, Safety, and Health
F	
FDCCP	Fugitive Dust Control Construction Permit
FFCA	Federal Facility Compliance Act
FFCO	Federal Facility Compliance Order
H	
HDRV	Historical Disposal Requests Validation
HMX	high melting explosive
HSWA	Hazardous and Solid Waste Amendment
I	
ISO	International Organization for Standardization

Term	Definition
K	
KAFB	Kirtland Air Force Base
L	
Lc	critical level
M	
MAPS	Monitoring Avian Productivity and Survivorship
MCL	maximum contaminant level
MDA	minimal detectable activity or minimum measured activity
MDL	method detection limit
MPN	most probable number
MS4	Municipal Separate Storm Sewer System
MSGP	Multi-Sector General Permit
N	
N	nitrogen
NA	not available
N/A	not applicable
ND	not detected
NE	not established
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSA	New Mexico Statutes Annotated
NPDES	National Pollutant Discharge Elimination System
NTESS	National Technology & Engineering Solutions of Sandia, LLC
NTU	nephelometric turbidity unit
P	
P	phosphorus
PCB	polychlorinated biphenyl
PFAS	polyfluoroalkyl substance
pH	potential of hydrogen
PL	Public Law
$PM_{2.5}$	particulate matter that has a diameter equal to or less than 2.5 microns
PM_{10}	particulate matter that has a diameter equal to or less than 10 microns
PQL	practical quantitation limit
PSTB	Petroleum Storage Tank Bureau

Term	Definition
R	
RCRA	Resource Conservation and Recovery Act
S	
SA	sample
Sandia	Sandia National Laboratories
SARA	Superfund Amendments and Reauthorization Act
SC Dome	Scale Compatibility Dome
SGCN	Species of Greatest Conservation Need
SNL/NM	Sandia National Laboratories, New Mexico
sp.	unknown species, singular
spp.	unknown species, plural
ssp.	subspecies
SU	standard unit
SWSP	stormwater sampling point

Term	Definition
T	
TA-I	Technical Area I
TA-II	Technical Area II
TA-III	Technical Area III
TA-IV	Technical Area IV
TA-V	Technical Area V
TAG	Tijeras Arroyo Groundwater
TAVG	Technical Area V Groundwater
TCLP	toxicity characteristic leaching procedure
U	
U.S.	United States

Units of Measure

Unit	Definition
°C	degree Celsius
°F	degrees Fahrenheit
Btu	British thermal unit
CFU/100 mL	colony forming units per 100 milliliters
Ci	curie
Ci/year	curies per year
cm	centimeter
g	gram
kV	kilovolt
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
µm	micrometer
µmhos/cm	micromhos per centimeter
m	meter
m^3	cubic meter
mb	millibar

Unit	Definition
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/sa	milligrams per sample
mL	milliliter
mm	millimeter
mrem	millirem
mrem/year	millirems per year
m/sec	meters per second
ng/g	nanograms per gram
ng/L	nanograms per liter
pCi/g	picocuries per gram
pCi/L	picocuries per liter
pCi/m^3	picocuries per cubic meter
pCi/sa	picocuries per sample
person-rem	person-roentgen equivalent, man
person-rem/year	person-roentgen equivalent, man per year
pg/L	picogram per liter

Data 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.
X	The data was rejected due to the peak not meeting identification criteria.

Data Validation Qualifier

Term	Definition
BD	The associated value was below the detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	The associated numerical value was an estimated quantity.
J-	The associated numerical value was an estimated quantity with a suspected negative base.
None	There was no data validation for corrected gross alpha activity.
R	The data are unusable and rejected (compound may or may not be present).
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

Sandia National Laboratories, New Mexico

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, New Mexico (SNL/NM) during calendar year 2021.

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 structured 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, Sandia's Environmental Management System is ISO 14001:2015 certified. SNL/NM personnel follow the system's requirements, as verified by an internal assessment in 2021. This environmental management system is Sandia's primary platform for implementing the environmental management programs that help achieve annual site sustainability goals.

Site Sustainability

A site sustainability plan is prepared annually and identifies contributions toward meeting DOE sustainability goals and the broader sustainability program set forth in EO 14008, *Tackling the Climate*

Crisis at Home and Abroad. Sandia's most recent plan, *Fiscal Year 2022 Site Sustainability Plan*, describes the performance status for fiscal year 2021.

Environmental Performance

DOE assesses environmental performance through the collection of data, measures, and indicators and then reports on this as part of an overall performance evaluation. During the most recent evaluation, Sandia earned an overall rating of very good.

Environmental Programs

Air Quality Compliance Program. Program personnel support compliance with air quality regulations, permits, and other requirements.. Sandia activities resulting in greenhouse gas emissions were below federal regulatory reporting thresholds. In April 2021, the Albuquerque-Bernalillo County Air Quality Program issued a post-inspection notification based on an April 1, 2021, inspection for failing to obtain a fugitive dust control permit prior to construction activities on the Chilled Water Loop project in Technical Area IV. A notice of violation was issued in December 2021.

Ambient Air Surveillance Program. Ambient air quality is monitored for particulate matter and analyzed for metals and radiological constituents.

Chemical Information System. In 2021, chemical containers were tracked along with information about any related chemical hazards.

Cultural Resource Management Program. Program personnel review and document potential impacts on archaeological sites and historic properties. In 2021, 17 archaeological surveys were conducted; no cultural resources were affected by ongoing or proposed activities. Sandia personnel coordinated with DOE for consulion with both the New Mexico State Historic Preservation Office and the Pueblo of Isleta regarding the visual effect of a proposed new facility. The New Mexico State Historic Preservation Office concurred that the proposed facility would cause no adverse effect; concurrence from the Pueblo of Isleta is pending.

In addition to the proposed new facility, historic building assessments for 49 actions at 53 facilities resulted in multiple consultations with the New Mexico State Historic Preservation Office. Consultation on the proposed demolition of four facilities is pending.

Ecology Program. Biota is monitored as an element of the overall environmental monitoring process for compliance with wildlife regulations and laws and to support land use decisions. Ecological and wildlife awareness campaigns are conducted to ensure safe work environments and sustainable decision-making strategies. In 2021, Ecology Program activities resumed to near-normal levels after being on hold the previous year because of COVID-19 restrictions.

Environmental Education Outreach. Program personnel interact with the community through various events and information campaigns. This interaction results in a beneficial exchange of information.

Environmental Release Response and Reporting Program. Program personnel are contacted in the event of an accidental spill or any type of release to the environment. In 2021, no releases to the environment met the criteria for reporting to the New Mexico Environment Department or the U.S. Environmental Protection Agency (EPA). No releases met the criteria of a DOE-reportable occurrence.

Environmental Restoration Operations. Sandia personnel manage sites impacted by past spill, release, or disposal activities. In 2021, six sites continued to require corrective action, including three groundwater areas of concern and three active test facilities.

Long-Term Stewardship Program. Legacy sites continue to be managed. In 2021, post-closure care activities were conducted at two permitted units, and long-term monitoring and maintenance activities were conducted at numerous solid waste management units and groundwater areas of concern. An application to renew the Chemical Waste Landfill Post-Closure Care Permit was submitted in December 2020.

Materials Sustainability and Pollution Prevention Programs. Measures are implemented to reduce resource use and waste generation. In 2021, the composting program was expanded to include Technical Area I and Technical Area IV, which required the deployment of over 450 additional compost bins. In 2021, less waste was generated, but this was due to COVID-19 restrictions and numerous personnel telecommuting.

Meteorology Program. Meteorological monitoring is conducted through a network of meteorological observation towers located across Kirtland Air Force Base. Program personnel provide services, data, and analyses to support project planning decisions.

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. In 2021, 410 proposed projects were reviewed, and the environmental impacts, if any,were documented. An additional 500 maintenance activities were reviewed through the Routine Maintenance Criteria SharePoint site.

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 2021, the inventory of oil storage containers operating under the *Sandia National Laboratories Spill Prevention, Control, and Countermeasure Plan* included 45 stationary aboveground storage tanks and 2 underground storage tanks. Additional oil storage capacity in 55-gallon drums, mobile and portable containers, mobile refuelers, and oil-filled operational equipment exists throughout the site.

Quality Assurance. All environmental monitoring is 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.

Radionuclide National Emission Standards for Hazardous Air Pollutants. Radionuclide air emissions from Sandia facilities are reported each year. In 2021, the primary radionuclides released from Sandia facilities were argon-41 and tritium. Calculated doses were well below the 10 mrem/year dose limit set by the EPA and DOE.

Safe Drinking Water Protection Program. Drinking water is supplied by the Kirtland Air Force Base-owned system. Sandia personnel adhere to New Mexico Environment Department regulations when operating and maintaining the drinking water system. In 2021, Safe Drinking Water Protection Program personnel coordinated with Kirtland Air Force Base to support compliance activities.

Stormwater Program. Three EPA National Pollutant Discharge Elimination System permits are maintained, and compliance activities are conducted. During 2021, monthly compliance inspections were conducted at approximately 35 construction and industrial sites, and water quality sampling was conducted at approximately 20 locations. In April 2021, stormwater personnel self-reported to the EPA that a stormwater construction general permit had not been obtained for the Chilled Water

Loop project in Technical Area IV before work started. Work at the site was paused until a permit was received from the EPA. No fine or violation was issued.

Surface Discharge Program. All planned water-based discharges to the ground surface are reviewed to comply with regulations. In 2021, 28 individual discharge requests for New Mexico met applicable standards and were approved. Approved releases complied with New Mexico Environment Department applicable requirements. Sandia personnel continue to operate the two evaporative lagoons through Discharge Permit 530 issued by the New Mexico Environment Department Ground Water Quality Bureau.

Terrestrial Surveillance Program. Surveillance activities are conducted at on-site and off-site locations; soil, sediment, and vegetation are sampled for various parameters. In 2021, sampling event results were within historical ranges. Environmental dosimeters used to measure the dose from ambient gamma radiation indicated levels within natural background values.

Waste Management Program. Solid and hazardous wastes are collected and managed (i.e., stored, treated, and packaged for shipment to off-site permitted facilities). In 2021, two no-notice hazardous waste compliance evaluation inspections were performed, one in May and one in December. The results and findings of the May 2021 inspection, including a notice of violation, were received in August 2021. The notice of violation was a DOE-reportable occurrence. The results and findings of the December 2021 inspection are pending.

Wastewater Discharge Program. Wastewater is discharged from six permitted on-site outfalls. In 2021, wastewater was monitored, and two permit-mandated split samplings were conducted with the Albuquerque Bernalillo County Water Utility Authority. All routine monitoring and split sampling events met the standards set by the Albuquerque Bernalillo County Water Utility Authority Sewer Use and Wastewater Control Ordinance requirements.

Chapter 1. Introduction

Greater roadrunner (*Geococcyx californianus*)

OVERVIEW ■ Sandia National Laboratories, located on Kirtland Air Force Base in Albuquerque, New Mexico, was designated a national laboratory in 1979. Operating for the National Nuclear Security Administration, the core mission is to provide science and engineering support for the nation's nuclear weapons stockpile. In addition, Sandia personnel collaborate with government agencies, the industrial sector, and universities to develop and commercialize new technologies.

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*. This report describes the environmental protection programs currently in place at Sandia National Laboratories, New Mexico (SNL/NM). This report is made available to the public in electronic form at Sandia Environmental Reports.

Sandia National Laboratories, hereinafter referred to as Sandia with the exception of when using an acronym to represent the facility location (SNL/NM), 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. The DOE National Nuclear Security Administration Sandia Field Office administers the contract and oversees contractor operations. Building on its original nuclear weapons mission, Sandia research and development programs support a wide variety of national security missions, resulting in technologies for nonproliferation, homeland security, energy and infrastructure, and defense systems and assessments.

While all 2021 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, and by maintaining core competencies in missions of national significance. Our principal mission is to deliver on commitments to 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.

1.2 History

Sandia operations began in 1945 as Z Division, the ordnance design, testing, and assembly arm of Los Alamos Scientific Laboratory (now Los Alamos National Laboratory). The division moved to Sandia Base (now merged into Kirtland Air Force Base [KAFB]), located on the perimeter of Albuquerque, to be near an airfield and to work closely with the military. In 1948, Z Division became a separate branch of the Los Alamos Scientific Laboratory and was renamed Sandia Laboratory. 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 management and operating contractor changed its name to NTESS. For more details, see Chapter 8.

At the end of fiscal year 2021, the Sandia workforce at all sites totaled approximately 14,922 employees and contractors.

Sandia recognized as a national laboratory

1.3 Location Description

Figure 1-1 shows the KAFB boundary, its land designations, and the agencies that operate within those boundaries. Located at the foot of the Manzanita Mountains, KAFB is a military installation that spans 51,559 acres, including 20,486 acres that are withdrawn land (withheld from the public domain) from the Cibola National Forest through an agreement with the U.S. Forest Service (DOE 1999). More than 450 federal government and private sector tenants and associated units operate on KAFB (U.S. Air Force 2012). KAFB and SNL/NM are adjacent to Albuquerque, which borders KAFB on the base's north, northeast, west, and southwest boundaries. The Albuquerque International Sunport (airport) and Mesa del Sol—a 12,800-acre mixed-use urban area under development—are west of KAFB. Isleta Pueblo is south of the KAFB boundary.

Sandia conducts operations on DOE-owned property, non-DOE-owned property contracted from other federal and state agencies, and privately owned leased property. Sandia sites located on DOE-owned property comprise 2,938 acres and include five technical areas (DOE 1999). At non-DOE-owned property, Sandia personnel conduct operations on 5,637 acres of land permitted from the U.S. Air Force, a portion of which are on land withdrawn by the U.S. Forest Service (SNL/NM 2006). DOE leases approximately 2,750 acres from the New Mexico State Land Office (La Semilla Buffer Zone) west of the KAFB boundary. This area serves as a margin of safety and a sound buffer for testing operations. In addition, Sandia personnel conduct operations at off-site leased facilities. There are approximately 6.54 million gross square feet of existing facilities at SNL/NM (SNL/NM 2021a).

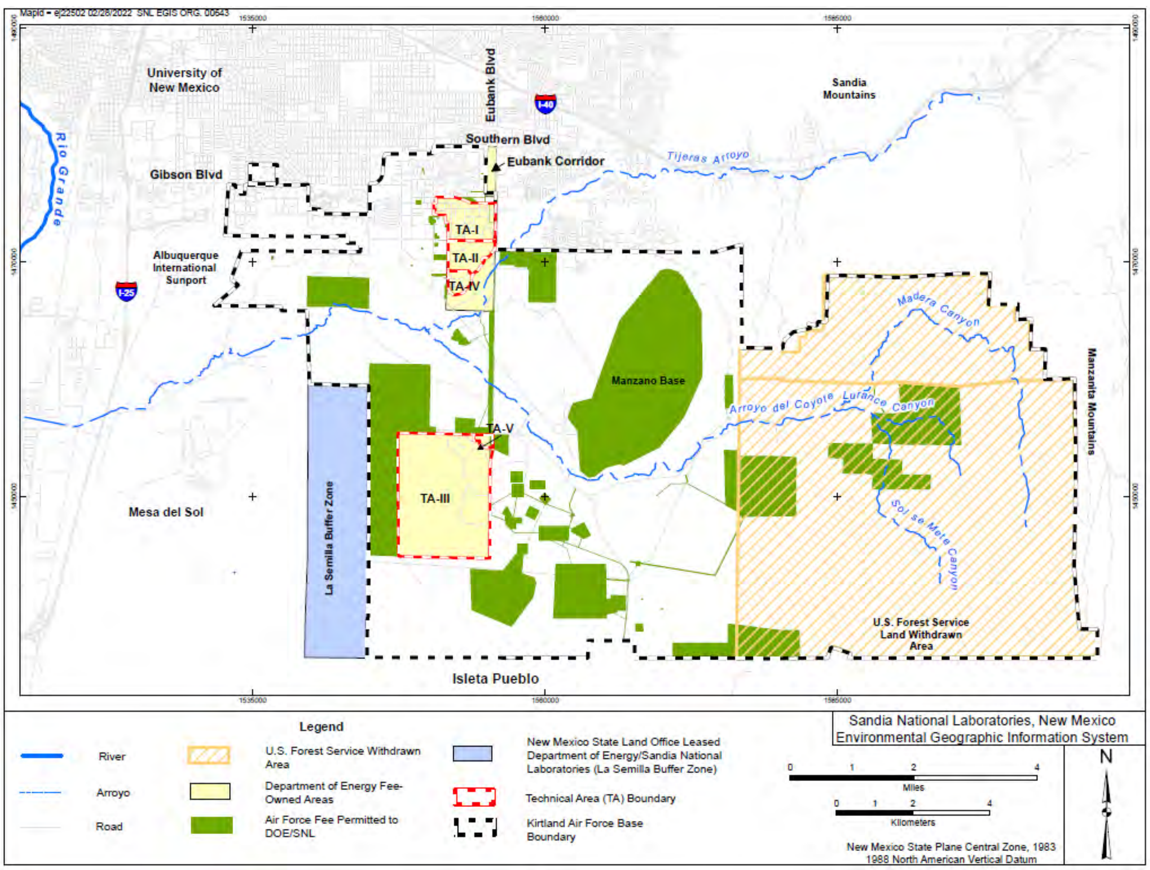


Figure 1-1. SNL/NM location, including technical areas and permitted areas

1.4 Demographics

New Mexico is the fifth-largest state in the United States, encompassing approximately 121,000 square miles. New Mexico's 2021 population was 2,115,877 (U.S. Census Bureau 2021). Albuquerque is the largest city in the state, with an estimated population of 562,559 in 2021 (U.S. Census Bureau 2021). The estimated metropolitan area population within a 50-mile radius of Albuquerque (Figure 1-2) was 1,073,460 in 2021 (StatsAmerica 2021).

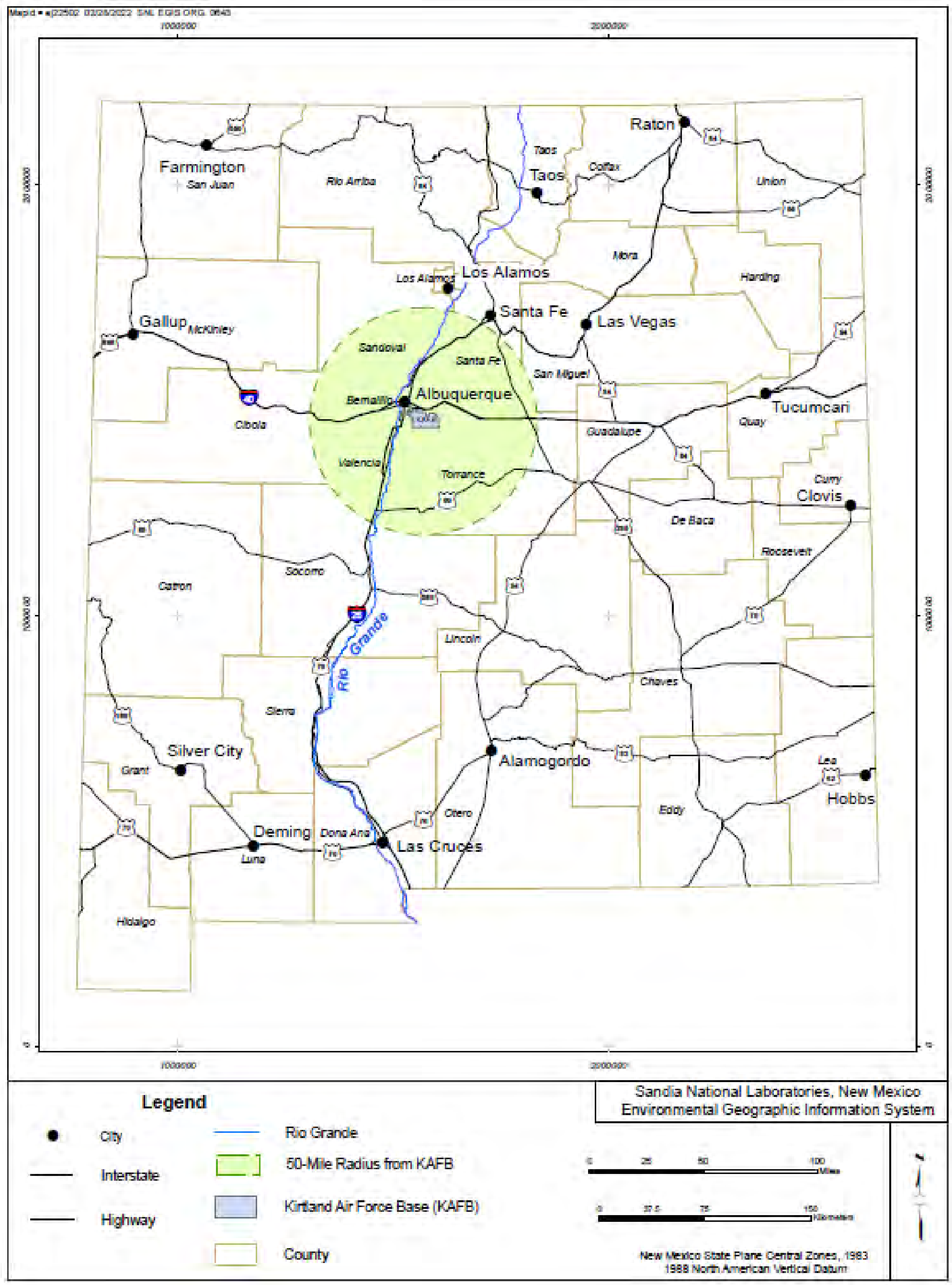


Figure 1-2. State of New Mexico, including counties

1.5 Activities and Facilities

SNL/NM consists of five secured technical areas: Technical Area I (TA-I), Technical Area II (TA-II), Technical Area III (TA-III), Technical Area IV (TA-IV), and Technical Area V (TA-V); buildings and structures in unsecured leased areas; and several remote testing areas (Figure 1-1).

1.5.1 The Technical Areas

TA-I is located in the northern portion of KAFB, and operations there include the main administrative center and numerous laboratories and offices. A majority of activities performed in TA-I are dedicated to weapon design, research and development on weapon systems, limited production of weapon systems components, technology transfer, high-performance computing, and energy research programs. Facilities in TA-I include several assembly and manufacturing areas; environmental test facilities; and various laboratories, such as the Ion Beam Laboratory, the Advanced Manufacturing Processes Laboratory, the Neutron Generator Facility, the Processing and Environmental Technology Laboratory, the Joint Computational Engineering Laboratory, the Sandia Tomography and Radionuclide Transport Laboratory, and the Microsystems and Engineering Sciences Applications Complex.

TA-II, located south of TA-I, includes both technical facilities and infrastructure support. Buildings include the Explosives Components Facility, the Hazardous Waste Handling Unit, the Solid Waste Collection and Recycling Center, the Construction and Demolition Recycle Center, and the National Infrastructure Simulation and Analysis Center.

TA-III, located in the south-central part of KAFB, is the largest and most remote of the technical areas. There are large outdoor test areas as well as facilities that can accommodate indoor testing. The area is used for engineering test activities that require large-scale safety and/or security buffers, (e.g., collision-testing sled tracks, centrifuges, vibration test facilities, and impact test complexes). A few of the outdoor test areas include the Rocket Sled Test Facility, the Water Impact/Drop Tower Complex, and the Terminal Ballistics Facility. A few of the indoor test facilities include the Centrifuge Facility, the Mechanical Shock Facility, and the Thermal Test Complex. The Radioactive and Mixed Waste Management Unit is in the southern portion of TA-III. The Mixed Waste Landfill, the Chemical Waste Landfill, and the Corrective Action Management Unit are also located in TA-III.

TA-IV, located south of TA-II, includes facilities used to conduct research and development activities in inertial confinement fusion, pulsed power, and nuclear particle acceleration. Accelerators located in TA-IV include the Z Machine, the Radiographic Integrated Test Stand, the High-Energy Radiation Megavolt Electron Source III, the Saturn Accelerator, and the Short-Pulse High Intensity Nanosecond X-Radiator.

TA-V, located adjacent to the northeast portion of TA-III, includes facilities that routinely handle radioactive materials used in experimental research and development programs. Capabilities include reactor technology, radiation transport techniques, radiation damage on materials, and radiation vulnerability assessments. Some of the facilities in TA-V include the Gamma Irradiation Facility, the Annular Core Research Reactor, the Sandia Pulsed Reactor/Critical Experiments, and the Auxiliary Hot Cell Unit.

1.5.2 Other Facilities and Areas

Several remote test areas are located east and southeast of TA-III within the canyons and foothills of the U.S. Forest Service withdrawn area—Arroyo del Coyote, Lurance Canyon, Madera Canyon, and Sol se Mete Canyon—on the west side of the Manzano Mountains (Figure 1-1). The remote test areas are known collectively as Coyote Test Field. These areas are used for environmental and developmental testing, including explosive ordnance testing, impact testing, rocket firing experiments, and open-burn thermal testing.

Sandia personnel operate several facilities on a combination of properties leased or owned by DOE outside the boundaries of KAFB. The Center for Integrated Nanotechnologies; the Microsystems Engineering, Sciences and Applications Complex; the International Programs Office; the Innovation Parkway Office Center; and the National Museum of Nuclear Science and History are all located on Eubank Boulevard Southeast within one mile of KAFB. There are also off-site projects, including the Advanced Materials Laboratory at the University of New Mexico, the North Slope Sites in Alaska, and the Weapons Evaluation Test Laboratory at the Pantex Plant in Texas.

1.6 Environmental Setting

SNL/NM is located in the high desert region of central New Mexico. The mountains on the east and the plateaus on the west create a diverse range of geological, hydrological, ecological, and climatic settings. A maximum elevation of 7,986 feet occurs on the eastern edges of KAFB; the mean elevation is 5,384 feet.

The most prominent topographic feature in the Albuquerque area is the Sandia Mountains, which are east of the city. The Sandia Mountains form a 13-mile-long escarpment distinguished by steep cliffs, pinnacles, and narrow canyons; the tallest point is Sandia Crest at 10,678 feet. The Sandia Mountains are divided from the Manzanita Mountains to the south by Tijeras Canyon (Figure 1-1).

Tijeras Arroyo, a major topographic feature, is situated diagonally northeast to southwest on KAFB. The watershed drained by Tijeras Arroyo includes the southern Sandia Mountains, the Manzanita Mountains, and the north end of the Manzano Mountains. The arroyo is normally dry except during heavy downpours, which can cause flash floods. The arroyo originates in Tijeras Canyon and runs coincident with the Tijeras Fault for several miles before deviating to the southwest; it discharges to the Rio Grande approximately six miles from the western boundary of KAFB.

1.6.1 Geology and Hydrology

SNL/NM and KAFB are situated in a geologic setting that was subjected to relatively recent episodes of basaltic volcanism and ongoing regional rifting (i.e., crustal extension). The Rio Grande Rift formed a series of connected, down-dropped basins filled with sedimentary deposits. The Rio Grande Rift extends for about 450 miles from Leadville, Colorado, into New Mexico; Albuquerque and KAFB are within this rift valley.

The Albuquerque Basin, a major structural feature, is approximately 30 miles wide and 100 miles long.

The Albuquerque Basin is a major structural feature and is one of several north–south-trending sediment-filled basins formed by the Rio Grande Rift. The Albuquerque Basin is approximately 30 miles wide, 100 miles long, and 3,000 square miles in area (Grant 1982). On the east, uplifted fault blocks manifested by the Sandia, Manzanita, and Manzano mountains bound the basin. The western side of the basin is bound by the Lucero Uplift to the south and by the Rio Puerco Fault Belt and the Nacimiento Uplift at the northern end. There is major structural relief but relatively little topographic relief along the Rio Puerco Fault Belt on the northwestern side of the basin. The Albuquerque Basin is drained to the south through the Rio Puerco and the Rio Grande.

Several faults run through KAFB (Figure 1-3). The Tijeras Fault, which has been traced as far north as Madrid, New Mexico, trends southwesterly through Tijeras Canyon and across KAFB. The Tijeras

Fault is a strike-slip fault on which movement is horizontal and parallel to the strike of the fault. Early movement along the Tijeras Fault can be traced to the late Precambrian period, 570 million years ago, and traces of the fault 20 miles northeast of KAFB have been active as recently as the late Pleistocene epoch, 12,000 years ago. The system of minor faults associated with the Tijeras Fault on KAFB is collectively referred to as the Tijeras Fault Complex. The Tijeras Fault Complex marks a distinct boundary between the Precambrian and Paleozoic bedrock geology on the east and the Tertiary and Quaternary sediment-filled basin to the west. This geologic boundary also forms a boundary between the two major groundwater regimes at KAFB.

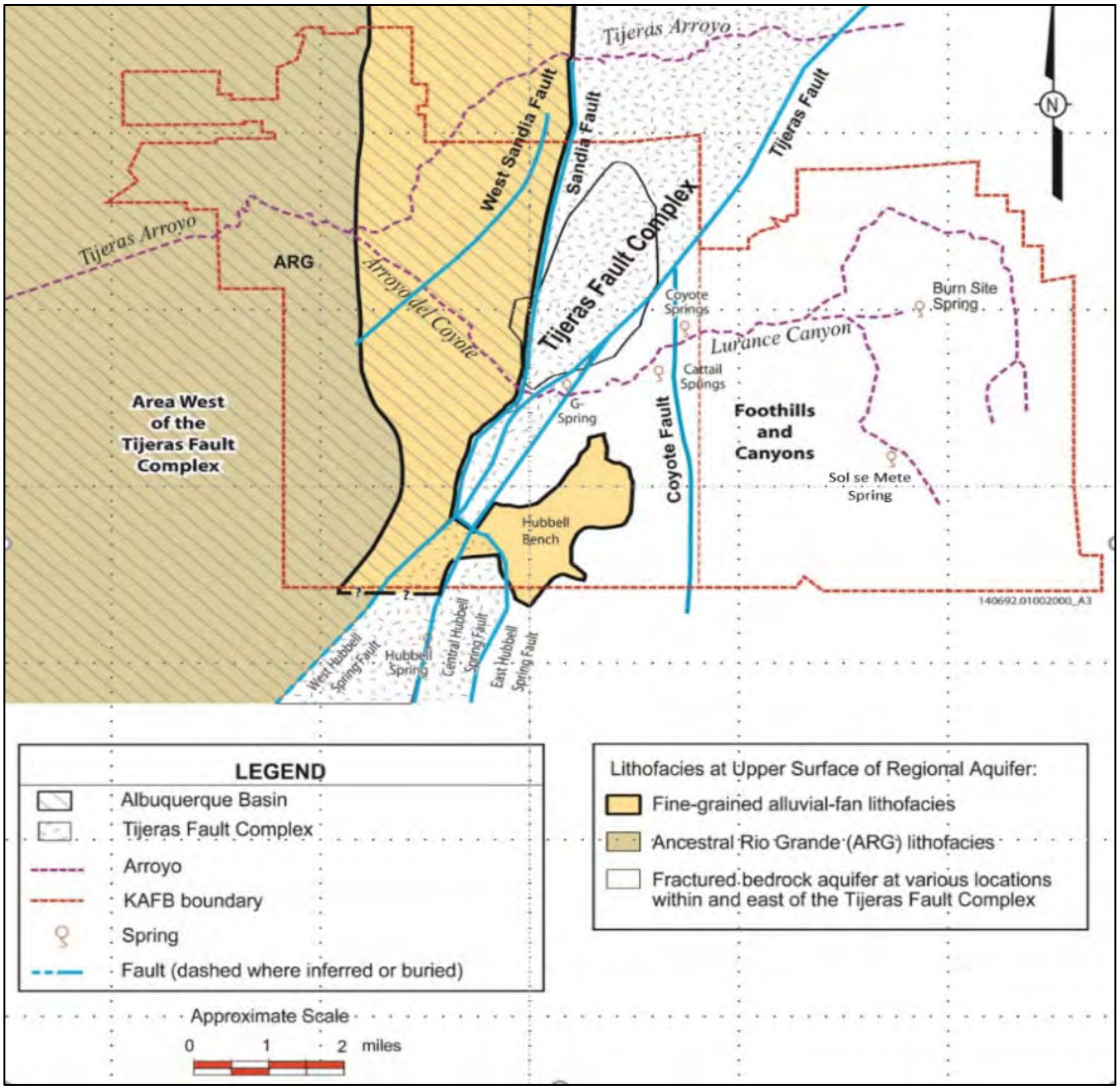


Figure 1-3. Faults and hydrogeologically distinct areas

The Sandia Fault establishes the eastern boundary of the Albuquerque Basin on KAFB. The up-thrown side of the fault is manifested as the Sandia and Manzanita mountains. The total vertical structural offset is on the order of 4.3 miles. South of KAFB, the basin's eastern boundary is the Hubbell Spring Fault. The Sandia Fault and Hubbell Spring Fault systems are north-trending, down-to-the-west, en echelon normal faults, which formed in the mid to late Tertiary Period (25 million years and younger) (Lozinsky and Tedford 1991; Woodward 1982). The Sandia Fault converges with the Tijeras Fault and the Hubbell Spring Fault in the region of KAFB, identified as the Tijeras Fault Complex.

Surface Water

There are three separate watersheds located within portions of KAFB and SNL/NM:

- Tijeras Arroyo watershed
- Unnamed closed basin
- Hubbell Spring watershed

The Tijeras Arroyo watershed encompasses the northernmost portion of KAFB, including SNL/NM technical areas I, II, and IV, and Lurance Canyon. An unnamed closed basin encompasses the central portion of KAFB immediately south of the Tijeras Arroyo watershed along with SNL/NM TA-V, the majority of TA-III, and portions of Coyote Test Field to the east of TA-III. The Hubbell Spring watershed encompasses the southern portions of KAFB, including some portions of Coyote Test Field.

The primary surface water feature on KAFB and SNL/NM is the Tijeras Arroyo. The Tijeras Arroyo originates in the Manzano Mountains to the east of SNL/NM and flows through KAFB in a roughly northeast to southwest direction. The Tijeras Arroyo is a major tributary to the Rio Grande, which lies approximately six miles downstream and to the west of the KAFB boundary. The Tijeras Arroyo is an ephemeral stream, flowing only for short durations in response to rainfall and snowmelt.

There are no named or well-defined drainages in either the closed basin or Hubbell Spring Basin. Surface flow in these basins is limited to stormwater runoff as sheet flow or in small gullies. Any stormwater flows that leave the boundary of KAFB and SNL/NM in these basins travel to unnamed playa lakes located immediately west of KAFB. Under extreme precipitation conditions, it may be possible for flows in the Hubbell Spring Basin to overfill the playa lakes and discharge into Hells Canyon, a tributary to the Rio Grande that flows southwest from the southern boundary of KAFB.

Two perennial springs—Coyote Springs and Sol se Mete Spring—are located on KAFB. In addition, one perennial spring (Hubbell Spring) is located immediately south of the KAFB boundary on Isleta Pueblo. Numerous ephemeral springs occur in the foothills and in the eastern reach of Arroyo del Coyote. Surface water flows from these springs infiltrate a short distance from the springs and do not contribute flow to Tijeras Arroyo

Groundwater

The hydrogeological system at KAFB is divided into two areas separated by the Tijeras Fault Complex (Figure 1-3, modified from *Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report* [SNL/NM 1995]). To the east of the Tijeras Fault Complex, the hydrogeology is characterized by fractured and faulted bedrock covered by a thin layer of mostly dry alluvium. Depths to groundwater east of the Tijeras Fault Complex range from approximately 44 to 360 feet below ground surface. On the west side of the Tijeras Fault Complex, groundwater in the regional aquifer is contained in alluvial sediments, and depths to groundwater range from approximately 451 to 571 feet below ground surface.

A perched groundwater system overlies the regional aquifer in the north portion of KAFB. The system extends from TA-I south to the Tijeras Arroyo Golf Course. The western extent of the perched groundwater system lies between Wyoming Boulevard and the Albuquerque International Sunport's east–west runway. The eastern extent is just east of the KAFB landfill and may be bounded by the West Sandia Fault. The groundwater gradient within the perched groundwater system is to the southeast, and the depth to groundwater is approximately 269 feet below ground surface in the west and 350 feet below ground surface in the east. Groundwater recharge in the eastern portion of KAFB is primarily derived from precipitation on the mountain front and along the major arroyos; however, the amount of recharge occurring in the foothills and canyons is not well characterized.

The primary regional aquifer in the Albuquerque Basin is within the upper unit and, to a lesser degree, the middle unit of the Santa Fe Group Aquifer System. Albuquerque Bernalillo County Water Utility Authority (ABCWUA) water supply wells generally are located in the most productive portion of the aquifer on the east side of the Rio Grande. The highest-yield wells are screened in the sediments associated with Ancestral Rio Grande deposits (Figure 1-3). Prior to extensive urban development in the Albuquerque area beginning in the 1950s, regional groundwater in the KAFB area primarily flowed to the southwest. As a result of groundwater withdrawal, the local water table has dropped by as much as 141 feet (Thorn, McAda, and Kernodle 1993); however, in the last 10 to 15 years the water table has recovered as ABCWUA has transitioned to using the Rio Grande as a water source. Groundwater withdrawal from KAFB and ABCWUA wells at the north end of KAFB have created a trough-like depression in the water table, causing flow to be diverted northeast in the direction of the well fields.

Until recently, water levels declined nearly 1.5 feet per year, which was associated with long-term pumping of KAFB and ABCWUA production wells. However, since late 2008, hydrographs for regional aquifer wells in the northern part of KAFB show an increasing trend in groundwater elevations. Presumably, this is in response to ABCWUA transitioning to surface water withdrawals for potable water supplies and decreasing dependence on production wells immediately north of KAFB.

1.6.2 Ecology

An ecosystem is a network of living organisms and nonliving components that interact with one another to comprise an overall environment. The ecosystem at SNL/NM includes the interactions among many living components—such as humans, animals, insects, plants, and fungi—within several habitat types. Nonliving components within the ecosystem include air, water, mineral soil, buildings, structures, roads, and paved surfaces. The habitats in the SNL/NM ecosystem include grasslands, woodland, arroyo shrub, scattered piñon-juniper, and closed canopy piñon-juniper. This ecosystem is a dynamic entity that is impacted by external and internal factors. External factors include such influences as climate, time, topography, and biota. Internal factors include the introduction of non-native species to the ecosystem and human disturbance and interactions (through development) within the various habitats.

An *ecosystem* is 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.

The desert grasslands of New Mexico have been heavily disturbed during the last 150 years, with a steady transition of what was once extensive grassland into shrubland (Dick-Peddie, Moir, and Spellenberg 1996; McClaran and Van Devender 1997). SNL/NM and KAFB grasslands have been excluded from grazing since the 1940s. Prior to this time, the grasslands were affected by anthropogenic (i.e., human-based) activities. The extent and severity of alteration to the grasslands has not been well documented. Grasslands at SNL/NM and KAFB are found both within and outside the Sandia technical areas between elevations of 5,200 and 5,700 feet. The SNL/NM and KAFB grasslands, which can best be described as fragments of historic grasslands, are bordered by urban Albuquerque to the north and west, forest lands to the east, and cattle-grazing shrublands to the south. These grasslands provide necessary habitat to support many species of birds, reptiles, amphibians, and mammals.

SNL/NM and KAFB woodland areas rise to the east from the grassland areas. The woodlands are typical of those in central New Mexico, consisting almost entirely of piñon pine and juniper species mosaics, commonly referred to as piñon-juniper habitat. At the highest elevations of SNL/NM and KAFB-managed lands, scattered ponderosa pines are present in low numbers.

There are large tracts within the SNL/NM and KAFB area that are undeveloped, resulting in a considerable diversity of plant and animal communities. Table 1-1 lists some of the common species of birds, mammals, reptiles, amphibians, and plants that have been encountered on-site. Chapter 7 provides more information on the ecology of the area.

Table 1-1. Plants and animals commonly identified in various life zones across KAFB

Common Name	Scientific Name	Common Name	Scientific Name
Birds			
American kestrel	*Falco sparverius*	Ladder-backed woodpecker	*Picoides scalaris*
Black-chinned hummingbird	*Archilochus alexandri*	Loggerhead shrike	*Lanius ludovicianus*
Black-throated sparrow	*Amphispiza bilineata*	Northern mockingbird	*Mimus polyglottos*
Common raven	*Corvus corax*	Red-tailed hawk	*Buteo jamaicensis*
Dark-eyed junco	*Junco hyemalis*	Spotted towhee	*Pipilo maculatus*
Horned lark	*Eremophila alpestris*	Western kingbird	*Tyrannus verticalis*
House finch	*Haemorhous mexicanus*	Western meadowlark	*Sturnella neglecta*
Mammals			
American black bear	*Ursus americanus*	Deer mouse	*Peromyscus maniculatus*
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	Desert cottontail	*Sylvilagus audubonii*
Black-tailed jackrabbit	*Lepus californicus*	Gray fox	*Urocyon cinereoargenteus*
Bobcat	*Felis rufus*	Gunnison's prairie dog	*Cynomys gunnisoni*
Coyote	*Canis latrans*	Mule deer	*Odocoileus hemionus*
Reptiles and Amphibians			
Chihuahuan spotted whiptail	*Aspidoscelis exsanguis*	Great plains skink	*Eumeces obsoletus*
Desert side-blotched lizard	*Uta stansburiana*	Long-nosed snake	*Rhinocheilus lecontei*
Eastern collared lizard	*Crotaphytus collaris*	New Mexico spadefoot toad	*Spea multiplicata*
Gopher snake	*Pituophis catenifer*	New Mexico whiptail	*Aspidoscelis neomexicana*
Greater short-horned lizard	*Phrynosoma hernandesi*	Prairie rattlesnake	*Crotalus viridis*
Plants			
Apache plume	*Fallugia paradoxa*	New Mexico feathergrass	*Hesperostipa neomexicana*
Black grama	*Bouteloua eriopoda*	One-seed juniper	*Juniperus monosperma*
Blue grama	*Bouteloua gracilis*	Piñon pine	*Pinus edulis*
Bush muhly	*Muhlenbergia porteri*	Purple three-awn	*Aristida purpurea*
Intermediate yucca	*Yucca intermedia*	Ring muhly	*Muhlenbergia torreyi*
James' galleta	*Hilaria jamesii*	Shrub live oak	*Quercus turbinella*

1.6.3 Climate

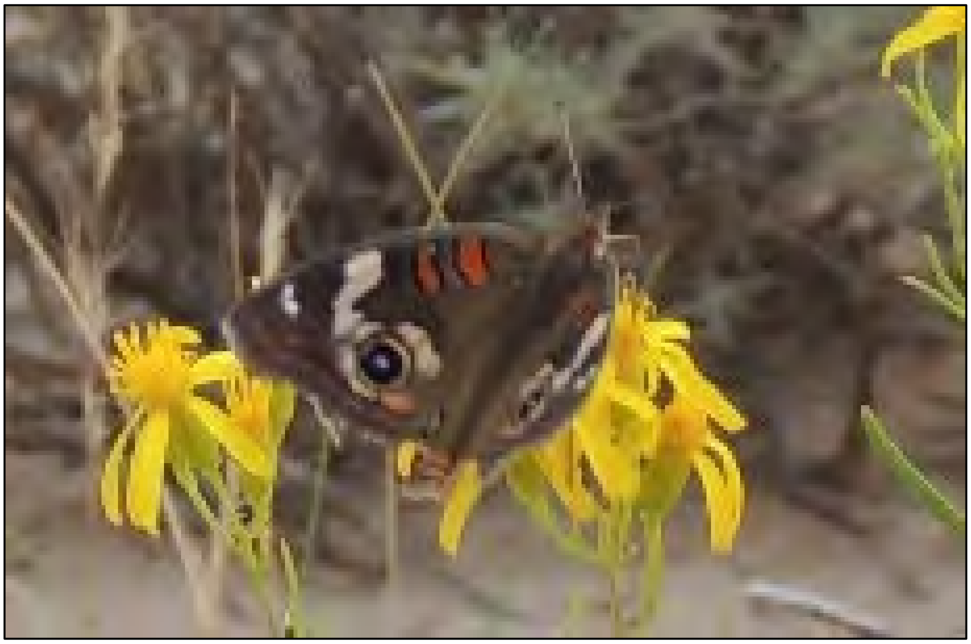
Large diurnal temperature ranges, summer monsoons, and frequent drying winds characterize the regional climate in the Albuquerque Basin and the Sandia, Manzanito, and Manzano mountains.

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

Precipitation varies across the region, with many locations in the higher elevations of the mountains receiving annual precipitation in the form of rainfall and snowfall greater than that of locations in the Albuquerque Basin. The winter season in the Albuquerque Basin and around SNL/NM is generally dry, with an average of less than 1.5 inches of precipitation falling between December and February. Most precipitation falls between July and October, mainly in the form of brief, heavy rain showers. According to the National Climatic Data Center, the average annual precipitation is approximately 8.84 inches at Albuquerque International Sunport (National Climatic Data Center 2020).

Site-specific meteorology is influenced by proximity to topographic features, such as mountains, canyons, and arroyos. These features influence local wind patterns across the site. Canyons and arroyos tend to channel or funnel wind, whereas mountains create upslope and downslope diurnal wind-flow patterns. Winds tend to blow toward the mountains or up the Rio Grande Valley during the day, and nocturnal winds tend to blow down the mountain toward the Rio Grande Valley. These topographically induced wind flows can be enhanced or negated by weather systems that move across the southwestern United States. The strongest winds occur in the spring when monthly wind speeds average 10 miles per hour and wind gusts commonly reach 50 miles per hour. Chapter 5 provides more information on meteorological conditions.

Chapter 2. Compliance Summary



Common buckeye (*Junonia coenia*)

OVERVIEW ■ Sandia operations 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 operations 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 reporting and permitting requirements. Permits and registrations in effect in 2021 are listed in Chapter 10.

All operations and activities, including those that are part of environmental programs, are performed under Sandia's Environment, Safety, and Health (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 is used to incorporate 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. 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 for continuous improvement.

2.1 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.

2.1.1 Federal Environmental 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 at Sandia are presented below along with compliance approaches and compliance activities.

Environmental Planning

National Environmental Policy Act of 1969

Requirement(s) and Compliance Approach	Compliance Activities
The National Environmental Policy Act (NEPA) of 1969 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) oversees NEPA implementation, principally through issuing guidance and interpreting regulations that implement NEPA procedural requirements. DOE codified its NEPA implementing procedures in 10 CFR 1021. Personnel use an online NEPA tool that generates a checklist intended to assess proposed actions and activities for potential environmental consequences and impacts. When projects or activities appear to be outside the scope of the *Final Site-Wide Environmental Impact Statement for Sandia National Laboratories/New* Mexico (DOE 1999), a NEPA checklist is prepared and forwarded to DOE for review and determination. Section 3.1 provides information on NEPA 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, Department Sustainability

Requirement(s) and Compliance Approach	Compliance Activities
DOE O 436.1, *Department Sustainability*, places environmental management systems and site sustainability at the forefront of environmental excellence. This order requires development of a Site Sustainability Plan for identification of 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 at SNL/NM (the primary operating location). This order also specifies requirements for compliance with Emergency Planning and Community Right-to-Know Act requirements. See "Chemical Management" and Table 2-2 for specifics on Sandia's approach to compliance with these requirements.	• Facilitate ISO 14001:2015 audits by a third-party registrar. • Follow the environmental management system requirements, including identification of the environmental aspects and impacts of activities. • Maintain an Environmental Management System and associated documentation. • Establish and implement an annual site sustainability plan. • Fulfill emergency planning and reporting requirements.

Hazardous Waste and Environmental Restoration

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

Requirement(s) and Compliance Approach	Compliance Activities
The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 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. DOE performed a preliminary assessment and site inspection in 1988. This inspection confirmed that no sites qualify for the National Priorities List. Therefore, with respect to inactive hazardous waste sites, there are no CERCLA remediation requirements nor CERCLA-related assessments for natural resource damages. The Superfund Amendments and Reauthorization Act (SARA) of 1986 establishes additional reporting requirements that are addressed under "Chemical Management."	• See "Chemical Management" and for compliance activities. • Administer and monitor solid waste management units (Chapter 3).

Federal Facility Compliance Act of 1992

Requirement(s) and Compliance Approach	Compliance Activities
Energy Independence and Security Act of 2007. Federal Facility Compliance Act of 1992 requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste, including full compliance with	• Maintain a site treatment plan (SNL/NM 2021d), including its inventory of wastes subject to the Federal Facility

Requirement(s) and Compliance Approach	Compliance Activities
the restrictions and prohibitions on extended storage of wastes that do not meet the applicable hazardous waste treatment standards. The Act further provides requirements for achieving compliance with the requirements of 40 CFR 268.50, *Prohibitions on Storage of Restricted Wastes*, for mixed waste. On October 4, 1995, the New Mexico Environment Department (NMED) issued a Federal Facility Compliance Order to DOE and the management and operating contractor for Sandia National Laboratories (NMED 1995). Section 3.5 provides information on Sandia's Waste Management Program.	Compliance Act and its schedule for processing the waste.

Resource Conservation and Recovery Act enacted in 1976, as amended

Requirement(s) and Compliance Approach	Compliance Activities
The Resource Conservation and Recovery Act (RCRA), enacted in 1976, as amended, sets forth the framework for managing hazardous solid waste, including the hazardous waste component of mixed waste. Wastes generated from activities and operations are collected and managed at several locations as described in Section 3.5. NMED, DOE, and the management and operating contractor for Sandia National Laboratories entered a Compliance Order on Consent in 2004 (NMED 2004). This Compliance Order on Consent requires corrective actions for releases of hazardous waste or hazardous constituents as well as for releases of nitrate and perchlorate from activities and operations. The Federal Facility Compliance Act amended RCRA (see "Federal Facility Compliance Act of 1992"). In addition, underground storage tank requirements were added as Subtitle I to RCRA in 1984 (see "Oil Pollution Act of 1990"). See Section 2.1.2 for state requirements for solid and hazardous management and Section 3.6 for environmental restoration activities.	• Operate hazardous and mixed waste management units under two permits issued by NMED. • Collect and screen material and waste in preparation for treatment and shipment to off-site facilities for recycling, storage, treatment, or disposal**.** • Conduct investigations and remediation for past releases of hazardous waste and hazardous constituents. • Adhere to closure and post-closure requirements for past releases of hazardous waste and hazardous constituents.

Radiation Protection

Atomic Energy Act of 1954

Requirement(s) and Compliance Approach	Compliance Activities
The Atomic Energy Act of 1954 specifies proper management of source, special nuclear, and by-product material. DOE has the authority to manage operations based on applicable statutes, federal regulations, and DOE directives. Sandia personnel achieve compliance through adherence to these directives and applicable regulations in 10 CFR 830, *Nuclear Safety Management*, and 10 CFR 835, *Occupational Radiation Protection*. The regulations include radiation protection standards,	• Manage materials and facilities in accordance with DOE requirements and oversight, including appropriate documentation. • Ensure that training requirements are met.

Requirement(s) and Compliance Approach	Compliance Activities
limits, and program requirements for protecting individuals from radiation exposure as a result of DOE activities.	

DOE O 435.1 Change 1, Radioactive Waste Management

Requirement(s) and Compliance Approach	Compliance Activities
This order ensures that all DOE radioactive waste is managed in a manner that is protective of worker and public health and safety, and of the environment. Personnel examine the lifecycle of radioactive waste, radioactive mixed waste, transuranic waste, and transuranic mixed waste before waste is generated to ensure appropriate management. DOE authorization is requested before generating radioactive waste streams with no identified disposal path. Information about the characteristics of each waste is used to manage the waste in a manner that is consistent with applicable law.	• Characterize and manage on-site waste. • Support inspections and audits. • Ensure that training requirements are met.

DOE O 458.1 Admin Change 4, Radiation Protection of the Public and the Environment

Requirement(s) and Compliance Approach	Compliance Activities
DOE O 458.1 Admin Change 4 (LtdChg), *Radiation Protection of the Public and the Environment*, 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. DOE issued a moratorium in January 2000 that prohibited the clearance of volume-contaminated metals, and subsequently in July 2000 suspended the clearance of metals from DOE radiological areas for recycling purposes. Chapters 3 through 7 provide information on relevant compliance, as indicated in the Compliance Activities column.	• Monitor emissions and provide dose assessments (Chapter 5). • Monitor radioactive releases to the sanitary sewer (Chapter 6). • Manage permitted radioactive waste units (Chapter 3). • Adhere to regulations during operation and maintenance of the drinking water system (Chapter 5). • Monitor groundwater (Chapter 3). • Monitor biota (Chapter 4 and Chapter 7). • Perform property clearances (during 2021, 230 personal property clearance surveys were processed, no metals subject to the moratorium or the suspension were cleared, and no real property was cleared).

Air Quality

Clean Air Act of 1970, as amended

Requirement(s) and Compliance Approach	Compliance Activities
The Clean Air Act of 1970, as amended, governs the management of regulated emissions through adherence to the conditions of permits and applicable regulations.	• Confirm that planned stationary sources of air pollutants (e.g., equipment) and potential emissions from operations meet applicable local and federal requirements. • Maintain documentation that ensures that sources are in compliance with regulations and/or permitted operating conditions. • Submit monitoring reports, annual emissions inventories, dose assessments, and other compliance assurance documentation to regulatory agencies.

Water Quality

Clean Water Act of 1972 and amendments

Requirement(s) and Compliance Approach	Compliance Activities
The Clean Water Act of 1972 and amendments establish 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. Discharges to ground surface are regulated by NMED under 20.6.2 NMAC, *Ground and Surface Water Protection*. Sandia Surface Discharge Program personnel review all requests for discharge to ground surface and obtain discharge permits from NMED when applicable. Sanitary sewer discharges are regulated by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA). Discharges from Sandia are received at the ABCWUA treatment facility, which is permitted under the National Pollutant Discharge Elimination System (NPDES). ABCWUA requires Sandia operations to meet all applicable NPDES permit requirements for discharges. Stormwater discharges are regulated by EPA Region 6 under the NPDES. Stormwater discharges from SNL/NM are permitted under three NPDES permits; the Municipal Separate Storm	• Evaluate proposed water and water-based compounds being discharged to the ground surface for potential contaminants. Obtain discharge permits from NMED when applicable. • Monitor all wastewater discharges. • Obtain NPDES permits, conduct routine assessments, and monitor stormwater. • Develop and update stormwater pollution prevention plans, including control measures, site inspections, and annual reporting.

Requirement(s) and Compliance Approach	Compliance Activities
Sewer System (MS4) Permit, the Multi-Sector General Permit (MSGP), and the Construction General Permit (CGP). See "Safe Drinking Water Act of 1974." Chapter 6 provides information on compliance with surface water quality regulations. Chapter 1 provides information on groundwater.	• Monitor sanitary sewer discharge at six on-site stations.

Energy Independence and Security Act of 2007, Section 438

Requirement(s) and Compliance Approach	Compliance Activities
The Energy Independence and Security Act (EISA) of 2007, Section 438, requires federal agencies to manage stormwater runoff from federal development projects for the protection of water resources. Sandia projects undergo a NEPA review (see "National Environmental Policy Act") and may identify the need to further address stormwater runoff under EISA § 438 in accordance with requirements in the CGP and MS4 Permit. Site planning, design, construction, and maintenance strategies are applied to maintain or restore predevelopment site hydrology. Section 6.4 provides information on the Stormwater Program.	• Coordinate with a drainage engineer to obtain site drainage plans that meet EISA § 438 requirements. • Develop Stormwater Pollution Prevention Plans that include EISA § 438 requirements and describe compliance measures. • Inspect EISA drainage structures to ensure proper long-term maintenance and operation.

Oil Pollution Act of 1990 (§ 311)

Requirement(s) and Compliance Approach	Compliance Activities
The Oil Pollution Act of 1990 (§ 311) establishes requirements for the prevention of, preparedness for, and response to oil discharges at specific non-transportation-related facilities. It requires the development and implementation of a spill prevention, control, and countermeasure plan. Personnel develop, implement, and maintain a *Sandia National Laboratories Spill Prevention, Control*, and *Countermeasure Plan* for all applicable oil storage containers. Implementing regulations are found in 40 CFR 112, *Oil Pollution Prevention*. Underground storage tank requirements were added as Subtitle I to RCRA in 1984 and, since 1990, the U.S. Environmental Protection Agency (EPA) has authorized the State of New Mexico, through NMED, 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)*. Section 6.2 provides information on the Oil Storage Program.	• Inspect bulk 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.

Safe Drinking Water Act of 1974, as amended

Requirement(s) and Compliance Approach	Compliance Activities
The Safe Drinking Water Act of 1974, as amended 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. The KAFB Public Water System provides potable water for Sandia facilities, and KAFB is responsible for meeting drinking water requirements as the supplier. Sandia personnel adhere to specific requirements from the State of New Mexico as NMED is authorized to administer and enforce safe drinking water requirements in lieu of the federal program detailed in 40 CFR 141, *National Primary Drinking Water Regulations* implementing regulations. Section 6.3 provides information on Sandia's safe drinking water program.	• Sample drinking water quality parameters routinely. • Inspect water quality associated with new construction water line disinfection and line repair activities.

America's Water Infrastructure Act of 2018

Requirement(s) and Compliance Approach	Compliance Activities
The America's Water Infrastructure Act is to improve drinking water and water quality, including the annual Consumer Confidence Report. This act's provisions represent changes to the Safe Drinking Water Act. The KAFB Public Water System provides the annual Consumer Confidence Report of drinking water quality for the KAFB Public Water System. Section 6.3 provides information on safe drinking water.	• Sandia disseminates the KAFB Consumer Confidence Report.

Chemical Management

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

Requirement(s) and Compliance Approach	Compliance Activities
The Emergency Planning and Community Right to-Know-Act (EPCRA) of 1986, also known as Title III of the Superfund Amendments and Reauthorization Act (SARA Title III), requires the reporting of toxic chemicals used and released by federal, state, and local governments and industry. Per EPCRA, chemical hazard information is provided to the community for awareness and enhancement of emergency planning efforts. See Table 2-2 for specific requirements.	• Maintain and report on a chemical inventory. • Report qualifying chemical releases.

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

Requirement(s) and Compliance Approach	Compliance Activities
The Federal Insecticide, Fungicide, and Rodenticide Act, enacted in 1910 and amended in 1972 regulates the use of herbicides, rodenticides, and insecticides. EPA regulations and applicable label guidelines are followed.	• Have state-licensed subcontractors supply, handle, and apply the products.

Toxic Substances Control Act, enacted in 1976 and later amended

Requirement(s) and Compliance Approach	Compliance Activities
The Toxic Substances Control Act, enacted in 1976 and later amended, regulates the manufacture, processing, distribution, use, and disposal of specific chemical substances and/or mixtures. Compliance with this act involves managing asbestos and polychlorinated biphenyls (PCBs) at SNL/NM. Chapter 3 provides information related to managing toxic substances.	• Conduct asbestos abatement in accordance with applicable regulatory requirements. • Evaluate electrical equipment for PCBs when they are taken out of service.

Pollution Prevention

Pollution Prevention Act of 1990

Requirement(s) and Compliance Approach	Compliance Activities
The Pollution Prevention Act of 1990 declares as national policy that pollution should be prevented or reduced at the source wherever feasible and disposed of or released into the environment only as a last resort. A toxic chemical source reduction and recycling report is required for facilities that meet the reporting requirements under EPCRA, Section 313. See the previous EPCRA discussion under "Chemical Management."	• 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.

Natural Resources

Bald and Golden Eagle Protection Act (16 USC § 668-668d), enacted in 1940
Endangered Species Act of 1973, amended in 1982
EO 11988 of 1977, Floodplain Management, as amended
EO 11990 of 1977, Protection of Wetlands, as amended
EO 13112, of 1999, Invasive Species
EO 13751, of 2016, Safeguarding the Nation from the Impacts of Invasive Species
Fish and Wildlife Conservation Act (PL 96-366), enacted in 1980
Lacey Act Amendments (PL 97-79), enacted in 1981
Migratory Bird Treaty Act of 1918 (and amendments)
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 Tijeras Arroyo Wildlife Corridor Memorandum of Understanding

Requirement(s) and Compliance Approach	Compliance Activities
A variety of statutes and presidential executive orders ensure the protection and conservation of natural resources, including the following: • Bald and Golden Eagle Protection Act (16 USC § 668-668d), enacted in 1940 • Endangered Species Act of 1973, amended in 1982 • EO 11988 of 1977, Floodplain Management, as amended • EO 11990 of 1977, Protection of Wetlands, as amended • EO 13112, of 1999, Invasive Species • EO 13751, of 2016, Safeguarding the Nation from the Impacts of Invasive Species • Fish and Wildlife Conservation Act (PL 96-366), enacted in 1980 • Lacey Act Amendments (PL 97-79), enacted in 1981 • Migratory Bird Treaty Act of 1918 (and amendments) • 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 Tijeras Arroyo Wildlife Corridor Memorandum of Understanding Natural resources are protected via compliance with applicable statutes, long-term surveillance, and ecological compliance. Management is initially through the NEPA process (see "National Environmental Policy Act"), review of project plan effects, and Eco Ticket (a web-based monitoring system) requests. Required applicable permits are obtained to conduct natural resource work. Chapter 7 provides more information on the Ecology Program.	• Conduct biological surveys. • Collect ecological resource inventory data. • Assess, inventory, and monitor vegetation. • Relocate wildlife.

Cultural Resources

American Indian Religious Freedom Act, enacted in 1978 and amended in 1994
Archaeological Resources Protection Act, enacted in 1979 and amended in 1988
DOE O 144.1, Department of Energy American Indian Tribal Government Interactions and Policy
DOE O 430.1C, Real Property Asset Management
DOE P 141.1, Management of Cultural Resources
National Historic Preservation Act, enacted in 1966 and amended in 2000, Section 106
Native American Graves Protection and Repatriation Act, enacted in 1990

Requirement(s) and Compliance Approach	Compliance Activities
Multiple statutes prescribe the management and preservation of cultural resources, including the following: • American Indian Religious Freedom Act, enacted in 1978 and amended in 1994 • Archaeological Resources Protection Act, enacted in 1979 and amended in 1988 • DOE O 144.1, *Department of Energy American Indian Tribal Government Interactions and Policy* • DOE O 430.1C, *Real Property Asset Management* • DOE P 141.1, *Management of Cultural Resources* • National Historic Preservation Act, enacted in 1966 and amended in 2000, Section 106 • Native American Graves Protection and Repatriation Act, enacted in 1990 Protection of cultural resources (including historical properties) is initially provided through the NEPA process (see "National Environmental Policy Act") and review of project plans. Cultural Resource Management Program personnel support DOE coordination with other federal agencies and with local, state, and tribal agencies to protect and preserve cultural resources. Chapter 8 provides more information on the Cultural Resource Management Program.	• Develop management plans. • Conduct cultural resource surveys. • 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 for impacts on cultural resources. • Monitor construction activities for impacts on cultural resources.

Reporting

DOE O 231.1B, Admin Change 1, Environment, Safety and Health Reporting

Requirement(s) and Compliance Approach	Compliance Activities
DOE O 231.1B, *Admin Change 1, Environment, Safety and Health Reporting*, 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. Environmental program personnel report on environmental program activities, monitoring results, accidental releases, and waste management operations.	• Produce an Annual Site Environmental Report.

DOE O 232.2A, Chg1 (MinChg), Occurrence Reporting and Processing of Operations Information

Requirement(s) and Compliance Approach	Compliance Activities
DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information*, 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. 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. Section 2.3 provides further information.	• Track all environmental events.

Quality Assurance

DOE O 414.1D Change 2, Quality Assurance

Requirement(s) and Compliance Approach	Compliance Activities
DOE O 414.1D, Change 2 (LtdChg), *Quality Assurance*, is intended to achieve quality in all work and ensure that products and services meet or exceed customer requirements and expectations. Environmental sampling and analyses at SNL/NM conform to applicable quality assurance plans, sampling plans, and field operations. Chapter 9 provides information on quality assurance.	• Develop quality assurance plans, operating plans, and sampling plans. • Provide a statement of work for contract laboratories. • Participate in quality assurance audits of contract laboratories.

Great-horned owl *(Bubo virginianus)*

2.1.2 New Mexico State and Local Environmental Requirements

New Mexico state and local environmental requirements applicable to Sandia operations include the following.

New Mexico State Statute and Bernalillo County, New Mexico, Air Quality Standards

The EPA program for attaining and maintaining National Ambient Air Quality Standards requires local agencies to develop a comprehensive permitting program. In accordance with the Air Quality Control Act (NMSA 1978, §§ 74-2-1 to-17), the Albuquerque Bernalillo County Air Quality Control Board has developed a set of regulations that govern mobile and stationary sources of air pollution in Bernalillo County, New Mexico.

- **Fugitive dust permitting.** The City of Albuquerque implements 20.11.20 NMAC, *Fugitive Dust Control*, to ensure that every person uses reasonably available control measures or other effective measures on an ongoing basis to prevent or abate fugitive dust if the fugitive dust may, with reasonable probability, injure human health or animal or plant life, or may unreasonably interfere with public welfare, visibility, or the reasonable use of property.
- **National Emission Standards for Hazardous Air Pollutants (NESHAP).** EPA develops and implements NESHAPs to limit the release of air pollutants that are known to cause or are suspected of causing cancer, birth defects, reproduction problems, and other serious illnesses. These standards are authorized by Section 112 of the Clean Air Act, and the regulations are published in 40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*, and 40 CFR 63, *National Emission Standards for Hazardous Air Pollutants for Source Categories*, which the City of Albuquerque implements in Bernalillo County. NESHAPs initially were established for seven pollutants, including asbestos, radionuclides, and beryllium. EPA changed the approach to NESHAPs with the 1990 Clean Air Act Amendments to focus the requirements on source categories rather than on individual hazardous air pollutants. Since then, NESHAPs have been implemented for a number of sources, including halogenated solvent cleaning, semiconductor manufacturing, surface coating operations, and stationary engines.
- **New Source Performance Standards and New Source Review requirements.** As part of an effort to control pollution in the United States, New Source Performance Standards and New Source Review permitting requirements identify the minimum level of air pollution controls for a new stationary source. The performance standards are authorized by Section 111 of the Clean Air Act, and the regulations are published in 40 CFR 60, *Standards of Performance for New Stationary Sources*. The New Source Review preconstruction permitting requirements include criteria pollutants as authorized by Section 110 of the Clean Air Act. In addition, sources may be subject to siting requirements found in Part C, *Prevention of Significant Deterioration of Air Quality*, and Part D, *Plan Requirements for Nonattainment Areas*, of Title I of the Clean Air Act. The permitting regulations are codified in 40 CFR 51, *Requirements for Preparation, Adoption, and Submittal of Implementation Plans*, and 40 CFR 52, *Approval and Promulgation of Implementation Plans*. Both the performance standards and permitting requirements are administered and enforced by the City of Albuquerque, as delegated by the EPA. New Source Performance Standards are established for a number of source categories, including boilers and stationary engines. New Source Review requirements provide assurance to the public that any new or modified source of air pollutants will be protective of human health and the environment, and that advances in pollution control will occur concurrently with industrial expansion.
- **Open burn permitting.** The City of Albuquerque established 20.11.21 NMAC, *Open Burning*, to ensure that all persons conduct open burning in a manner that prevents or abates emissions.
- **Ozone-depleting substances requirements.** Based on the requirements of Title VI of the Clean Air Act, EPA has established regulations to protect the stratospheric ozone layer by managing ozone-depleting substances.

The Clean Air Act Amendments of 1990 contain provisions under Title V that require an operating permit for all major sources of air pollutants. A *major source* is defined as a facility with the potential to emit 100 tons per year or greater of any criteria pollutant, 10 tons per year of any hazardous air pollutant, or 25 tons per year of any combination of hazardous air pollutants. Operating permits are issued by the City of Albuquerque.

New Mexico State Statutes and Regulations Related to Natural and Cultural Resources

The following New Mexico statutes related to natural resources and cultural resources are applicable to Sandia operations:

- 4.10.8 NMAC, *Permits to Conduct Archaeological Investigations on State Land*
- 4.10.15 NMAC, *Standards for Survey and Inventory*
- NMSA 1978, § 75-6-1, *Endangered Plants*
- NMSA 1978, §§ 17-2-13 through 17-2-15, protecting songbirds; hawks, vultures, and owls; and horned toads, respectively, *Hunting and Fishing Regulations*
- NMSA 1978, §§ 17-6-1 through 17-6-11, *Habitat Protection Act*
- NMSA 1978, Article 2, *Hunting and Fishing Regulations*
- NMSA 1978, §§ 76-8-1 through 76-8-4, *Protection of Native New Mexico Plants*
- NMSA 1978, §§ 17-2-37 through 17-2-46, *Wildlife Conservation Act*

New Mexico State Statutes and Regulations Related to Petroleum Storage Tanks

Under the authority of NMSA 1978, §§ 74-4-1 through 74-4-14, *New Mexico Hazardous Waste Act*, and NMSA 1978, §§ 74-6B-1, *New Mexico Groundwater Protection Act*, as well as with delegated authority from EPA under RCRA, NMED administers and enforces the underground storage tank regulatory program in New Mexico. Applicable SNL/NM underground and aboveground storage tanks are regulated under 20.5 NMAC, *Petroleum Storage Tanks*. See Chapter 6 for more information.

New Mexico State Statutes and Regulations Related to Solid and Hazardous Waste Management

Under RCRA, EPA delegates authority to state programs for nonhazardous solid waste and hazardous solid waste, also referred to as hazardous waste. NMED administers and enforces the solid waste program in New Mexico under the authority of NMSA 1978, §§ 74-9-1 through 74-9-43. *New Mexico Solid Waste Act*. Solid waste management activities at SNL/NM are conducted pursuant to 20.9 NMAC, *Solid Waste*. See Chapter 3 for more information.

NMED administers the hazardous waste program in New Mexico under the authority of the New Mexico Hazardous Waste Act. Hazardous waste management activities at SNL/NM are conducted pursuant to 20.4 NMAC*, Hazardous Waste*. See Chapter 3 for more information.

New Mexico Water Quality Control Commission

The *New Mexico Water Quality Act*, NMSA 1978, §§ 74-6-1 through 74-6-17, establishes a Water Quality Control Commission and defines its authority to adopt water quality standards and direct programs consistent with the Clean Water Act. All discharges made to the ground or surface water must be evaluated for compliance with standards adopted for the protection of groundwater and surface water quality prior to discharge (20.6.2 NMAC, *Ground and Surface Water Protection*). See Chapter 6 for more information.

2.2 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 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.

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.

DOE O 436.1, *Departmental Sustainability*, presents requirements for managing sustainability practices. Sandia personnel implement this order through an ISO 14001-certified environmental management system. Sandia National Laboratories received initial ISO 14001:2004 certification in June 2009. In 2015, the Sandia site-specific certifications for primary operating locations in New Mexico and California were integrated into a multi-site ISO 14001:2004 certification. In 2018, the environmental management system was recertified under the new ISO 14001:2015. To maintain this certification, audits by a third-party registrar are required annually to ensure continued conformance with the standard. Additional information can be found at Sandia Environmental Management.

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 2021, the significant aspects for Sandia operations were: greenhouse gas air emissions and hazardous air pollutants (asbestos); hazardous materials; hazardous, mixed, and radiologic waste; release of explosives and combustion byproducts to soil, surface, and groundwater; wastewater and process water discharge; and water use. Positive aspects for fiscal year 2021 operations were a reduction in water usage and greenhouse gas air emissions. 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.

2.2.1 Site Sustainability Plan

Sandia prepares an annual site sustainability plan which identifies contributions toward meeting DOE sustainability goals and the broader sustainability program set forth in EO 14008, *Tackling the Climate Crisis at Home and Abroad*. Sandia's most recent plan, *Fiscal Year 2022 Site Sustainability Plan* (SNL/NM 2021a), describes the performance status for fiscal year 2021. Additional information about pollution prevention activities is provided in Chapter 3.

Table 2-1 presents performance status for several selected key areas for SNL/NM (SNL/NM 2021a).

Table 2-1. Site Sustainability Plan performance status for key areas for SNL/NM in 2021

DOE Goal/Sandia Objective	Sandia Performance Status in Fiscal Year 2021
Electronic Stewardship	
Electronics stewardship from acquisition, operations, to end of life.	Managed electronics stewardship with 93.1 percent for acquisition, 100 percent for operations, and 100 percent for end-of-life acquisitions and operations.
Greenhouse Gas Reduction	
Reduce Scope 1, Scope 2, and Scope 3 greenhouse gas emissions.	• Reduced Scope 1 and Scope 2 greenhouse gas emissions by 58.3 percent from the fiscal year 2008 baseline, but increased year-over-year emissions by 3.4 percent relative to fiscal year 2021. • Reduced Scope 3 greenhouse gas emissions by 31.9 percent from the fiscal year 2008 baseline, but increased year-over-year by 6 percent relative to fiscal year 2021.
Organizational Resilience	
Discuss overall integration of climate resilience in emergency response, workforce, and operations procedures and protocols.	Addressed climate resilience by continuity of operations and emergency management risk-based planning and assurance measures that address a variety of hazards to assist in the prioritization of assets, efforts, and personnel. Included the impacts of climate change in risk mitigation efforts. Focused continuity efforts on incorporating resilience measures to provide emergency backup power to buildings supporting mission essential functions.
Pollution Prevention and Waste Reduction	
Reduce nonhazardous solid waste sent to treatment and disposal facilities. Reduce construction and demolition materials and debris sent to treatment and disposal facilities.	Diverted 73.8 percent of nonhazardous solid waste from treatment and disposal facilities. Diverted 87.2 percent construction and demolition waste from treatment and disposal facilities.
Sustainable Acquisition	
Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring that all sustainability clauses are included as appropriate.	Placed a contract with Ecomedes to enhance the Sustainable Facilities Tool so it can be used as a data aggregation tool. Dependent on Procurement personnel adding green product purchasing language with reporting requirements into applicable contracts.
Sustainable Buildings	
Increase the number of owned buildings that implement with the Guiding Principles.	Achieved this goal by implementing the Guiding Principles at 18.4 percent of buildings. Revised the investment plan to bring existing buildings into full implementation of the Guiding Principles. Changed specifications to ensure the certification of all new buildings.
Sustainable Energy Management	
Reduce energy use intensity (Btu per gross square foot) in goal-subject buildings.	In fiscal year 2021, reduced energy intensity by 4.1 percent relative to fiscal year 2020.
Water Use Efficiency and Management	
Reduce potable water use intensity (gallons per gross square foot).	Reduced potable water intensity by 38.1 percent in fiscal year 2021 relative to a fiscal year 2007 baseline and reduced it by 10.2 percent relative to fiscal year 2020.

Guiding Principles = *Guiding Principles for Sustainable Federal Buildings*

2.2.2 Sustainability Awards

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 celebrate excellence in energy, water, and fleet management projects and practices. Each year, Environmental Management System personnel select nominees from that year's Environmental Excellence Awards winners. In 2021, Sandia personnel submitted six nominations for the DOE Sustainability Awards and an individual at SNL/NM received the 2021 Sustainability Champion Award.

The individual who received the Sustainability Champion Award recognized that Sandia's architecture and engineering partners were unsure how to implement the Guiding Principles (The Council on Environmental Quality 2020). To ensure implementation of the Guiding Principles, retaining high fee consultants was considered. The award winner determined a lower-cost solution existed, but would require clarifying the Guiding Principles for the architecture and engineering and construction partners. The awardee collaborated with the Facilities Projects team to modify the *Sandia National Laboratories/New Mexico Design Standards Manual* (SNL/NM) and Facilities specifications in order to implement the Guiding Principles, thus minimizing confusion and costs.

Facilities' design standards manual and specifications regulate all design and construction work at SNL/NM. Ensuring the requirements in these documents are met will lead to the construction of high-performing, energy-efficient, and environmentally sustainable buildings.

2.3 Environmental Performance

Environmental performance is measured 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 Sandia performance evaluation were set forth in the *Fiscal Year 2021 DOE/NNSA Strategic Performance Evaluation Measurement Plan (PEMP)* (DOE/NNSA/SFO 2021b). Subsequently, the DOE National Nuclear Security Administration Sandia Field Office prepared the *FY2021 Performance Evaluation Summary* (DOE/NNSA/SFO 2022), assessing the management and operating contractor performance including environment, health, and safety for October 1, 2020, through September 30, 2021. 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 categories: 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.

2.3.1 Audits, Assessments, and Inspections in 2021

Environmental programs are routinely subjected to audits, assessments, inspections, and/or verifications by external agencies and authorities. Table 2-2 summarizes the 2021 audits, including any findings, notices of violation, or other environmental occurrences. The Sandia Internal Audit group also conducts 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 evaluate performance and compliance and identify deficiencies and opportunities for improvement as well as noteworthy practices and lessons learned.

The NMED DOE Oversight Bureau provides independent verification of environmental monitoring results obtained by Sandia personnel on behalf of DOE. The Oversight Bureau achieves verification through the following:

- Assesses DOE management of its New Mexico facilities to ensure attainment of public health and environmental standards
- Provides input to DOE for prioritization of its cleanup and compliance activities
- Develops and implements an independent monitoring and oversight program
- Increases public knowledge and awareness of environmental matters at DOE facilities in New Mexico

The NMED DOE Oversight Bureau performs sampling and monitoring activities in conjunction with Sandia environmental program personnel. In 2021, this included air, water, vegetation, and soil and sediment sampling programs. The samples were analyzed by independent laboratories under contract to the NMED DOE Oversight Bureau. More information can be found at NMED Department of Energy Oversight Bureau.

Table 2-2. Environmental-related external audits, assessments, inspections, and violations, 2021

Appraising Agency/Authority	Title/Description	Date	Summary
City of Albuquerque Air Quality Program	Site Evaluation of TA-IV Chill Water Loop Project	4/1/2021 and 12/29/2021	• Post Inspection • Notice of Violation
Albuquerque Bernalillo County Water Utility Authority	Annual industrial permit assessment of SNL permitted outfalls 2069A, 2069F, 2069G, 2069I, 2069K and 2238A	4/20/2021 and 4/27/2021	No findings
New Mexico Environment Department Hazardous Waste Bureau	Hazardous Waste Compliance Evaluation Inspection	5/17/2021–5/19/2021	• One notice of violation • Four noncompliances • Two opportunities for improvement
New Mexico Environment Department Petroleum Storage Tank Bureau	Building 888 Underground Storage Tanks	6/29/2021	No findings
Orion Registrar, Inc.	ISO 14001:2015 Recertification Audit	8/2/21–8/5/2021	• Eight opportunities for improvement • Fourteen strengths
City of Albuquerque Air Quality Program	Final Approval FDCCP Walkdown of Building 814	8/13/2021	No findings
City of Albuquerque Air Quality Program	Final Approval FDCCP Walkdown of Parking Lots 897 and 960	10/6/2021	Two construction sites approved for FDCCP
Albuquerque Bernalillo County Water Utility Authority	Quarter 4 split sampling	10/18/21–10/22/21	No findings

FDCCP = Fugitive Dust Control Construction Permit

2.3.2 Occurrence Reporting in 2021

Under DOE O 232.2A, Chg 1 (MinChg), *Occurrence Reporting and Processing of Operations Information*, 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, Chg 1 (MinChg1) reporting thresholds, they may still be reportable to outside agencies.

Per DOE, an *occurrence* is 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.

Occurrences that met DOE O 232.2A, Chg 1 (MinChg1) 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 occurrences in the following reporting criteria groups (as defined by DOE O 232.2A Chg 1 [MinCh1]):

- Group 5, Environmental
- Group 9, Noncompliance Notifications
- Group 10, Management Concerns and Issues (with an 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 2021, the four occurrences shown in Table 2-3 met the criteria for reporting in this Annual Site Environmental Report.

Table 2-3. Occurrence reports per DOE O 232.2A, 2021

Reporting Criteria	Month	Report Level	Report Number and Title
Group 10, Management Concerns and Issues (with an identified environmental impact) - An event, condition, or series of events that does not meet any of the other reporting criteria but is determined by the Facility Manager or line management to be of safety significance or of concern for that facility or other facilities or activities in the DOE complex.	February	Informational	**NA--SS-SNL-4000-2021-0002**, *Construction Activity Begins without Proper Approvals*
Group 10, Management Concerns and Issues 10(1) - An event, condition, or series of events that does not meet any of the other reporting criteria but is determined by the Facility Manager or line management to be of safety significance or of concern for that facility or other facilities or activities in the DOE complex.	March	Informational	**NA--SS-SNL-7000-2021-0003**, *Tritium Alarm System Failure after Low Level Tritium Release*
Group 9 – Noncompliance Notifications 9(1) - Any written notification from an outside regulatory agency that a site/facility is considered to be in noncompliance with a schedule or requirement.	April	Informational	**NA--SS-SNL-4000-2021-0006**, *Post Inspection Notification (PIN) issued for Failing to Obtain Fugitive Dust Control Permit (FDCP)*

Reporting Criteria	Month	Report Level	Report Number and Title
Group 9 – Noncompliance Notifications **9(1)** - Any written notification from an outside regulatory agency that a site/facility is considered to be in noncompliance with a schedule or requirement.	August	Informational	**NA--SS-SNL-NMSITE-2021-0003**, *NMED NOV for New Mexico Hazardous Waste Management Regulations*

NMED = New Mexico Environment Department NOV = notice of violation

2.4 Reporting Requirements Other than to DOE

External reporting requirements (other than to DOE) are necessary for both routine and nonroutine releases of pollutants or hazardous substances. Release information may be used to evaluate facility operation compliance, waste-handling activities, and emergency response programs. Table 2-4 summarizes the primary reporting requirements for qualifying releases. EPCRA reporting requirements are also included.

Table 2-4. Reporting requirements to outside agencies (other than DOE)

Report	Description	Agency and Regulation	Required Reporting in 2021?
Accidental Slug Discharge Notification	ABCWUA requires notification to its Wastewater Utility Division of any accidental release or slug discharge to the sanitary sewer that may cause potential problems for publicly owned treatment works. The user shall report to the ABCWUA as follows: • Immediate verbal notification to the ABCWUA Industrial Pretreatment Engineer • Written notification to the ABCWUA Industrial Pretreatment Engineer within five days following such occurrence describing the cause of the discharge and measures to be taken to prevent similar future occurrences	Albuquerque Bernalillo County Water Utility Authority Sewer Use and Wastewater Control Ordinance	No
Annual NESHAP Dose Assessment Report	EPA requires reporting on a dose assessment of the calculated effective dose equivalent to the maximally exposed individual based on the assumption that an exposed individual resides 24 hours per day at an area of highest incident radiation.	EPA 40 CFR 61, Subpart H	Yes Dose assessment is discussed in Chapter 5.
EPCRA Emergency Planning	Sections 301–303 of EPCRA require an annual report that lists the chemical inventories above the reportable threshold planning quantities, including the location of the chemicals and the emergency contacts.	EPA 40 CFR 350, 40 CFR 355, 40 CFR 370, and 40 CFR 372	Yes Reports submitted to the EPA are discussed in Chapter 6.
EPCRA Emergency Notification	Section 304 of EPCRA requires immediate notification about the accidental release of a reportable quantity of extremely hazardous substances.		No
EPCRA Community-Right-to-Know: Hazardous Chemical Storage Reporting	Sections 311–312 of EPCRA provide requirements for maintaining safety data sheets for hazardous chemicals and for submitting inventory forms for these chemicals. Maintenance of safety data sheets is discussed in Chapter 3.		Yes Reports submitted to EPA are discussed in Chapter 6.

Report	Description	Agency and Regulation	Required Reporting in 2021?
EPCRA Community-Right-to-Know: Toxic Chemical Release Inventory Reporting	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 Reports submitted to EPA are discussed in Chapter 6.
Notification of Environmental Release	NMED requires reporting of any discharge from any facility of oil or other water contaminants in such quantity as may with reasonable probability (1) injure or be detrimental to human health, animal life, or plant life or (2) be harmful to property or unreasonably interfere with the public welfare or use of the property. The owner/operator shall report to the appropriate agency within NMED as follows: • Verbal notification as soon as possible after learning of such a discharge, but in no event more than 24 hours thereafter • Written notification within one week verifying the prior verbal notification • Written notification within 15 days describing any corrective actions taken and/or to be taken relative to the discharge	NMED 20.6.2.1203 NMAC	No
Notification of Environmental Release	NMED requires reporting of any newly identified or suspected solid waste management unit or area of concern, with all available information regarding contaminants released to environmental media as follows: • Written notification within 15 days after discovery • Written report of follow-up investigation within 60 days after the initial notification	Compliance Order on Consent	No
Notification of Unauthorized Non-Stormwater Discharge	EPA requires reporting of unauthorized non-stormwater discharges that may endanger human health or the environment. The owner/operator shall report to EPA Region 6 office as follows: • Verbal notification as soon as possible after learning of such a discharge, but in no event more than 24 hours thereafter • Written notification within five days to EPA Region 6 Office for the NPDES Stormwater Program	EPA NPDES Multi-Sector General Permit Part 7.7	No
Petroleum Storage Tanks Reporting and Investigation of Suspected and Confirmed Releases	NMED requires reporting of any suspected or confirmed release from a storage tank system. The system owner shall report a suspected or confirmed release as follows: • Verbal notification within 24 hours describing conditions and other pertinent information • Written notification within 7 days, including additional information on source and cause of release, estimated volume, and any actions taken to mitigate immediate damage	NMED 20.5.118 NMAC	Yes Suspected release reported to NMED is discussed in Chapter 6.

Chapter 3. Environmental Programs

Sandia sunrise

OVERVIEW ■ Sandia personnel take the responsibility of protecting the environment seriously. Numerous program teams monitor the air, water, and soil to help prevent pollution and conserve natural resources.

Sandia personnel collect data to determine and report the impact of existing operations on the environment. These environmental program activities meet or exceed federal, state, and local environmental requirements as well as DOE directives in Sandia's Prime Contract. Presidential executive orders and DOE guidance documents are also used to establish program criteria.

Environmental monitoring began at SNL/NM in 1959, when the principal objective was to monitor radioactive effluents and determine any associated environmental impacts. Since then, environmental programs and waste management, along with other ES&H activities, have expanded greatly. The current environmental programs and focus areas include:

- National Environmental Policy Act Program (Section 3.1)
- Environmental Education Outreach (Section 3.2)
- Chemical Information System and Chemical Exchange Program (Section 3.3)
- Materials Sustainability and Pollution Prevention Program (Section 3.4)
- Waste Management Program (Section 3.5)
- Environmental Restoration Operations (Section 3.6)
- Long-Term Stewardship Program (Section 3.7)

The following additional environmental programs are presented in separate chapters:

- Terrestrial Surveillance Program (Chapter 4)
- Air Quality Compliance and related programs (Chapter 5)

- Water quality programs (Chapter 6)
- Ecology Program (Chapter 7)
- Cultural Resource Management Program (Chapter 8)

3.1 National Environmental Policy Act Program

NEPA Program personnel provide technical assistance, reviewing operations to ensure compliance with NEPA at all Sandia locations: SNL/NM, Tonopah Test Range, Nevada; Kauaʻi Test Facility, Hawaiʻi; and other remote locations as needed. Project owners use the NEPA Module, an on application tool, to provide information about proposed projects and activities in the form of a NEPA checklist. Sandia NEPA personnel use the NEPA checklist, an internal form, to assess projects and activities and identify potential environmental impacts.

After a NEPA analysis is completed, NEPA Program personnel review projects and activities to determine whether proposed activities have been addressed previously in existing NEPA documents. Other relevant environmental program subject matter experts also review proposed projects and activities to determine and communicate any applicable environmental permitting and/or other requirements to project managers. Project managers are required to ensure that all environmental requirements are met.

The *Final Site-Wide Environmental Impact Statement for Sandia National Laboratories/New Mexico* (DOE 1999) reviewed ongoing activities at Sandia as well as proposed activities. The site-wide environmental impact statement was updated and supplemented in 2006. In addition, a variety of environmental assessments ensure NEPA compliance for specific activities. SNL/NM NEPA compliance documents can be found at DOE Office of NEPA Policy and Compliance NEPA Documents.

A NEPA checklist is forwarded to DOE for review and determination 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 or permitted to Sandia.

Projects or activities that have not been reviewed in existing NEPA documents or do not qualify for a categorical exclusion (per 10 CFR 1021, *National Environmental Policy Act Implementing Procedures*) 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 existing environmental impact statements and environmental assessments. Sandia personnel continue to assist DOE in the development of a new site-wide environmental impact statement.

3.1.1 National Environmental Policy Act Compliance in 2021

In calendar year 2021, the NEPA Program team participated in the following programmatic activities:

- Sandia personnel continued to respond to the evolving Coronavirus Disease 2019 (COVID-19) pandemic. This effort required rapid engagement by NEPA Program personnel to ensure that projects had sufficient NEPA coverage for work to proceed. Projects reviewed for NEPA compliance included work in the following areas:
  - Sandia staff vaccination and testing site
  - Disinfection testing

  - Development of vaccines
  - Bioengineering research and development
- NEPA Program personnel reviewed routine maintenance activities at SNL/NM for NEPA compliance, including the need for biological surveys, historic building and archaeological surveys, and permits (e.g., discharge permits). Overall, 500 maintenance activities were reviewed using the Routine Maintenance Criteria SharePoint site.
- NEPA Program personnel continued to support two capital acquisition projects: the Power Sources Capability Facility in TA-II and the Combined Radiation Environments for Survivability Testing Facility planned for TA-V. An environmental compliance strategy was developed for the Power Sources project as a required deliverable for Critical Decision 1, and NEPA compliance was assessed for a survey of geotechnical borings to be used for siting the Combined Radiation Environments for Survivability Testing Facility.
- NEPA Program personnel worked with Facilities construction management personnel and two line organizations to obtain programmatic approval for build-out of the Agile Facility into laboratory space. The Agile Facility provides temporary space for short-term mission use and turnaround space for flexibility in managing Sandia's laboratory space needs.

Along with these activities, NEPA Program personnel reviewed 410 proposed actions in 2021, including continuation of ongoing operations. Of these, 249 NEPA checklists were reviewed internally and approved as falling within an existing NEPA determination, and 152 NEPA checklists were transmitted to DOE for review and determination. Further, 9 NEPA checklists were transmitted to the U.S. Air Force for review and determination for projects proposed to occur on KAFB permitted land.

The following NEPA activities required DOE review and determination in 2021. Of these completed NEPA reviews, none required preparation of an environmental assessment or an environmental impact statement.

Roof Asset Management Program Projects

The Roof Asset Management Program—under the DOE Office of Safety, Infrastructure, and Operations—is set up to replace existing roofing systems that have reached the end of their life. At SNL/NM, the scope includes removing existing membrane roofs and replacing them with new thermoplastic olefin membrane roofs.

In 2021, NEPA Program personnel reviewed 25 NEPA checklists and six routine maintenance requests for Roof Asset Management Program projects.

Facility Projects

NEPA Program personnel review and evaluate projects for new construction, demolition and disposal of structures, and work on existing or new parking lots, roads, and utilities systems.

In 2021, NEPA Program personnel reviewed potential environmental impacts from:

- Laboratory building build-out
- Outdoor storage site improvements
- Parking lot reconstruction
- Building addition
- Demolition of several structures
- Seismic bracing

- Mobile building remodel
- Contractor gate restoration
- Entrance vestibule construction
- New building construction
  - Approximately 19,000-square-foot building for laboratory space, a standard acquisition and recapitalization project
  - Approximately 11,000-square-foot building for office and laboratory space
  - Approximately 46,000-square-foot building for office space
  - Single-story metal building for storing materials
  - Several maintenance yard storage sheds and canopy structures

NEPA Program personnel also reviewed utility projects:

- Chiller replacements
- Electric panel replacement
- Transformer relocation
- Air handler replacement
- Boiler replacement
- Liquid nitrogen conversion
- Substation upgrade

Unmanned Aerial System Projects

In 2021, NEPA Program personnel worked on consolidating a variety of projects for unmanned aerial systems based on proposed locations. These proposed projects consisted of research, development, testing, and evaluation. One of these location-based projects was given a NEPA determination that work may proceed in 2021.

Other Projects

NEPA Program personnel also reviewed and made NEPA determinations for the following projects:

- Erosion and drainage control
- Geotechnical borings
- Lease agreements
- Research and development
- Sandia operations, including:
  - Energy
  - Global security
  - National security programs
  - Nuclear weapons
- Waste shipments

3.2 Environmental Education Outreach

Environmental Education Outreach personnel connect with the local community and Sandia personnel through organized events. In addition to complying with requirements, it is recognized that communicating with the local community and Sandia personnel about reducing environmental impacts at work and at home is important. An integrated approach is employed to communicate environmental awareness to personnel via newsletters, annual campaigns, and outreach events.

Environmental Education Outreach activities include participating in or hosting several in-house and public outreach and awareness events annually. Events conducted in 2021 included a virtual Earth Day and a virtual presentation of the annual Environmental Excellence Awards. Environmental education models are used in presentations and include topics such as air quality, landfills, groundwater, and watersheds. In 2020, environmental professionals recorded a demonstration of the watershed module and distributed it electronically to local schools during the 2020 and 2021 academic years. Sandia personnel and community members are encouraged to provide feedback and to ask questions about any of Sandia's environmental programs.

The annual Environmental Excellence Awards are presented in recognition of Sandia personnel who demonstrate environmental excellence in areas such as energy and water conservation, environmental protection, waste minimization, and recycling. Since the inception of the awards in 2006, there have been 277 nominations for contributions to the vision of environmental excellence.

3.3 Chemical Information System and Chemical Exchange Program

The Chemical Information System is a comprehensive chemical information tool used to track workplace chemical and biological containers by location. The primary drivers for the Chemical Information System are state and federal regulations, including EPCRA. The Chemical Information System compiles information concerning chemical hazards and appropriate protective measures for Emergency Management Operations, other ES&H programs, and the workforce.

The Chemical Exchange Program reduces the amount of usable chemicals disposed of as waste and instead makes them available for reuse, thereby lowering the cost for both new acquisitions and disposal.

The inventory 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 125,000 safety data sheets in its library. 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 help reduce sources, which helps to minimize 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.

The Chemical Exchange Program was developed in 1989 as a hazardous waste management waste minimization program. The goal is to reduce the amount of usable chemicals disposed of as waste and instead make them available for reuse, thereby lowering the cost for both new acquisitions and disposal. This program has been through multiple transformations since its inception, and in 2008 the Chemical Exchange Program was introduced as a module within the Chemical Information System. The Chemical Information System/Chemical Exchange Program team continues to develop a more user-friendly, web-based, interactive tool for using the Chemical Exchange Program.

3.4 Materials Sustainability and Pollution Prevention Program

The Materials Sustainability and Pollution Prevention Program is a central element in the Environmental Management System and applies to all activities that involve procuring and using resources and generating waste. Program personnel provide guidance and specify strategies and methods for reducing the quantity and toxicity of waste and pollutants, conserving energy and resources, and purchasing environmentally preferable products. Program focus areas include waste minimization, sustainable acquisitions, electronics stewardship, recycling and composting of solid waste, and awareness and outreach. Integration of materials sustainability into operations is promoted.

3.4.1 Waste Minimization

Waste minimization is accomplished by reducing or eliminating the generation of wastes and other pollutants at the source, including segregation, substitution, and reuse of materials that could otherwise create future environmental legacies. Since establishing the goal of Zero Waste by 2025, the diversion rate has gone from 47 percent in the baseline year of 2008 to 70 percent in 2021. The goal will be considered accomplished when operations meet the internationally accepted definition of Zero Waste. This means reducing waste by 90 percent from the baseline year (i.e., generating less than 23 pounds per person of commercial solid waste per year at SNL/NM).

3.4.2 Sustainable Acquisition

Sustainable acquisitions are one way to reduce environmental impacts. This includes integrating products with reduced environmental impact into purchase agreements and ongoing operations and maintenance. Products containing recycled and biobased content, those designed with identified environmentally preferable attributes, and those with third-party-certified green labels are preferred. In 2021, an interdepartmental working group placed a contract with Ecomedes to modify their existing product search tool (SFTool) into an application that Sandia subcontractors can use to maintain compliance with contractual requirements for sustainable product purchasing and reporting. A pilot using the modified Ecomedes Sustainable Facilities Tool was launched in January 2022 with construction subcontractors. Additional subcontractors were identified and solicited to conduct user testing and provide feedback on the tool's functionality before it is deployed into all applicable contract categories.

3.4.3 Electronics Stewardship

Sandia procurement personnel are committed to purchasing electronic equipment that is registered in the Electronic Product Evaluation Assessment Tool. Products registered in this tool are considered to be green electronics. Registered equipment has been designed with the environment in mind. Green electronics are defined as equipment whose manufacture, operation, and end-of-life disposition have lower environmental impacts than electronics not registered in the Electronic Product Evaluation Assessment Tool registry.

3.4.4 Recycling of Solid Waste

Materials suitable for reuse and/or recycling are diverted from landfills, thereby minimizing the economic and environmental impacts of waste disposal. Rather than paying to throw away material in a landfill, avoided fees and any realized value are used to support diverse recycling and composting programs. This business model has created three permanent jobs and supported numerous positions at local and regional companies.

3.4.5 Awareness and Outreach

Materials Sustainability and Pollution Prevention Program personnel promote the use of green initiatives and available resources to decrease the environmental impact of existing operations. More than 450 additional compost bins were deployed in 2021, which brings the total to over 700 compost bins. A majority of these new bins were located in TA-I and TA-IV, areas that previously did not have any compost bins due to restricted access. Program personnel escort the driver from the local business that services the compost bins to these restricted-access areas. Diverting waste from the local landfill for compost turns it into a valuable commodity.

Various communication tools are used to increase awareness about and bolster participation in recycling, composting, and acquiring sustainable products. Major outreach efforts include the Zero Waste Challenge and the dedicated Zero Waste by 2025 website. Unfortunately, COVID-19 restrictions prevented Materials Sustainability and Pollution Prevention Program personnel from attending and hosting information tables during events such as Earth Day and Pollution Prevention Week. Sandia continues to sponsor the New Mexico Recycling Coalition.

Information on Materials Sustainability and Pollution Prevention Program initiatives, events, and accomplishments can be found at Sandia Pollution Prevention.

3.5 Waste Management Program

Sandia personnel follow the waste management hierarchy dictated in the Pollution Prevention Act of 1990 and reinforced in amendments to RCRA. The objective is to reduce, reuse, or recycle waste (in that order), as appropriate, before any treatment or disposal. Waste management activities are conducted in accordance with applicable permits and regulations as discussed in Chapter 2.

Wastes are generated during daily activities that include research and testing, production, maintenance and support operations (e.g., construction, renovation, and decommissioning and demolition), environmental protection, and waste management. Wastes include the following:

- Commercial solid waste
- Construction and demolition waste
- Hazardous waste
- Mixed waste (including low-level radioactive mixed waste and mixed transuranic waste)
- Radioactive waste (including low-level radioactive waste and transuranic waste)
- Toxic Substances Control Act-regulated waste
- Other regulated wastes

Processes at waste management units vary according to the specific waste type, but general tasks are to collect, screen, sort, bale, repackage, treat, and store wastes in preparation for shipment to off-site facilities for recycling, storage, treatment, or disposal.

Types of waste handled and shipped in 2021 are summarized in Table 3-1. Wastes recycled in 2021 are summarized in Table 3-2.

Table 3-1. Waste shipped by waste management facilities, 2021

Waste Category	Waste Shipped (pounds)
Radioactive Waste	
Low-level radioactive waste	60,764
Transuranic waste	0
Subtotal	**60,764**
Mixed Radioactive and Hazardous Waste	
Mixed low-level radioactive waste	30,675
Mixed transuranic waste	0
Subtotal	**30,675**
RCRA Waste	
Hazardous waste	106,936
Subtotal	**106,936**
Toxic Substances Control Act	
PCBs	194
PCBs and hazardous waste mixture	0
Subtotal	**194**
Other Regulated Wastes	
Infectious waste	4,971
Asbestos waste	38,823
Chemical waste (includes special waste and industrial solid waste)	604,158
Used oil (not recycled)	0
Subtotal	**647,952**
Solid Waste	
Solid waste collection and recycling center dry waste	1,639,357
Off-site office waste (Sandia Science and Technology Park)	4,000
Construction and demolition waste	5,329,234
Other solid waste	39,463
Subtotal	**7,012,054**
Total Waste Shipped	**7,858,575**

Note: All wastes were shipped off-site for treatment and/or disposal. Wastes that were treated on-site and shipped off-site are included in the quantities of wastes shipped off-site. Waste treatment may increase waste quantity (e.g., adding inert material when treating waste through macroencapsulation within an outer container). Waste containers are included in the quantities of wastes shipped off-site, and some containers (e.g., containers with lead shielding for radiation protection) may increase the quantity significantly.

Table 3-2. Waste recycled, 2021

Recycle Category	Waste Recycled (pounds)
Regulated or Chemical Waste Recycled	
Batteries	54,653
Capacitors	1,140
Computer electronics	333,677
Lead	29,914
Light bulbs	6,720
Toner and ink cartridges	101,155

Recycle Category	Waste Recycled (pounds)
Used oil	28,649
Subtotal	**555,908**
Commercial, Construction, and Demolition Solid Waste Recycled	
Asphalt/concrete	25,736,760
Batteries	0
Cardboard	310,268
Carpet	9,750
Chairs	49,240
Compost (food, green waste, paper, and plywood)	246,272
Food grease	135,768
Metals	1,300,965
Nitrile gloves	400
Paper (mixed and white)	124,153
Plastics	38,218
Three-dimensional printer cartridges	12,600
Tires	0
Wood	311,400
Subtotal	**28,275,794**
Total Waste Recycled	**28,831,702**

3.5.1 Waste Management Activities in 2021

Waste management takes place at the following locations: the Auxiliary Hot Cell Unit, the Hazardous Waste Handling Unit, the seven Manzano Storage Bunkers, the Radioactive and Mixed Waste Management Unit, the Solid Waste Collection and Recycling Center, and the Thermal Treatment Unit.

At each location, wastes are tracked, inspected, and managed at all times to protect human health and the environment. Wastes are not disposed of at SNL/NM. Waste management activities at individual units during 2021 are summarized as follows:

- At the Auxiliary Hot Cell Unit, mixed and radioactive wastes were generated and stored.
- At the Hazardous Waste Handling Unit, hazardous and other regulated wastes were screened, sorted, repackaged, and stored.
- At the Manzano Storage Bunkers, hazardous, mixed, radioactive, and solid wastes were stored and repackaged. Five of the seven bunkers are included in the RCRA Facility Operating Permit; hazardous and mixed waste management activities are limited to these five bunkers.
- At the Radioactive and Mixed Waste Management Unit, hazardous, mixed, and radioactive wastes were screened, sorted, repackaged, stored, and treated. Wastes were treated by one or more of the following methods: solidification and stabilization, chemical deactivation and neutralization, macroencapsulation, detonation inside a portable boom box, or physical treatment (volume reduction).
- At the Solid Waste Collection and Recycling Center, commercial waste was screened prior to shipment off-site for disposal. Other solid wastes and recyclable materials were collected and processed for shipment off site.
- At the Thermal Treatment Unit, small quantities of unique explosive hazardous waste generated by research and test activities at an adjacent facility were treated on-site.

3.5.2 Hazardous and Mixed Waste Permits in 2021

NMED has issued two permits for hazardous and mixed waste management activities, post-closure care, and long-term monitoring and maintenance at SNL/NM: the RCRA Facility Operating Permit and the Chemical Waste Landfill Post-Closure Care Permit.

RCRA Facility Operating Permit

The following units and activities are subject to the RCRA Facility Operating Permit:

- Auxiliary Hot Cell Unit
- Corrective Action Management Unit (post-closure care)
- Hazardous Waste Handling Unit
- Manzano Storage Bunkers (five)
- Radioactive and Mixed Waste Management Unit
- Solid Waste Management Units and Areas of Concern for which Corrective Action is Complete (long-term monitoring and maintenance)
- Thermal Treatment Unit

The RCRA Facility Operating Permit was modified once during 2021 as follows:

- The contingency plan for emergency response at each hazardous and mixed waste management unit was modified to update the names and contact information in the rosters of personnel who can serve as emergency coordinators. The change was effective February 22, 2021.

A request to modify the RCRA Facility Operating permit was submitted on December 21, 2021. The modification request proposes specific changes to the Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan, which is incorporated by reference into Permit Attachment M "Long-Term Monitoring and Maintenance Plan for Solid Waste Management Units and Areas of Concern Granted Corrective Action Complete with Controls." The Mixed Waste Landfill is Solid Waste Management Unit 76. The intent of the proposed changes is to optimize soil vapor, groundwater, radon, and tritium monitoring; these changes require regulatory approval.

Chemical Waste Landfill Post-Closure Care Permit

The Chemical Waste Landfill post-closure care activities are subject to the Chemical Waste Landfill Post-Closure Care Permit. An application to renew this permit was submitted on December 1, 2020.

3.5.3 Hazardous Waste

Hazardous waste generated at SNL/NM includes a wide variety of wastes from research and testing, together with larger quantities of wastes from decontamination and demolition, production, maintenance, and support operations, including waste management activities. Hazardous wastes that cannot be recycled or treated on-site are sent to off-site facilities for treatment, as needed, before disposal at permitted off-site facilities. Applicable regulations for hazardous waste handled at SNL/NM are listed in Chapter 10.

Certain types of explosives waste generated at SNL/NM are treated at the Radioactive and Mixed Waste Management Unit or the Thermal Treatment Unit. Explosives waste is generally managed at the point of generation until it is shipped to an off-site facility for treatment in accordance with regulatory requirements.

In accordance with Section 2.5 of the RCRA Facility Operating Permit, DOE and Sandia personnel annually certify that there is a "program in place to reduce the volume and toxicity of hazardous waste generated by the facility's operation to the degree determined by the Permittee to be economically practicable" at SNL/NM. Many types of hazardous waste are recycled where feasible. Recycled hazardous waste includes various batteries, silver compounds, mercury compounds, lamps, capacitors, and toxic metals such as lead. Sandia personnel investigate and implement waste minimization efforts with support and technical assistance from Materials Sustainability and Pollution Prevention Program personnel (see Section 3.4). Hazardous and mixed waste minimization activities are described in an annual report to NMED (SNL/NM 2021b), which is available to the public in hard copy at the University of New Mexico's Zimmerman Library. An index of the RCRA-related documents that are available in the Information Repository can be found at Sandia RCRA Facility Operating Permit Information Repository Index.

3.5.4 Radioactive Waste and Mixed Waste

DOE and Sandia personnel manage low-level radioactive waste and low-level radioactive mixed waste that is generated through a variety of processes, including production, research, decontamination and demolition, and waste management activities. DOE and Sandia personnel also manage transuranic and mixed transuranic wastes that have been generated through research and waste management activities. High-level radioactive waste is not generated at SNL/NM. During 2021, legacy wastes (wastes originally generated between 1990 and 1998) were also managed at SNL/NM.

Low-level radioactive waste generally consists of laboratory waste, debris from maintenance activities, debris from decontamination and demolition activities, and personal protective equipment. Low-level radioactive waste is contaminated primarily with one or more isotopes of americium, cesium, cobalt, plutonium, strontium, thorium, tritium, and/or uranium. Plutonium and americium in low-level radioactive waste are below the activity level designated for transuranic waste.

Transuranic waste may derive from sealed instrument sources, research, decontamination and demolition waste, personal protective equipment, and/or laboratory waste. The radioactive components in transuranic waste are generally americium, curium, neptunium, and/or plutonium.

Low-level radioactive mixed waste and mixed transuranic waste generally consist of inorganic debris and radioactive metallic objects with hazardous waste constituents and include wastes that have been treated to meet hazardous waste treatment standards. The radioactive components of low-level radioactive mixed waste and mixed transuranic waste are similar to those in low-level radioactive waste or transuranic waste.

All radioactive waste and mixed waste generators are required to contact Radioactive Waste Program personnel to obtain approval before generating waste. This promotes waste minimization and allows a pathway to be developed for waste treatment and disposal before the waste is generated. Radioactive wastes typically are shipped to off-site facilities within one year but may remain on-site longer than one year, if necessary, to complete the process for acceptance at an off-site facility and/or to achieve full utilization of transport vehicles.

Sandia personnel manage mixed waste that is subject to the Federal Facility Compliance Order (NMED 1995). The compliance requirements include: (1) deadlines for processing and/or disposing of various types of waste as specified in the current site treatment plan (SNL/NM 2021d) and (2) instructions for providing an annual update of activities and a current inventory of stored waste still on-site. During 2021, DOE and Sandia personnel met all regulatory deadlines, shipped no mixed transuranic waste to the Waste Isolation Pilot Plant for disposal, and provided an annual update of mixed waste activities during the previous year (SNL/NM 2021d). During 2021, Sandia personnel managed 1.64 cubic meters of mixed transuranic waste that was subject to the Federal Facility Compliance Order. Table 10-1 lists the quantities of mixed waste subject to the Federal Facility

Compliance Order at the end of fiscal year 2021. These wastes are subject to a site treatment plan compliance deadline of December 31, 2024.

3.5.5 Other Regulated Waste

Other regulated waste types at SNL/NM are managed in accordance with applicable regulatory requirements.

Screening solid waste is not a regulatory requirement, but it is a best management practice that Sandia personnel follow to prevent prohibited materials from inadvertently being sent to a landfill.

Industrial Solid and Special Wastes

Industrial solid waste and special waste include a wide variety of wastes generated from research and testing, production, maintenance and support, decontamination and demolition, and waste management activities. Wastes that cannot be recycled or treated on-site are sent to off-site facilities for treatment as needed before disposal at permitted off-site facilities. Many categories of nonhazardous waste are recycled, including alkaline batteries, fluorescent lamps, oils, and ballasts not containing PCBs. Waste minimization efforts are also applicable to nonhazardous waste, as discussed in Section 3.4 and Section 3.7.

Polychlorinated Biphenyl Wastes

PCBs are a class of organic chemicals that were used widely in the past in industrial applications due to their physical and chemical properties. PCBs were used in dielectric fluids (e.g., fluids in transformers or capacitors), hydraulic fluids, and other applications requiring stable, fire-retardant materials. The domestic production and distribution of PCBs was banned in 1979, and their use continues to be phased out.

Most PCBs and PCB-containing equipment at SNL/NM have been identified and replaced. There are currently no known PCB-containing items remaining in use that require tracking per regulations. Former locations of electrical transformers since removed from service will undergo future remediation. Electrical equipment (e.g., capacitors and light ballasts) are evaluated for PCBs when taken out of service. Table 3-1 summarizes the PCB waste shipped in 2021.

Asbestos Wastes

Asbestos-containing materials are present in older buildings, and abatement is ongoing. Asbestos-containing material is only removed when it presents an inhalation hazard or the building is slated to be torn down or renovated. Building materials containing asbestos are present in floors, ceilings, roofing tile, certain types of insulation, and other fire-retardant construction materials; these are typical asbestos wastes generated during abatement in buildings. Typical asbestos waste generated from equipment abatement is found in fume hoods, ovens, and cable insulation. In instances where laboratory equipment has asbestos-containing material in good condition and in a nonfriable form (which poses no inhalation risk), these items may remain in service or be redistributed through the Property Management and Reapplication Department. Table 3-1 summarizes the quantities of asbestos waste shipped in 2021.

3.5.6 Waste Management Program Results

Representatives of the NMED Hazardous Waste Bureau performed two no-notice hazardous waste compliance evaluation inspections of the entire SNL/NM site during 2021. One inspection was in May, and one was in December.

The fiscal year 2021 inspection was held May 17–19, 2021, and a notice of violation was issued, which is a DOE reportable occurrence (Chapter 2). The fiscal year 2022 inspection took place December 7–9, 2021, and results of the inspection are pending.

Spider wasp *(Pompilidae)* on a desert willow *(Chilopsis linearis)*

3.6 Environmental Restoration Operations

The Environmental Restoration Project (now Environmental Restoration Operations) was created under the DOE Office of Environmental Management to identify, assess, and remediate sites potentially contaminated by past spill, release, or disposal activities in accordance with RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984. Hazardous and Solid Waste Amendments requirements apply to environmental restoration sites that include solid waste management units or areas of concern. A solid waste management unit is any unit "from which hazardous constituents might migrate, irrespective of whether the units were intended for the management of solid and/or hazardous waste" (EPA 1993).

Areas of concern, which are not regulated as solid waste management units, were not identified in the initial list of sites at SNL/NM when Hazardous and Solid Waste Amendments Module of Permit NM5890110518-1 was issued in 1993 (EPA 1985); however, NMED identified these areas as requiring investigation (SNL/NM 1996). Later modifications to Permit NM5890110518-1 included the addition of areas of concern and other revisions to the list of solid waste management units (e.g., newly identified sites). Permit NM5890110518-1 expired in August 2002 but remained in effect until NMED issued the RCRA Facility Operating Permit, which became effective February 2015 (NMED 2015). The current complete list of solid waste management units and areas of concern at SNL/NM is included in the RCRA Facility Operating Permit.

Sandia and the DOE entered a "Compliance Order on Consent"with the NMED pursuant to the New Mexico Hazardous Waste Act, NMSA 1978, § 74-4-10 and New Mexico Solid Waste Act, NMSA 1978, § 74-9-36(D) to address specific requirements for nitrate and perchlorate constituents. The Compliance Order on Consent became effective in 2004 (NMED 2004) and governs investigation and corrective action requirements at SNL/NM. In general, the Compliance Order on Consent will terminate upon receipt of written notice by the NMED that the terms, with the exception of record preservation, have been satisfactorily completed. Sections of the Compliance Order of Concent on record preservatiton, State's covenant not to sue, and State's reservation of rights will survive the termination as an agreement between the parties..

3.6.1 Waste Cleanup and Site Closures

The initial identification of environmental restoration sites was completed in 1987. At that time, 117 sites were identified in the initial *Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment* (DOE/AL 1987); those sites were also identified in subsequent years and were incorporated into the list of sites that were subject to the RCRA corrective action requirements in Hazardous and Solid Waste Amendments Module of Permit NM5890110581-1 (EPA 1993).

Since 1993, additional sites (including those certified in the *Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment*), potential sites, or individual historical activities have been identified for investigation. In 1992, the Environmental Restoration Project was officially launched to implement assessment and remediation activities for sites that had been contaminated or potentially contaminated because of past Sandia operations. In addition to the SNL/NM sites, other Sandia sites included in the original scope of Environmental Restoration Operations were Sandia National Laboratories, California; Kaua'i Test Facility, Hawai'i; and Tonopah Test Range, Nevada. There were also a few miscellaneous sites located in other areas nationally and internationally.

All corrective action complete proposals and Class 3 permit modifications are available for review at the University of New Mexico Zimmerman Library.

DOE and Sandia personnel propose environmental restoration sites to NMED for Corrective Action Complete status when the site investigations and, if necessary, remediations have been completed and the results indicate the site to be at acceptable levels of risk to human health and the environment. NMED determines whether to confer Corrective Action Complete status.

After NMED grants Corrective Action Complete status to an environmental restoration site, DOE and Sandia personnel submit a request for a Class 3 modification to the RCRA Facility Operating Permit to document the status through two steps: (1) remove the site from the list of solid waste management units and areas of concern requiring corrective action and then (2) add the site to a list of solid waste management units and areas of concern for which corrective action is complete. Risk to human health and the environment is calculated for sites with residual contamination according to EPA and NMED guidelines. The remaining level of contamination and the appropriate land use category (i.e., industrial, residential, or recreational use) are combined with the available information and conceptual model for each site to determine the risk and whether site controls are needed. Solid waste management units and areas of concern requiring controls present a higher level of risk to human health and the environment.

All corrective action complete proposals and Class 3 permit modifications are available in hard copy for review at the University of New Mexico Zimmerman Library.

The RCRA Facility Operating Permit currently lists 317 solid waste management units and areas of concern at SNL/NM. Many of these include multiple smaller sites that may be renamed and tracked separately if warranted by risk and controls needed after corrective action is complete. The current status of the 317 solid waste management units and areas of concern are summarized as follows:

- Solid waste management units and areas of concern for which corrective action is complete and controls are not required (286 sites)
- Solid waste management units and areas of concern for which corrective action is complete and controls are required (25 sites)
- Solid waste management units and areas of concern for which corrective action is required (6 sites)

The solid waste management units and areas of concern that require corrective action are as follows:

- Three solid waste management units at active test facilities have potential soil contamination that will be evaluated at the end of their test operations: SWMU 83, SWMU 84, and SWMU 240.
- Three groundwater areas of concern require final remedies through public input and NMED process: TA-V Groundwater (TAVG), Tijeras Arroyo Groundwater (TAG), and Burn Site Groundwater (BSG).

3.6.2 Groundwater Monitoring at Areas of Concern

In 2021, routine groundwater samples were collected for the three groundwater areas of concern (TAVG, TAG, and BSG). A summary of activities and results follows. Additional information can be found in Appendix A, "Summary of Groundwater Monitoring in 2021." Details of all the groundwater monitoring conducted at SNL/NM can be found in the *Annual Groundwater Monitoring Report, Calendar Year 2021* (SNL/NM 2022a), which documents the results of all groundwater monitoring activities for 2021. The report is available at Sandia Environmental Reports.

Groundwater samples were analyzed for the following parameters:

- TAVG wells—Target Analyte List metals (plus uranium), dissolved metals, inorganics (including nitrate plus nitrite and major anions), total alkalinity, volatile organic compounds, 1,4-dioxane, gross alpha, gross beta, and selected radionuclides
- TAG wells—Target Analyte List metals (plus uranium), inorganics (including nitrate plus nitrite and major anions), total alkalinity, volatile organic compounds, 1,4-dioxane, gross alpha, gross beta, and selected radionuclides
- BSG wells—Target Analyte List metals, inorganics (including nitrate plus nitrite, and major anions), total alkalinity, volatile organic compounds, diesel range organics, gasoline range organics, high explosive compounds, gross alpha, gross beta, and selected radionuclides
- Groundwater Monitoring Program wells—Target Analyte List metals (plus uranium), mercury, inorganics (including nitrate plus nitrite, major anions, and total cyanide), total phenols, total alkalinity, volatile organic compounds, total organic halogens, high explosive compounds (at select wells), gross alpha, gross beta, and selected radionuclides

For the TAVG area of concern, 17 monitoring wells were sampled in 2021. Several analytical results exceeded the maximum contaminant levels for trichloroethene and nitrite plus nitrate.

- Trichloroethene exceeded the maximum contaminant level of 5 μg/L in three wells with a maximum concentration of 15.2 μg/L.
- Nitrite plus nitrate exceeded the maximum contaminant level of 10 mg/L in three wells with a maximum concentration of 13.9 mg/L.

For the TAG area of concern, 21 monitoring wells were sampled in 2021.

- For the perched groundwater system, the nitrate plus nitrite concentration exceeded the nitrate maximum contaminant level (10 mg/L) at six wells with the maximum being 23.0 mg/L. None of the wells screened in the regional aquifer exceeded the maximum contaminant level; the maximum nitrate plus nitrite concentration was 4.03 mg/L. One monitoring well was screened in the groundwater merging zone between the perched aquifer and the regional aquifer; this well had a maximum nitrate plus nitrite concentration of 31.7 mg/L.
- Tetrachloroethene exceeded the maximum contaminant level (5 μg/L) at one well in the perched groundwater system with a maximum concentration of 9.65 μg/L. Trichloroethene exceeded the maximum contaminant level (5 μg/L) at one well in the perched groundwater system with a maximum trichloroethene concentration of the perched groundwater system of 18.5 μg/L. The maximum trichloroethene concentration in the regional aquifer exclusive of the merging zone well was 0.580 J μg/L. In the merging zone above the regional aquifer, trichloroethene was not detected (< 0.300 μg/L).

For the BSG area of concern, 14 wells were sampled in 2021. Nitrate plus nitrite exceeded the maximum contaminant levels in five wells, with a maximum concentration of 39.8 mg/L. All other analytical results for groundwater samples from the three areas of concern were below established maximum contaminant levels.

A *perched aquifer* is a body of groundwater that is separated from an underlying body of groundwater by intervening unsaturated earth materials.

Field quality control samples associated with sampling events at the areas of concern included duplicate environmental, equipment blank, field blank, and trip blank samples.

3.7 Long-Term Stewardship Program

The Long-Term Stewardship Program is designed to protect human health and the environment from hazards associated with residual contamination at legacy sites and to minimize environmental liability by ensuring compliance with the environmental requirements in multiple NMED permits. Stewardship of legacy sites also protects natural and cultural resources from hazards associated with residual radioactivity and hazardous contamination.

Long-Term Stewardship Program personnel perform the following:

- Post-closure care for the Chemical Waste Landfill (including groundwater monitoring to satisfy post-closure care permit requirements)
- Post-closure care for the Corrective Action Management Unit (including leachate collection and vadose zone monitoring to satisfy RCRA Facility Operating Permit requirements)
- Long-term monitoring and maintenance for the Mixed Waste Landfill (including groundwater monitoring to satisfy RCRA Facility Operating Permit requirements)
- Long-term monitoring and maintenance for solid waste management units (other than the Mixed Waste Landfill) with Corrective Action Complete with Controls status (to satisfy RCRA Facility Operating Permit requirements)
- Sampling for the Groundwater Monitoring Program (to satisfy the Compliance Order on Consent, Section IV, "Background" (NMED 2004) and DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting*, for groundwater surveillance)

Program personnel prepare annual reports for NMED on each of the post-closure care and long-term monitoring and maintenance sites.

Groundwater sampling results are compared with EPA maximum contaminant levels for drinking water supplies and NMED maximum allowable concentrations for human health standards of groundwater as promulgated by the New Mexico Water Quality Control Commission. Field quality control samples associated with sampling events included duplicate environmental, equipment blank, field blank, and trip blank samples.

Groundwater levels are measured in approximately 100 wells on a quarterly basis. Water-level data are used to generate a regional water table elevation contour map from which groundwater flow directions can be obtained. Groundwater elevation tables, hydrographs, and contour maps derived from the data are provided in the *Annual Groundwater Monitoring Report, Calendar Year 2021* (SNL/NM 2022a).

3.7.1 Chemical Waste Landfill Post-Closure Care

The Chemical Waste Landfill is a 1.9-acre remediated hazardous waste landfill in the southeastern corner of TA-III undergoing post-closure care. From 1962 until 1985, the Chemical Waste Landfill was used for the disposal of hazardous, radioactive, and mixed waste; from 1981 through 1989, it was used as a hazardous waste drum storage facility. From 1997 to 2003, the Chemical Waste Landfill was remediated through a voluntary corrective action program, including the extraction of organic soil vapor and the complete excavation of waste. An at-grade evapotranspirative cover was installed in September 2005. In June 2011, NMED approved closure of the Chemical Waste Landfill (NMED), and the Chemical Waste Landfill Post-Closure Care Permit (NMED 2009) took effect. An application to renew the post-closure care permit was submitted to the NMED in December 2020. Until the permit renewal process is completed, the post-closure care permit remains in effect. The post-closure care permit defines all post-closure requirements for the Chemical Waste Landfill, including groundwater monitoring.

The groundwater monitoring network at the Chemical Waste Landfill consists of four wells. In 2021, semiannual groundwater monitoring was performed in January and July in accordance with post-closure care permit requirements. Groundwater samples were analyzed for volatile organic compounds (including trichloroethene), nickel, and chromium. January and July results were consistent with previous years; trichloroethene was the only volatile organic compound detected. No analytes were detected at concentrations exceeding EPA maximum contaminant levels or post-closure care permit-defined hazardous concentration limits.

In addition to semiannual groundwater monitoring, the post-closure care permit requires other monitoring, inspection, maintenance, and repair activities. Inspections conducted in 2021 confirm that the Chemical Waste Landfill evapotranspirative cover was in good condition, evenly covered by native perennial grasses, and performing as designed. Volatile organic compound soil-vapor-monitoring continues to confirm that the residual volatile organic compound soil vapor plume is stable, slowly dissipating through diffusion, and not a threat to groundwater. All post-closure care permit-required activities for 2021 are documented in the *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2021* (SNL/NM 2022b).

3.7.2 Corrective Action Management Unit Post-Closure Care

The Corrective Action Management Unit, a containment cell located near the Chemical Waste Landfill, holds treated soils generated from the Landfill Excavation Voluntary Corrective Measure of the Chemical Waste Landfill. Long-Term Stewardship Program personnel conduct post-closure care for the Corrective Action Management Unit in accordance with the RCRA Facility Operating Permit issued on January 27, 2015 (NMED 2015), having an effective date of February 26, 2015.

The Corrective Action Management Unit containment cell consists of engineered barriers, including a final cover system with a bottom liner system, a leachate collection system, and a vadose zone monitoring system. The Corrective Action Management Unit monitoring system, which provides information on soil conditions under the containment cell for early detection of leaks, consists of three monitoring subsystems: a primary subliner, a vertical sensor array, and the Chemical Waste Landfill sanitary sewer line. All three monitoring subsystems are monitored quarterly for soil moisture content. The vertical sensor array and Chemical Waste Landfill sanitary sewer monitoring subsystems are sampled annually for volatile organic compound concentrations in the soil vapor at various depths.

The 2021 soil vapor monitoring results continue to show the edge of the residual soil vapor plume emanating from the nearby former Chemical Waste Landfill. This is consistent with the conceptual model of the Chemical Waste Landfill residual soil vapor plume (SNL/NM 2004). Volatile organic compound concentrations at the vertical sensor array monitoring subsystem locations continue to correlate with seasonal soil temperature variations, increasing when the soil temperature is warmer and decreasing when the soil temperature is cooler. The volatile organic compound concentrations are not attributed to the material in the Corrective Action Management Unit containment cell. Baseline data for soil vapor and soil moisture were established between October 2003 and September 2004.

The 2021 soil moisture monitoring results remained consistent with the baseline data for the primary subliner and vertical sensor array monitoring subsystems with no trigger levels exceeded. Increases at four of the six Chemical Waste Landfill sanitary sewer monitoring subsystem locations are most likely related to a sanitary sewer line leak. Ongoing monitoring will be used to evaluate and determine any additional action if necessary. Soil moisture values did not exceed the trigger level at any Chemical Waste Landfill sanitary sewer monitoring subsystem locations.

Leachate is water that collects contaminants as it percolates through wastes, pesticides, or fertilizers. Leaching may occur in farming areas, feedlots, or landfills, and may result in hazardous substances entering surface water, groundwater, or soil.

In 2021, 219 gallons of leachate (a listed hazardous waste) were removed from the leachate collection system compared to 232 gallons of leachate removed in 2020. The evapotranspirative cover continues to meet successful revegetation criteria and is in excellent condition with even coverage of mature, native perennial grasses. Additional information on activities conducted—including inspection, monitoring, and sampling details—can be found in the *Corrective Action Management Unit Report of Post-Closure Care Activities Calendar Year 2021* (SNL/NM 2022c).

3.7.3 Mixed Waste Landfill Long-Term Monitoring and Maintenance

The Mixed Waste Landfill is a 2.6-acre solid waste management unit with Corrective Action Complete with Controls status. The Mixed Waste Landfill is in the north-central portion of TA-III and is undergoing long-term monitoring and maintenance. The site consists of two distinct disposal areas: the classified area (occupying 0.6 acres) and the unclassified area (occupying 2.0 acres). From March 1959 through December 1988, the Mixed Waste Landfill was used for the disposal of low-level radioactive, hazardous, and mixed waste. The Mixed Waste Landfill has undergone corrective action in accordance with two NMED orders (NMED 2004; NMED 2005) and 20.4.1.600 NMAC, *Hazardous Waste Management* (20.4.1 NMAC). The NMED Final Order for Corrective Action Complete with Controls (NMED 2016) became effective in March 2016, granting a Class 3 Permit Modification to reflect that the Mixed Waste Landfill is Corrective Action Complete with Controls. All controls are defined in the Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan, which was implemented upon NMED approval (NMED 2014) and included in the RCRA Facility Operating Permit.

The groundwater monitoring network at the Mixed Waste Landfill consists of four compliance wells and three wells monitored for groundwater elevation only. In 2021, semiannual groundwater monitoring was performed at the Mixed Waste Landfill in May and November in accordance with the Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan. All groundwater samples were analyzed for volatile organic compounds; metals including cadmium, chromium, nickel, and uranium; specific radionuclides by gamma spectroscopy; gross alpha and gross beta; tritium; and radon-222. Results were consistent with previous years, and no analytes were detected at concentrations exceeding EPA maximum contaminant levels or Long-Term Monitoring and Maintenance Plan-defined trigger levels.

In addition to semiannual groundwater monitoring, the Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan requires other monitoring, inspection, maintenance, and repair activities. Ongoing activities are documented comprehensively in a Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report submitted to NMED in June of each year. In 2021, the evapotranspirative cover was in excellent condition, evenly covered by mature native perennial grasses. Based on all monitoring, inspection, and maintenance results, the evapotranspirative cover and monitoring systems are functioning as designed, and site conditions remain protective of human health and the environment. Long-Term Monitoring and Maintenance Plan-required monitoring activities for 2021 are documented in the *Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, April 2021 through March 2022* (SNL/NM 2022d).

3.7.4 Solid Waste Management Units Granted Corrective Action Complete with Controls for Long-Term Monitoring and Maintenance

The Long-Term Monitoring and Maintenance Plan addresses measures that provide protection for human health and the environment from constituents of concern that are present at solid waste management units that have been granted Corrective Action Complete with Controls status per the RCRA Facility Operating Permit. Measures include surveilling site conditions and maintaining institutional controls.

All RCRA Facility Operating Permit-required physical inspections were completed in 2021. Replacement of weathered signs was performed at three solid waste management units in 2021. The administrative and physical institutional controls in place at the 24 solid waste management units are effectively providing continued protection for human health and the environment. The *Solid Waste Management Unit and Areas of Concern Annual Long-Term Monitoring and Maintenance Report for Calendar Year 2021* (SNL/NM 2022f) was submitted to NMED.

3.7.5 Groundwater Monitoring Program

Groundwater Monitoring Program personnel sampled 16 wells and one spring in 2021. Groundwater samples were analyzed for the following parameters: Target Analyte List metals (plus uranium), mercury, inorganics (including nitrate plus nitrite, major anions, and total cyanide), total phenols, total alkalinity, volatile organic compounds, total organic halogens, high explosive compounds (at select wells), gross alpha, gross beta, and selected radionuclides.

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

Fluoride was detected above the maximum allowable concentration in three groundwater wells and at Coyote Springs. Beryllium concentrations at Coyote Springs exceeded EPA maximum contaminant levels. The exceedance for each of these elements is attributable to the elevated natural concentrations associated with bedrock groundwater systems at the sampling locations. All other analytical results for groundwater samples were below established maximum contaminant levels. The 2021 water quality results for this sampling were consistent with results from past years.

Field quality control samples associated with these groundwater sampling programs included duplicate environmental, equipment blank, field blank, and trip blank samples.

Chapter 4. Terrestrial Surveillance Program

Gunnison's prairie dog (*Cynomys gunnisoni*)

OVERVIEW ■ Terrestrial Surveillance Program personnel collect soil, sediment, and vegetation samples, which are analyzed for radiological, nonradiological, and other site-specific constituents. Environmental dosimeters are used to measure ambient external gamma radiation levels.

Terrestrial Surveillance Program personnel collect environmental media (soil, sediment, and vegetation) samples on a calendar-year basis, which are analyzed for radiological constituents, as required. As a best management practice, samples are also collected to analyze metals and other site-specific constituents.

In addition to the environmental samples collected, ambient external gamma radiation levels are measured using environmental dosimeters. These surveillance activities are conducted at designated locations that are on-site, off-site, and around the perimeter of DOE fee-owned areas, leased property, and KAFB.

Environmental radiological surveillance began at SNL/NM in 1959 (SNL/NM 1973). Nonradiological surveillance sampling began in 1993 with the implementation of the Terrestrial Surveillance Program and included the collection of samples for metal analyses.

4.1 Regulatory Criteria

The Terrestrial Surveillance Program is designed to address DOE O 458.1, Change 4 (LtdChg), *Radiation Protection of the Public and the Environment,* which establishes standards and requirements to protect the public and the environment from undue risk from radiation associated with radiological activities under DOE control.

The Terrestrial Surveillance Program is also designed to satisfy Sandia's Environmental Management System objectives, and is certified to ISO 14001:2015. Reporting is done in accordance with DOE O 231.1B, Admin Change 1, *Environment, Safety and Health Reporting.*

4.2 Sample Locations and Media

Terrestrial Surveillance Program personnel use three sample location classifications: on-site, perimeter, and off-site.

Soil is loose, unconsolidated minerals 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.

The on-site sampling locations (Figure 4-1) are in areas of known contamination (such as solid waste management units), areas of potential release (sites with current outdoor testing activities), and/or areas where concentrations may be naturally elevated due to geologic conditions. The perimeter sample locations are situated around the boundaries of KAFB (Figure 4-1). The off-site sample locations are within a 25-mile radius of KAFB (Figure 4-2).

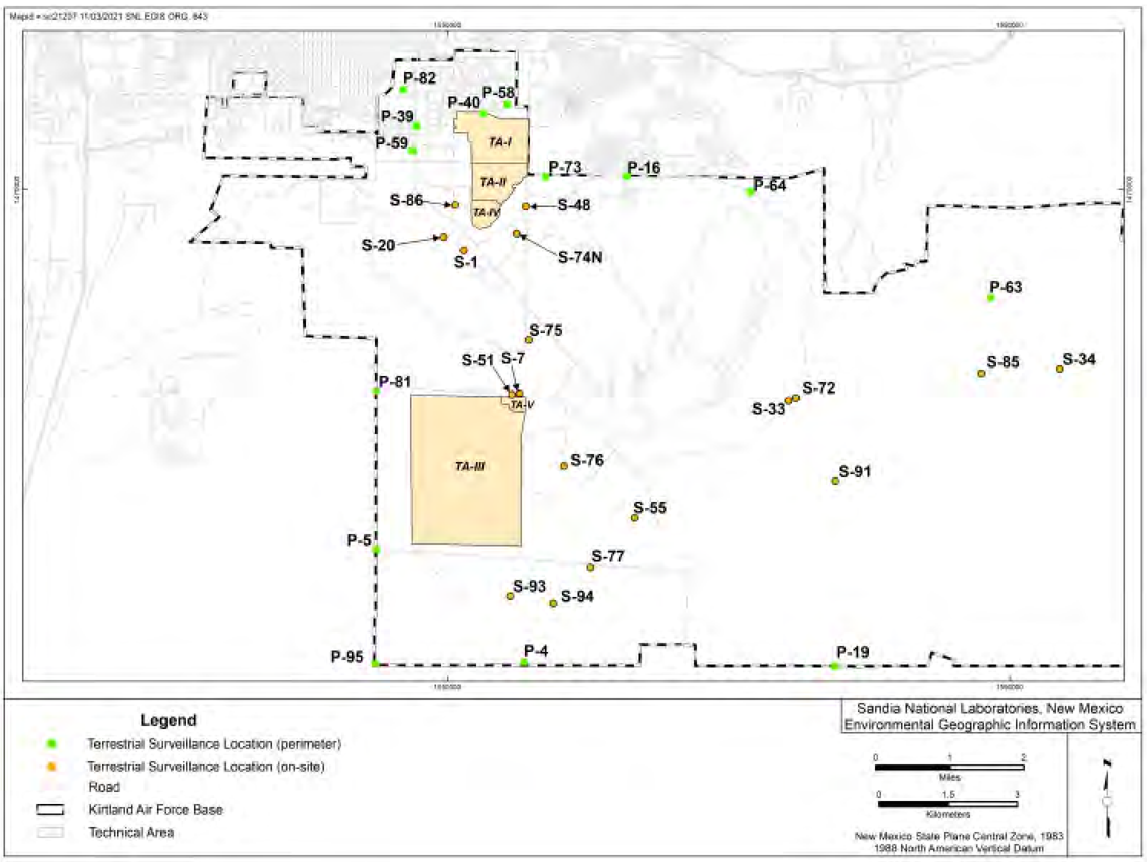


Figure 4-1. Terrestrial Surveillance Program on-site and perimeter sampling locations

The various environmental sample media that are collected include surface soil (less than two inches deep), arroyo and river sediment samples, and vegetation. Vegetation samples, which are collected from native grasses and small leafy plants, are used to monitor the potential uptake of radioactive and nonradiological materials from the soil. Environmental dosimeters, deployed and collected quarterly, are used to measure the cumulative ambient external radiation dose and to approximate the dose potentially received from natural and nonnatural sources. Table 4-1, Table 4-2, and Table 4-3 list the sampling locations, the type of media collected, and the analytical parameters sampled at the on-site, perimeter, and off-site locations, respectively.

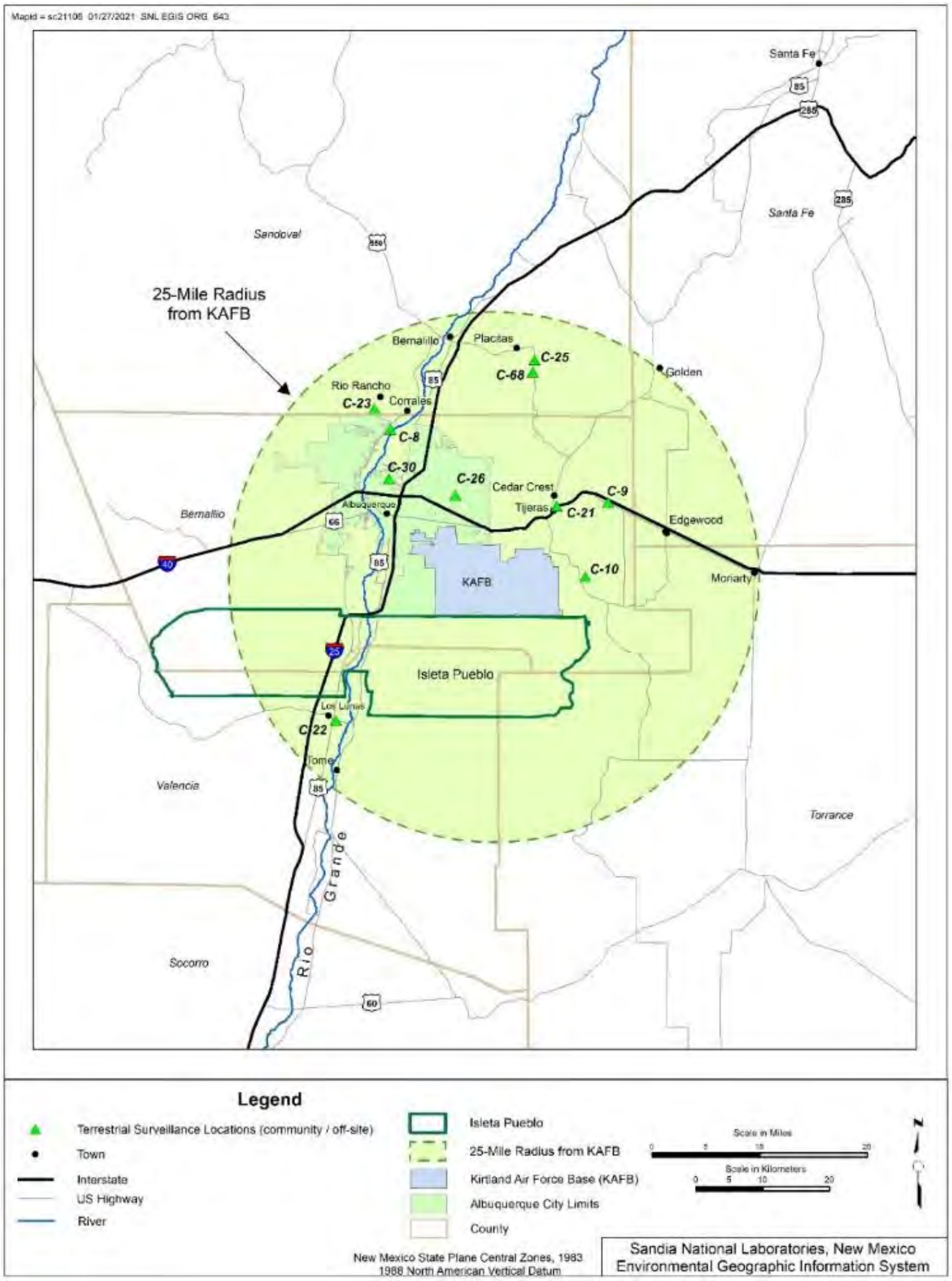


Figure 4-2. Terrestrial Surveillance Program off-site sampling locations

Table 4-1. On-site terrestrial surveillance locations, sample media, and parameters

Location Number	Sampling Location	Soil[a]	Sediment[a]	Vegetation[b]	Dosimeter[c]
S-1	Pennsylvania Avenue	X			X
S-6	TA-III (east of the water tower)	X		X	X
S-7	Unnamed arroyo (north of TA-V)				X
S-20	TA-IV (southwest)				X
S-33	Coyote Springs	X		X	
S-34	Lurance Canyon Burn Site	X		X	
S-45	Radioactive and Mixed Waste Management Unit, TA-III (northwest corner)	X		X	X
S-46	TA-II (south corner)	X[d]		X	X
S-48	Tijeras Arroyo (east of TA-II)				X
S-49	Near the Explosives Components Facility	X[d]		X	
S-51	TA-V (north of a culvert)	X		X	
S-53	TA-III (south of the Long Sled Track)	X[e]			
S-55	Large Melt Facility, Building 9939	X		X	
S-57	TA-IV, Building 970 (northeast corner)	X			
S-72	Arroyo del Coyote (midstream)		X		
S-74N	TA-IV, Tijeras Arroyo (midstream)		X		
S-75	Arroyo del Coyote (downstream)		X		
S-76	Thunder Range (north)	X[d]			
S-77	Thunder Range (south)	X[d]			
S-85	Arroyo del Coyote Cable Site		X		
S-86	Corner of Wyoming Boulevard and S Street	X[d]		X[d]	
S-90	TA-III Land Mine Test Site	X[f]			
S-91	Background Arroyo near SWMU 87		X[d]		
S-92	TA-III Classified Waste Landfill	X			
S-93	Thunder Range Explosives Test Area	X[f,g]			
S-94	Thunder Range (southeast of Range 5)	X[f,g]			

[a] Soil and sediment samples are collected annually (except as noted) and analyzed for terrestrial surveillance metals and radionuclides (including tritium).
[b] Vegetation samples are collected annually (except as noted) and analyzed for terrestrial surveillance metals and radionuclides (including tritium).
[c] Dosimeters are analyzed to determine the dose from ambient gamma radiation.
[d] Terrestrial surveillance metals are not included in the sample analysis.
[e] Perchlorate is included in the sample analysis.
[f] High explosive compounds are included in the sample analysis.
[g] Radionuclides and metals are not included in the sample analysis.

Table 4-2. Perimeter terrestrial surveillance locations, sample media, and parameters

Location Number	Sampling Location	Soil[a]	Sediment[a]	Vegetation[b]	Dosimeter[c]
P-4	Isleta Reservation gate	X		X	X
P-5	McCormick gate	X		X	X
P-16	Four Hills	X		X	X
P-19	U.S. Geological Survey Seismic Center gate	X			X
P-39	Northwest DOE complex				X
P-40	TA-I (northeast)				X

Location Number	Sampling Location	Soil[a]	Sediment[a]	Vegetation[b]	Dosimeter[c]
P-58	North KAFB housing	X		X	
P-59	Zia Park (southeast)	X			
P-60	Tijeras Arroyo (downstream)		X		
P-61	Albuquerque International Sunport	X			
P-63	No Sweat Boulevard	X			
P-64	North Manzano base	X			
P-73	Tijeras Arroyo (upstream)		X		
P-81	KAFB (west fence)	X			X
P-82	Commissary	X		X	
P-95	Southwest corner of KAFB	X			

[a] Soil and sediment samples are collected annually and analyzed for terrestrial surveillance metals and radionuclides (including tritium).
[b] Vegetation samples are collected annually and analyzed for terrestrial surveillance metals and radionuclides (including tritium).
[c] Dosimeters are analyzed to determine the dose from ambient gamma radiation.

Table 4-3. Off-site terrestrial surveillance locations, sample media, and parameters

Location Number[a]	Sampling Location	Soil[b]	Sediment[b]	Vegetation[c]	Dosimeter[d]
C-8	Rio Grande, Corrales Bridge (upstream)		X		
C-9	Sedillo Hill, Interstate 40	X		X	
C-10	Oak Flats	X		X	X
C-21	Bernalillo Fire Station 10, Tijeras				X
C-22	Los Lunas Fire Station				X
C-23	Rio Rancho Fire Station, 19th Avenue				X
C-25	Placitas Fire Station	X		X	X
C-26	Albuquerque Fire Station 9, Menaul Boulevard Northeast				X
C-30	Albuquerque Fire Station 6, Griegos Road Northwest				X
C-68	Las Huertas Creek		X		

[a] Off-site samples were previously called "community locations," thus the *C* label in the location number (maintained for the database).
[b] Soil and sediment samples are collected annually and analyzed for terrestrial surveillance metals and radionuclides (including tritium).
[c] Vegetation samples are collected annually and analyzed for terrestrial surveillance metals and radionuclides (including tritium).
[d] Dosimeters are analyzed to determine the dose from ambient gamma radiation.

4.3 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* (SNL/NM 2019).

Off-site laboratories 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* (SNL/NM 2020a). Samples were analyzed for the following parameters: specific metals, high explosive compounds, perchlorate, and radionuclides (including tritium), as specified in Table 4-1, Table 4-2, and Table 4-3. The specific metals list is referred to as terrestrial surveillance metals and includes the following: aluminum, antimony, arsenic, beryllium, cadmium, chromium (total), copper, iron, lead, magnesium, nickel, selenium, silver, thallium, uranium (total), and zinc.

In 2021, the use of optically stimulated luminescent dosimeters was employed to measure ionizing radiation. The dosimeters are issued and analyzed by an accredited off-site laboratory.

The 2021 dosimeter data is presented here, but trend analyses will not be performed until several more years of data are available. Optically stimulated luminescent dosimeters have been used since 2018.

Field quality control samples were collected and included duplicate environmental samples and equipment blank samples. These samples were prepared in accordance with applicable field operating procedures. Laboratory quality control samples are prepared and analyzed as specified in Chapter 9.

4.4 Data Analysis and Methodology

The statistical analysis methodology performed on soil, sediment, and vegetation sample results is being revised. Therefore, general statistics, population comparisons, and trend analyses were not conducted this year. However, results for samples collected in 2021 were compared to available reference values.

There are no regulatory limits with which to compare concentrations of radiological constituents found in surface soils, sediment, or vegetation.

Environmental dosimeter data may be compared to established natural background (terrestrial and cosmic) radiation levels in the Albuquerque area. Levels in the Albuquerque area are elevated when compared to much of the United States due to the higher elevation and the presence of radionuclides in the soil and bedrock. The local annual radiation dose from natural background sources (indoor radon not included) is 89 mrem (Mauro and Briggs 2005).

Analytical results for metals in soil and sediment samples may also be compared to values in the following references (presented in Table 4-4):

- Local and regional soil concentrations (Dragun and Chekiri 2005)
- NMED soil screening levels (NMED 2021)
- Trace elements in soil (Kabata-Pendias 2000)

Table 4-4. Comparison reference values for metals in soil

Analyte	NM Soil Concentrations[a]		NMED Soil Screening Levels[b]		Trace Elements in Soil[c]	
	Lower Limit (mg/kg)	Upper Limit (mg/kg)	Residential, Noncancer (mg/kg)	Industrial, Noncancer (mg/kg)	Lower Limit (mg/kg)	Upper Limit (mg/kg)
Aluminum	5,000	100,000	78,000	1,290,000	4,500	100,000
Antimony	0.2	1.3	31.3	519	0.25	0.60
Arsenic	2.5	19	13.0	208	0.1	30
Beryllium	1.0	2.3	156	2,580	0.04	2.54
Cadmium	ND	11	70.5	1,110	0.08	0.47
Chromium (total)	7.6	42	45,200	314,000	7.0	1,500
Copper	2.1	30	3,130	51,900	1.0	70
Iron	1,000	100,000	54,800	908,000	5,000	45,000
Lead	7.8	21	NA	NA	10	70

Analyte	NM Soil Concentrations[a]		NMED Soil Screening Levels[b]		Trace Elements in Soil[c]	
	Lower Limit (mg/kg)	Upper Limit (mg/kg)	Residential, Noncancer (mg/kg)	Industrial, Noncancer (mg/kg)	Lower Limit (mg/kg)	Upper Limit (mg/kg)
Magnesium	300	100,000	15,600,000	5,680,000	NA	NA
Nickel	2.8	19	1,560	25,700	5.0	150
Selenium	0.2	0.8	391	6,490	0.1	4.0
Silver	0.5	5.0	391	6,490	0.2	3.2
Thallium	NA	NA	0.78	13.0	0.02	2.8
Uranium (total)	NA	NA	234[d]	3,880[d]	0.30	10.7
Zinc	18	84	23,500	389,000	5.0	164

[a] Source: Dragun and Chekiri 2005.
[b] Source: NMED 2021.
[c] Source: Kabata-Pendias 2000.
[d] Refers to uranium (soluble salts).
NA = not available
ND = not detected

4.5 Terrestrial Surveillance Program Results in 2021

The following Terrestrial Surveillance Program activities occurred in 2021:

- The annual sampling of soil and sediment occurred in May 2021 at designated locations.
- The quarterly exchange (deployment and retrieval) of environmental dosimeters occurred at designated locations.

The analytical results for radiological parameters (including environmental dosimeters) and nonradiological parameters for the 2021 sampling events are provided in Appendix B, "Terrestrial Surveillance Analytical Results in 2021."

4.5.1 Radiological Results

Radiological analyses were performed on soil and sediment samples. In 2021, soil and sediment sample results for on-site locations were within historical ranges.

4.5.2 Dosimeter Results

Analysis of dosimeter data was performed to determine the average dose rates for the three location classifications.

The average dose rate summary statistics for 2021 are shown in Table 4-5. The average annual dose rates are below the local estimated value of 89 mrem from natural background sources (Mauro and Briggs 2005). The difference may be attributed to a variety of elevations, the proximity to bedrock, and the statistical nature of radioactivity.

Table 4-5. Dosimeter dose rate summary statistics by location classification, 2021

Location Classification	Number of Observations	Average (mrem/year)	Median (mrem/year)	Standard Deviation (mrem/year)	Minimum (mrem/year)	Maximum (mrem/year)
On-site	7	65	67	8.0	54	74
Perimeter	7	63	62	8.0	54	79
Off-site	7	62	66	12.6	43	76

4.5.3 Nonradiological Results

Nonradiological parameters include terrestrial surveillance metals, high explosive compounds, and perchlorate.

Metals

All metal results were compared to values referenced in Section 4.4 and provided in Table 4-4 and to results from previous years. In 2021, no sample results (soil and sediment) exceeded all on-site historical values or NMED soil screening levels.

High Explosive Compounds

Three on-site locations (S-90, S-93, and S-94; all soil samples) were analyzed for high explosive compounds (Figure 4-1). There were no detections above the method detection limit for any high explosive compounds.

Perchlorate

One on-site location (S-53; soil sample) was analyzed for perchlorate (Figure 4-1). The result was 0.091 J mg/kg. The J-qualified data indicates the result is an estimated value due to the lack of matrix-specific accuracy data. The estimated result is below the NMED soil screening level of 54.8 mg/kg for residential use (NMED 2021).

4.6 Additional Activities and Variances

Terrestrial Surveillance Program sampling in 2021 was conducted with the following variance: due to ongoing drought conditions, there was insufficient vegetation for collection at any of the designated locations.

Chapter 5. Air Quality Compliance and Related Programs

Sandia Mountains crest

OVERVIEW ■ Air quality personnel help Sandia operations maintain compliance with applicable air quality regulations and policies. Meteorological personnel provide decision support services, data, and analyses to all programs and operations that require meteorological information.

Air quality and meteorological monitoring and surveillance activities are conducted through the following programs:

- Air Quality Compliance Program (Section 5.1)
- Ambient Air Surveillance Program (Section 5.2)
- Meteorology Program (Section 5.3)
- Radionuclide NESHAP Program (Section 5.4)

5.1 Air Quality Compliance Program

In Bernalillo County, New Mexico, the City of Albuquerque Air Quality Program implements air quality regulations and standards established by EPA and the Albuquerque Bernalillo County Air Quality Control Board.

5.1.1 Stationary Sources

Stationary source registrations are required for sources that emit more than 2,000 pounds of any air contaminant per year or any amount of a hazardous air pollutant. Stationary source permits may be required for sources that have the potential to emit 10 pounds per hour or more or 25 tons per year or more of any single regulated air contaminant, 2 tons per year of a single hazardous air pollutant, or 5 tons per year of any combination of hazardous air pollutants. Permits may also be required for any equipment or process that is subject to federal New Source Performance Standards or NESHAPs. Permits include requirements for monitoring source emissions and maintaining records of operations to ensure compliance with regulations, emission limits, and other conditions of the permit. Regulated air contaminants include criteria pollutants and hazardous air pollutants. Criteria pollutants include carbon monoxide, lead, nitrogen oxide, ozone, particulate matter, and sulfur dioxide. DOE air quality permits and registrations for SNL/NM stationary sources are presented in Table 10-1.

Most of the permitted stationary sources at SNL/NM are boilers used for comfort heat and emergency generators. Criteria pollutant emissions from combustion are monitored based on operation and/or fuel use. As required, *CY2021 Stationary Source Emissions Inventory Report for Sandia National Laboratories* (DOE/NNSA/SFO 2021a), was submitted to the City of Albuquerque Air Quality Program. Emissions data for permitted and registered stationary sources in 2021 are provided in Table 5-1.

Table 5-1. Permitted and registered stationary source emission data, 2021

Carbon Monoxide	Hazardous Air Pollutant	Nitrogen Oxide	Particulate Matter with a Diameter ≤ 10 µm	Sulfur Dioxide	Volatile Organic Compound
11.63	8.88	8.05	1.56	0.10	3.26

Note: All units are in tons per year.

Site-Wide Volatile Organic Compound and Hazardous Air Pollutant Emissions

Site-Wide Chemical Permit 1901-M1 includes all hazardous air pollutant and volatile organic compound emissions from general laboratory research and development uses. During 2021, potential emissions were 8.88 tons of hazardous air pollutants and 3.26 tons of volatile organic compounds. These emissions were within permitted limits.

Title V

DOE submitted a Title V Operating Permit application (DOE 2002) to the City of Albuquerque on March 1, 1996, since potential emissions from Sandia operations were greater than 100 tons per year of criteria pollutants annually. An application update was submitted in 2002. The City of Albuquerque has not issued the final permit and a new updated application is currently being negotiated with the City of Albuquerque.

Greenhouse Gas Emissions

On May 13, 2010, EPA issued a final rule that addressed greenhouse gas emissions from stationary sources under the Clean Air Act permitting programs. This final rule sets thresholds for greenhouse gases that define when permits under the New Source Review Prevention of Significant Deterioration and Title V Operating Permit programs are required for new and existing industrial facilities.

EPA defines a *greenhouse gas emission* as being 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.

Major stationary sources that emit at least 100,000 tons per year of carbon dioxide equivalent will be required to include greenhouse gases in their Title V permit applications. The fugitive emissions are only included in the major source determination when the source belongs to a listed source category in Section 302(j) of the Clean Air Act. Sandia emissions are not from a listed source category, and stack greenhouse gas emissions are much less than 100,000 tons per year of carbon dioxide equivalent.

Greenhouse gas emissions are calculated on a fiscal year basis. During fiscal year 2021, Sandia operations emitted a total of 175,848 tons of carbon dioxide equivalent (including fugitive greenhouse gas emissions).

In 2009, EPA issued the Mandatory Greenhouse Gas Reporting Rule (codified in 40 CFR 98, *Mandatory Greenhouse Gas Reporting*), which requires reporting of greenhouse gas data from specific categories of large sources and from suppliers that meet designated emissions thresholds. Sandia activities resulting in greenhouse gas emissions were below reporting thresholds in 2021.

Sandia's annual site sustainability plan documents greenhouse gas reductions, projected performance, and current status (see Chapter 2).

As of October 1, 2021, EPA began implementation of the hydrofluorocarbon phasedown requirements in the American Innovation and Manufacturing Act of 2020, which was enacted as Section 103 in Division S, Innovation for the Environment, of the Consolidated Appropriations Act, 2021. The Act provides EPA new authority to address the phasedown of listed hydrofluorocarbons in consumption and production to 15 percent of a 2011–2013 baseline by 2036. Hydrofluorocarbons are greenhouse gases with very high global warming potentials and are used as refrigerants, in fire-suppression systems, and in certain scientific equipment. More information on the American Innovation and Manufacturing Act can be found at EPA Final Rule – Phasedown of Hydrofluorocarbons.

Hydrofluorocarbons are used at SNL/NM in applications such as refrigeration, semiconductor manufacturing, and material analysis.

5.1.2 Stratospheric Ozone Protection

Title VI of the Clean Air Act Amendments of 1990 required EPA to establish regulations to phase out the production and consumption of ozone-depleting substances. Ozone-depleting substances are defined as chlorofluorocarbons, hydrochlorofluorocarbons, and other halogenated chemicals that have been found to contribute to the depletion of the stratospheric ozone layer. EPA has established regulations in 40 CFR 82, *Protection of Stratospheric Ozone*, which require the following: recycle ozone-depleting substances and other refrigerants when servicing equipment, establish requirements for recycling and recovering equipment, repair substantial leaks in refrigeration equipment containing more than 50 pounds of refrigerant, and establish safe disposal standards.

At SNL/NM, ozone-depleting substances are used for comfort cooling for some buildings and for some limited research and development applications. Halon is contained in some fire-suppression systems and fire extinguishers.

5.1.3 Vehicles

As required by 20.11.100 NMAC, *Motor Vehicle Inspection—Decentralized*, an annual vehicle inventory and inspection plan was submitted to the City of Albuquerque for applicable vehicles owned by Sandia.

5.1.4 Open-Burn Permits

As required by 20.11.21 NMAC, *Open Burning*, open-burn permits are required for the following activities:

- Treating explosives waste by open burning (hazardous waste treatment)
- Open burning or detonating explosives related to research and development activities (no limit)
- Detonating explosives aboveground (more than 20 pounds)
- Disposing of explosives by burning to avoid transport or handling hazards (no limit)
- Igniting rocket motors (greater than 4,000 pounds of fuel)

A list of 2021 permits can be found in Chapter 10.

5.1.5 Fugitive Dust

As required by 20.11.20 NMAC, *Fugitive Dust Control*, DOE obtains fugitive dust permits for each applicable Sandia construction project that will disturb more than three-quarters of an acre of soil. A list of 2021 permits is included in Chapter 10.

In April 2021, the Albuquerque-Bernalillo County Air Quality Program issued a post-inspection notification based on an April 1, 2021, inspection for failing to obtain a Fugitive Dust Control Permit prior to construction activities on the TA-IV Chilled Water Loop project. A notice of violation was issued in December 2021(see Table 2-2).

5.2 Ambient Air Surveillance Program

Ambient air is surveilled through a network of air-monitoring stations located on or near Sandia property (Figure 5-1). In fiscal year 2021, the stations monitored ambient air for particulate matter that has a diameter equal to or less than 2.5 micrometers ($PM_{2.5}$) and particulate matter that has a diameter equal to or less than 10 micrometers (PM_{10}).

Program activities are reported in this Annual Site Environmental Report on a fiscal-year basis unless otherwise noted (programs based on the fiscal year operate from October 1 through September 30, annually).

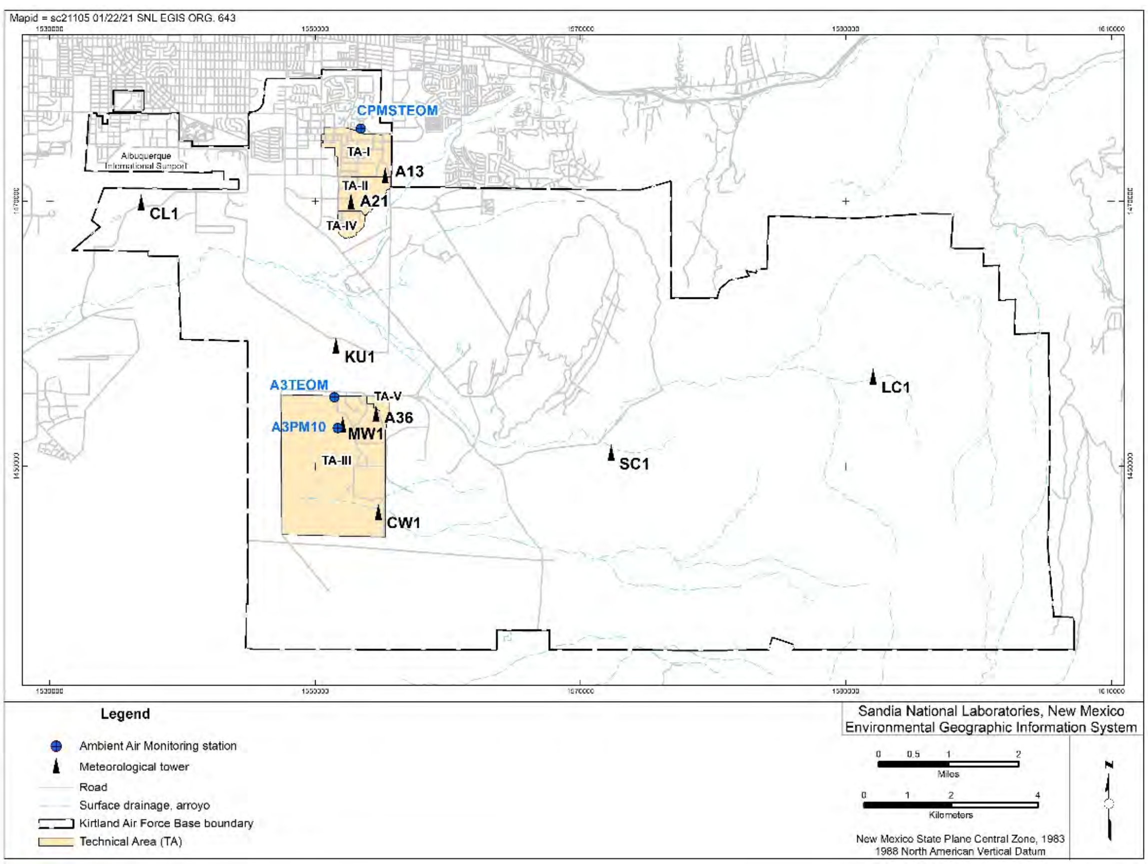


Figure 5-1. Clean air network of meteorological towers and ambient air-monitoring stations

EPA has delegated authority to the City of Albuquerque to monitor the ambient air in Bernalillo County in order to determine compliance with the National Ambient Air Quality Standards and New Mexico Ambient Air Quality Standards. The ambient air-monitoring data is essential to the City of Albuquerque Environmental Health Department for regulating stationary source emissions, issuing air permits, and complying with the National Ambient Air Quality Standards.

Ambient means that portion of the atmosphere, external to buildings, to which the general public has access.

Ambient air quality data collected by the City of Albuquerque is available at City of Albuquerque Air Quality Monitoring.

5.2.1 Monitoring Stations

Ambient air-monitoring stations used in fiscal year 2021 measured the following:

- $PM_{2.5}$ was measured at two monitoring locations (CPMSTEOM and A3TEOM). These particulates were measured continuously and recorded in hourly concentrations 24 hours a day, 365 days per year, contingent on equipment functionality. There were outages at both $PM_{2.5}$ monitors for several months, but operability resumed by late fiscal year 2021.
- PM_{10} was measured at one monitoring location (A3PM10). The air was sampled for a 24-hour period every quarter, contingent on equipment functionality. The PM_{10} monitor was not functioning for three quarters in 2021, but operability resumed by late fiscal year 2021.

5.2.2 Ambient Air-Monitoring Results for Fiscal Year 2021

Ambient air-monitoring data are presented here for fiscal year 2021. Laboratory data are available in Appendix C, "Ambient Air Surveillance Results in Fiscal Year 2021," and are summarized below.

Particulate Matter That Has a Diameter Equal to or Less than 2.5 Micrometers

The monthly and annual averages for one-hour $PM_{2.5}$ measurements in fiscal year 2021 are listed in Table 5-2.

Table 5-2. Monthly and annual averages for one-hour $PM_{2.5}$ measurements, fiscal year 2021

Sample Location	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Year Average
A3TEOM[a]	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	10.17	8.94	**9.56**
CPMSTEOM[b]	4.71	3.75	3.23	EM	EM	EM	EM	EM	EM	EM	EM	EM	**3.90**

Note: All units are in µg/m^3.

[a] The A3TEOM monitor was inoperable as of late first quarter in fiscal year 2021. Approximately 30 percent of all recorded data were ≤ 0, and therefore, were removed from monthly average calculations.

[b] CPMSTEOM data collection resumed August 10, 2021. Approximately 11 percent of all recorded data were ≤ 0, and, therefore, were removed from monthly average calculations.

EM = equipment malfunction

Particulate Matter That Has a Diameter Equal to or Less than 10 Micrometers

The highest monthly average PM_{10} concentration in fiscal year 2021 was 43.66 µg/m^3, which occurred in the second quarter of fiscal year 2021. The quarterly and annual averages for PM_{10} are provided in Table 5-3.

Table 5-3. Quarterly and annual averages for PM_{10}, fiscal year 2021

Sample Location	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year Average
A3PM10[a]	9.03	43.66	30.49	N/A	**27.73**

Note: All units are in µg/m³.
[a] This monitor malfunctioned during fourth quarter.

The PM_{10} samples are also analyzed for metals and radiological constituents, and the fiscal year 2021 averages are listed in Table 5-4.

Most of the radionuclides are either naturally occurring or are short-lived decay daughter products detected during analysis and are not emitted from Sandia sources.

Table 5-4. Average results of PM_{10} analysis, fiscal year 2021

Analyte	Units	Station A3PM10	Threshold Limit Value[a, b]
Aluminum	µg/m³	9.45E-02	2,000
Antimony	µg/m³	2.40E-04	500
Arsenic	µg/m³	DE	10
Barium	µg/m³	2.69E-03	50
Beryllium	µg/m³	DE	0.05
Cadmium	µg/m³	DE	10
Calcium	µg/m³	3.52E-01	2,000
Chromium	µg/m³	2.76E-03	10
Cobalt	µg/m³	9.15E-05	20
Copper	µg/m³	6.01E-02	1,000
Iron	µg/m³	1.09E-01	5,000
Lead	µg/m³	5.19E-04	150
Magnesium	µg/m³	4.90E-02	10,000
Manganese	µg/m³	3.05E-03	200
Nickel	µg/m³	2.83E-04	50
Potassium	µg/m³	5.46E-02	2,000
Selenium	µg/m³	6.13E-05	200
Silver	µg/m³	3.63E-04	10
Sodium	µg/m³	3.13E-02	5,000
Thallium	µg/m³	DE	100
Uranium	µg/m³	3.26E-06	200
Vanadium	µg/m³	4.37E-05	50
Zinc	µg/m³	2.42E-03	10
Actinium-228	pCi/m³	DE	100
Alpha, gross	pCi/m³	2.61E-03	0
Americium-241	pCi/m³	DE	NE
Beryllium-7	pCi/m³	2.68E-01	40,000
Beta, gross	pCi/m³	2.68E-02	0
Bismuth-212	pCi/m³	DE	700
Bismuth-214	pCi/m³	DE	2,000
Cesium-137	pCi/m³	DE	400
Cobalt-60	pCi/m³	DE	80
Lead-212	pCi/m³	DE	80

Analyte	Units	Station A3PM10	Threshold Limit Value[a, b]
Lead-214	pCi/m^3	DE	2,000
Neptunium-237	pCi/m^3	DE	0
Potassium-40	pCi/m^3	DE	900
Radium-223	pCi/m^3	DE	NE
Radium-224	pCi/m^3	DE	4
Radium-226	pCi/m^3	DE	1
Radium-228	pCi/m^3	DE	3
Sodium-22	pCi/m^3	DE	NE
Thorium-227	pCi/m^3	DE	0.7
Thorium-231	pCi/m^3	DE	NE
Thorium-234	pCi/m^3	DE	400
Uranium-235	pCi/m^3	DE	0.1
Uranium-238	pCi/m^3	DE	0.1

[a] Threshold limit values are guidelines and not legal standards; these guidelines help to control occupational health hazards (American Conference of Governmental Industrial Hygienists 2011).
[b] Quarter 1, 2, and 3 data presented; the monitor malfunctioned in quarter 4.
DE = data excluded due to undetected analyte, presumed false positives, or lack of blank and actual sample bona fide data
NE = not established

5.3 Meteorology Program

Meteorology Program personnel provide data (e.g., wind speeds, precipitation percentages, and lightning possibilities) to inform go/no go decisions for future tests and analyses of past weather conditions (including wind gusts, average wind speed, and total precipitation values) to all Sandia programs and operations that require atmospheric information, such as health and safety operations, emergency management and response, regulatory permitting and reporting processes, and general research and development activities. DOE directives and regulations applicable to the Meteorology Program are listed in "References."

5.3.1 Meteorological Monitoring Network

Meteorological monitoring is conducted through a network of meteorological towers located throughout KAFB on or near Sandia property. The network includes seven 10-meter towers, one 30-meter tower, and one 60-meter tower (Table 5-5). Meteorological tower locations are shown in Figure 5-1. All towers are instrumented to measure temperature and wind velocity at 3-meter and 10-meter levels above the surface. Temperature and wind velocity are also measured at the top of the two tallest towers (30 meters and 60 meters).

Table 5-5. Meteorological towers

Tower	Height (m)
A13	30
A21	10
A36	60
CL1	10
CW1	10
KU1	10
LC1	10
MW1	10
SC1	10

Relative humidity is measured at all locations, while rainfall is measured at the A36, A21, LC1, and SC1 towers. Barometric pressure is measured at towers A36, A21, and LC1. Routine instrument calibrations and a strong preventive maintenance field program are used to ensure data quality. Current weather information from the meteorological network can be found at Sandia Meteorological Program.

5.3.2 Meteorological Monitoring Results

New Mexico's weather in 2021 was warmer and drier than climatological means. The statewide temperature average was 55.4°F, 2.6 degrees above the normal of 52.8°F. Calendar year 2021 was the seventh-warmest year on record for New Mexico (National Weather Service 2022). The statewide average precipitation was 12.44 inches, which was 1.55 inches below the normal of 13.99 inches. This precipitation deficit made 2021 the 36th driest year on record for New Mexico (National Weather Service 2022).

Local conditions across SNL/NM were generally in line with the statewide pattern, with drought conditions worsening as the year progressed. Tower A36 is a 60-meter tower used to describe general meteorology at SNL/NM owing to its central geographic position and the availability of all network measurements at this one location. In 2021, Tower A36 observations showed significantly warmer and drier conditions than the site's 1995–2019 climatological averages. Rainfall at Tower A36 totaled 6.81 inches, more than two inches below the 8.86-inch average at that site. While August and September saw slightly above average precipitation, every other month had below-average values. October through December measured a total of only 0.51 inches of rain. Very few recordable snow events occurred in 2021 at SNL/NM. It is important to note that the Meteorological Program rain gauges do not have built-in heaters and can only measure snowfall when it melts. These measurements miss much of the actual snowfall total as the snow is blown off the top of the rain gauge.

The annual mean temperature at Tower A36 was 59.0°F; this was 1.5°F above the 25-year average of 57.5°F. The months of April through December were all particularly warmer than usual. February and March were the only months with cooler temperatures than their climatological averages. Primary forcing mechanisms for these precipitation and temperature deviations are likely climate change and the El Niño-Southern Oscillation pattern, which has been negative (La Niña) since mid-2021. La Niña events, even weak ones, historically have a warming and drying effect across New Mexico.

The 2021 annual summary for Tower A36 is shown in Table 5-6.

Table 5-6. Annual climatic summary from Tower A36, 2021

Measurement	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Annual
Temperature (°C)													
Average daily low	−4.77	−3.39	0.26	4.98	10.90	17.20	18.40	17.60	14.80	5.81	1.42	−2.71	6.71
Average daily high	9.29	11.60	15.90	21.70	27.60	32.60	32.40	31.90	29.60	21.60	17.50	12.00	21.97
Monthly mean	3.26	5.16	8.95	14.00	19.40	25.30	24.70	24.40	22.50	14.90	11.20	6.32	15.01
Extremes (°C)													
Low	−11.79	−14.29	−6.95	−1.06	4.73	7.93	15.18	14.59	8.57	−1.30	−3.39	−12.14	−14.29
High	14.10	19.18	24.25	28.55	31.93	39.34	37.79	35.22	34.54	27.08	23.47	18.54	39.34
Relative Humidity													
Humidity (percent)	46.30	41.80	33.80	26.90	28.10	30.30	49.30	43.50	41.10	36.50	35.70	41.50	37.90

Measurement	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Annual
Precipitation (cm)													
24-hour maximum	0.28	0.41	0.41	0.76	0.33	0.58	0.94	1.75	1.27	0.15	0.41	0.61	1.75
Monthly total	0.33	0.66	0.79	0.76	0.74	1.68	4.06	3.94	3.05	0.15	0.41	0.74	17.30
Wind Speed (m/sec)													
Highest 24-hour average	10.15	9.59	10.09	10.39	8.20	9.09	6.77	6.45	5.08	7.81	4.84	7.98	10.39
Monthly mean	3.45	3.95	4.21	4.94	4.80	4.39	3.75	3.85	3.20	3.47	2.69	3.13	3.82
Maximum gust	25.49	23.90	29.81	28.17	26.09	26.73	25.25	26.33	25.18	22.14	16.78	22.26	29.81
Barometric (mb)													
Pressure	836	832	833	832	833	835	838	836	836	835	839	833	834.83

Note: Winter precipitation that falls as snow is underestimated.

In general, the annual statistics for each of the monitoring towers are similar. However, daily conditions vary considerably across the meteorological network. This real-time variability of meteorological conditions has implications for the transport and dispersion of pollutants, which are important in atmospheric emergency release scenarios and air dispersion modeling. Table 5-7 shows some of the variations and extremes from the meteorological measurements throughout the year.

Table 5-7. Variations and extremes in meteorological measurements across the tower network, 2021

Meteorological Measurement	Minimum	Maximum	Spread
Temperature	**°C**	**°C**	**°C**
Average daily temperature range	14.52 Tower A21	16.43 Tower CW1	1.91
Average daily minimum temperature	5.49 Tower CW1	7.59 Tower CL1	2.1
Average daily maximum temperature	20.92 Tower SC1	22.32 Tower CL1	1.4
Average annual temperature	12.60 Tower LC1	15.29 Tower KU1	2.69
Annual temperature extremes	-15.79 Tower SC1	39.71 Tower MW1	55.5
Precipitation	**cm**	**cm**	**cm**
Maximum daily precipitation	1.70 Tower SC1	2.69 Tower LC1	0.99
Greatest monthly precipitation variation	2.59 Tower A21	6.60 Tower LC1	4.01 July
Annual precipitation extremes	16.21 Tower A21	24.71 Tower LC1	8.5
Wind Speed	**m/sec**	**m/sec**	**m/sec**
Average daily maximum wind speed	8.47 Tower LC1	12.85 Tower A13	4.38
Average annual wind speed	3.64 Tower LC1	3.90 Tower CW1	0.26
Maximum annual wind gust	25.85 Tower LC1	29.81 Tower A36	3.96

Note: Winter precipitation that falls as snow is underestimated.

5.3.3 Wind Analysis

The most important implication of meteorological variations is the wind impact on transport and dispersion of potential pollutants. Wind transport is a complex result of large-scale, synoptic-based weather systems and local or regional topographic influences. The local topography produces nocturnal drainage flows and can also channel large-scale driven winds. Wind roses are diagrams used to present the distributions of wind speed and wind direction. It should be noted that wind direction is defined as the direction from which the wind originates. The wind roses for towers A36, CL1, and SC1 are shown in Figure 5-2. Typical diurnal variations and wind shifts cannot be seen in Figure 5-2.

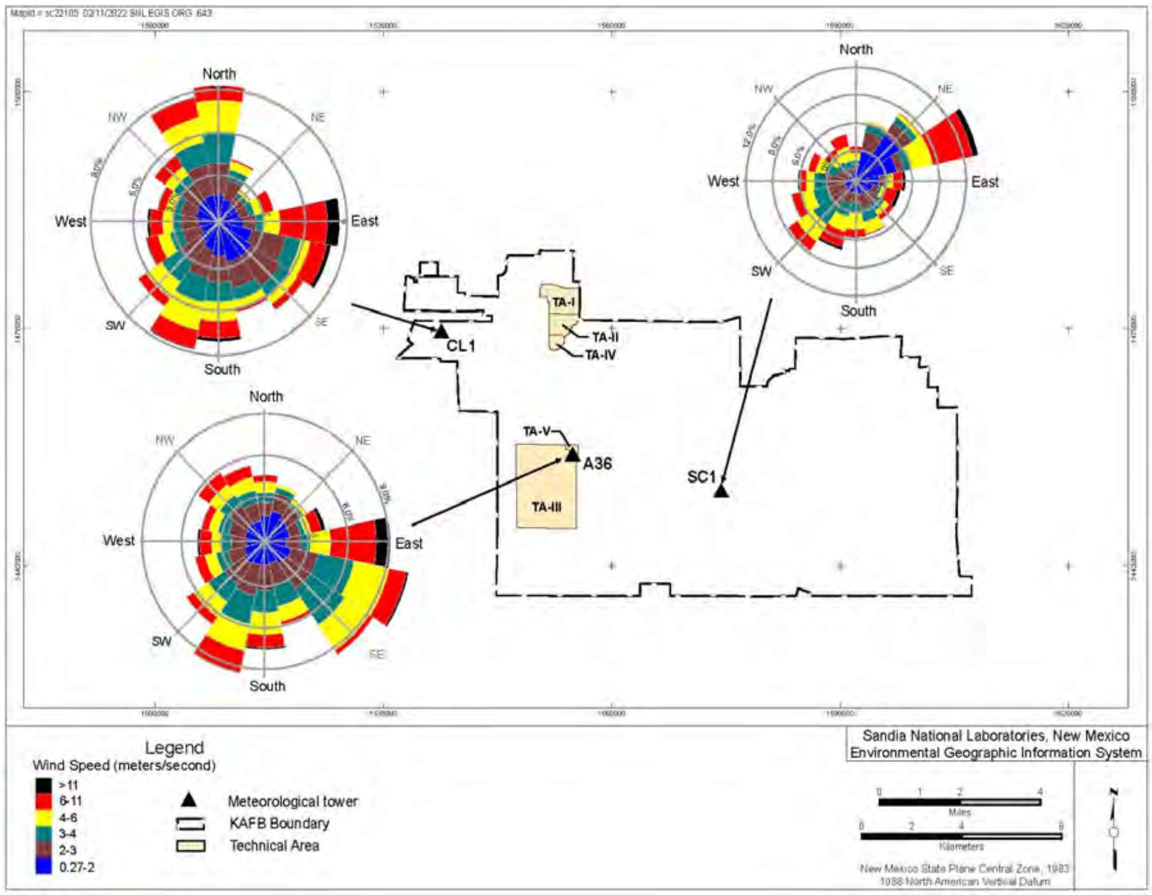


Figure 5-2. Annual wind roses at towers A36, CL1, and SC1

Figure 5-3 shows a much different wind pattern and nature, with the data divided into daytime and nighttime intervals at Tower A36. A similar diurnal pattern is seen at other locations within KAFB. The predominant wind direction at most locations is a product of local topographic features.

The relative location of a monitoring tower to local slopes and canyons identifies the exact direction of local topographic influences, which determines the predominant wind for the year, especially during nighttime hours.

Table 5-8 lists the predominant wind directions for daytime and nighttime periods for all towers in the network. Across the network, nighttime-predominant winds ranged from east-northeasterly to south. During the day, the predominant wind direction ranged from south-southwesterly to northwesterly.

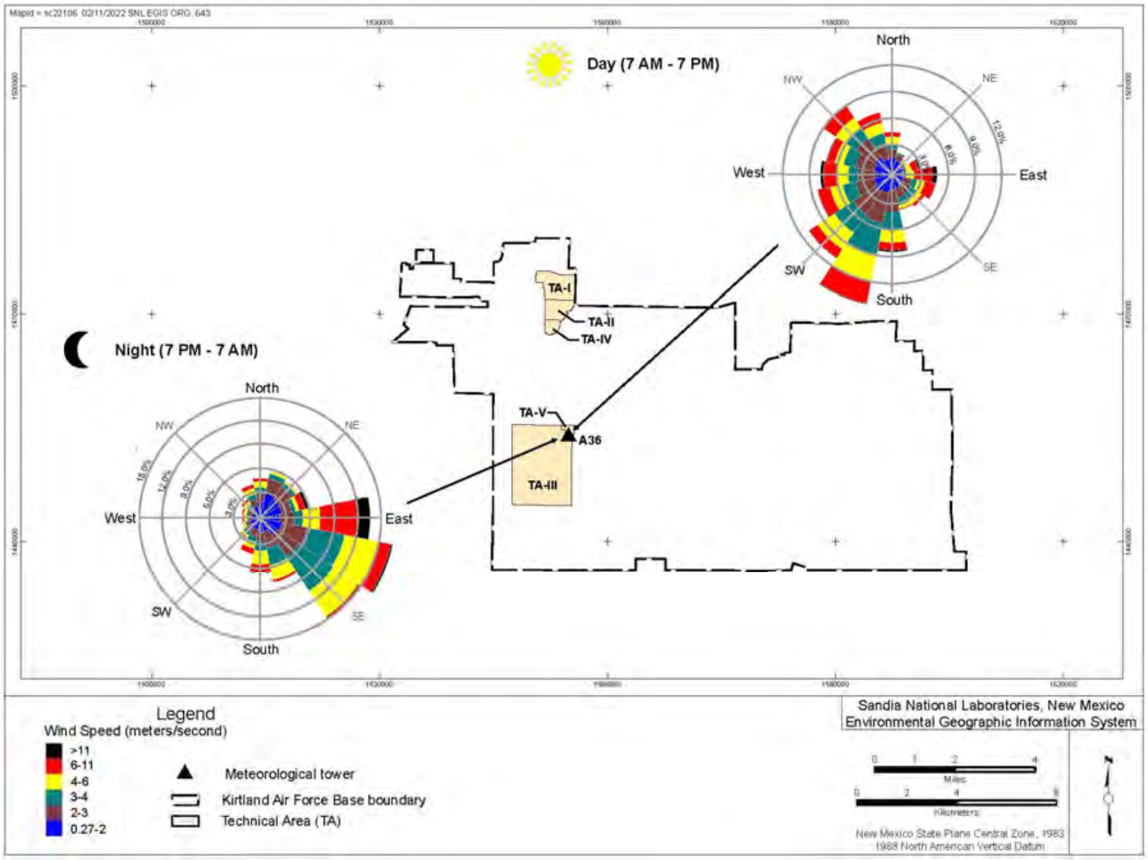


Figure 5-3. Annual wind roses for daytime and nighttime frequency at Tower A36

Table 5-8. Predominant wind directions for day and night periods by tower, 2021

Tower	Day	Night
A13	South-southwest	East-northeast
A21	South-southwest	East
A36	South-southwest	East-southeast
CL1	South-southwest	East
CW1	*Data invalidated (anemometer damaged)*	*Data invalidated (anemometer damaged)*
KU1	South-southwest	South-southeast
LC1	West	East-northeast
MW1	South-southwest	East-southeast
SC1	Southwest	East-northeast

5.4 Radionuclide National Emission Standards for Hazardous Air Pollutants Program

EPA regulates radionuclide air emissions in accordance with 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities," and has established an effective dose equivalent limit of 10 mrem/year to any member of the public resulting from all radionuclide air emissions from a DOE facility. A summary of radionuclide releases and public doses resulting from Sandia operations in 2021 is provided in Table 5-9.

Table 5-9. Radiological dose and release reporting, 2021

Radiologic Doses			
Dose to On-Site Maximally Exposed Individual (mrem)	Dose to Off-Site Maximally Exposed Individual (mrem)	Estimated Population Dose in a 50-Mile Radius of KAFB (person-rem)	EPA and DOE Dose Limit for Air Pathway (mrem)
4.43-03	8.52E-03	3.32E-02	10

Radiological Atmospheric Releases (in Curies)							
Tritium	Noble Gases (half-life < 40 days)	Fission and Activation Products (half-life < 3 hours)	Fission and Activation Products (half-life > 3 hours)	Total Radiostrontium	Total Uranium	Other Actinides	Other
4.96E+01	8.90E-01	7.26E-04	5.03E-06	5.04E-06	1.60E-06	2.06E-06	2.00E-08

5.4.1 Compliance Reporting

An annual radionuclide NESHAP report summarizes radionuclide air emission releases from Sandia facilities and presents the results of the annual dose assessment. DOE submits the annual report to EPA and the City of Albuquerque Environmental Health Department. Details can be found in the *Radionuclide NESHAP Annual Report CY 2021, SNL/NM* (SNL/NM 2022e).

5.4.2 Facilities

Point releases are emission sources that could potentially discharge material to the atmosphere through a facility's exhaust stack or rooftop vent (Figure 5-4). Table 5-10 lists the radionuclides and the total reported emissions from each of Sandia's radionuclide NESHAP sources in 2021.

TA-I Sources

The Ion Beam Laboratory accelerators are used to study and modify material systems. Some activities at the laboratory involve the use of tritium targets, which can off-gas elemental tritium during use. The off-gassed tritium exits the laboratory building through its ventilation exhaust.

The Neutron Generator Facility is the nation's principal production facility for neutron generators. This facility currently emits only tritium. The facility has two stacks, but only the main stack in the Tritium Envelope North Wing is used. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, monitoring is performed voluntarily at the facility as a best management practice.

The Process Research and Development Laboratory is used to perform small-scale operations. Activities at the laboratory include handling and researching sealed and unsealed tritiated materials. Activities at the laboratory could result in the release of tritium.

The START Laboratory is used to perform small-scale experiments. Activities at the START laboratory could result in the occasional release of trace amounts of radionuclides. No emissions were reported from the START facility.

TA-II Sources

The Explosives Components Facility is used to perform destructive testing on neutron generators. Activities at the facility could result in the release of trace amounts of tritium.

TA-III Sources

The Radioactive and Mixed Waste Management Unit is used for handling radioactive and mixed waste products. Activities could result in the release of trace amounts of radionuclides. Although anticipated releases do not exceed the regulatory threshold requiring continuous monitoring,

monitoring is performed voluntarily at the Radioactive and Mixed Waste Management Unit as a best management practice.

TA-IV Sources

The High-Energy Radiation Megavolt Electron Source III accelerator is used to test the effects of prompt radiation on electronics and complete military systems. Activities at the accelerator produce air activation products, primarily nitrogen-13 and oxygen-15.

The Z Accelerator Facility is used for research on light-ion inertial confinement fusion. Large amounts of electrical energy are stored for several minutes and then released as an intense concentrated burst (shot) at a target. Some experiments could result in the release of trace amounts of radionuclides.

TA-V Sources

The Annular Core Research Reactor is used to subject test objects to a mixed photon and neutron irradiation environment. Activities at the reactor could result in the occasional release of trace amounts of radionuclides.

The Auxiliary Hot Cell Unit is used to identify, sort, characterize, and repackage legacy nuclear materials for permanent removal from SNL/NM. Legacy material may include accountable nuclear material, spent nuclear fuel, and radiological material. Activities at the Auxiliary Hot Cell Unit could result in the occasional release of trace amounts of radionuclides.

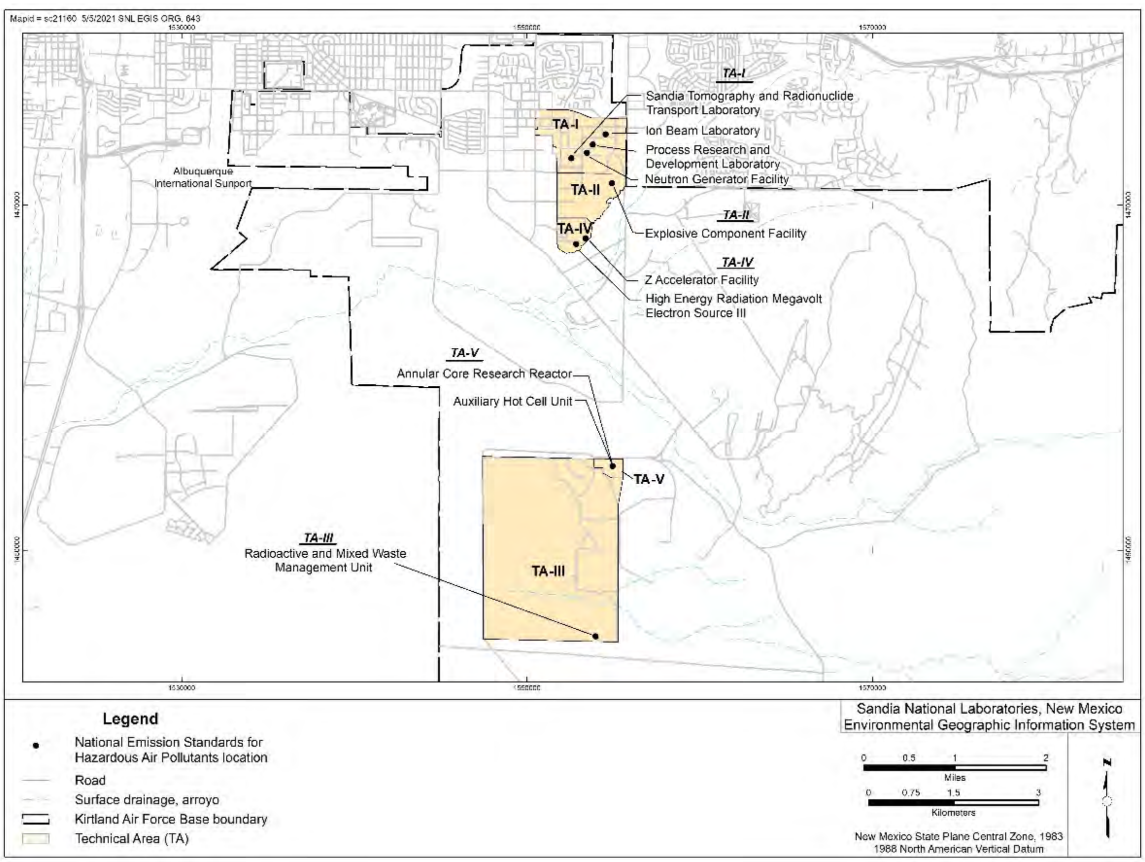


Figure 5-4. Locations of facilities with the potential to emit radionuclides

Table 5-10. Summary of radionuclide releases from NESHAP sources, 2021

Source Name, Location	Description	Source Type	Monitoring Method	Radionuclide Emitted	Reported Release (Ci/year)
Annular Core Research Reactor, TA-V	Reactor used to perform in-pile experiments for severe reactor accident research projects	Point	Periodic	Argon-41	0.89
Auxiliary Hot Cell Unit, TA-V	Facility used to identify, sort, characterize, and repackage legacy nuclear materials for permanent removal; legacy material may include accountable nuclear material, spent nuclear fuel, and radiological material	Point	Periodic	Americium-241 Cesium-137 Krypton-85 Plutonium-238 Plutonium-239 Plutonium-241 Samarium-151 Strontium-90 Tritium Uranium-235m[a]	7.0E-11 1.0E-08 2.0E-08 2.8E-11 2.6E-11 2.1E-10 2.8E-10 1.5E-08 1.3E-09 2.6E-11
Explosives Components Facility, TA-II	Facility used to test neutron generator design and manufacturing	Point	Calculation	Tritium	2.61E-03
High-Energy Radiation Megavolt Electron Source III, TA-IV	Gamma simulator used primarily to simulate the effects of prompt radiation from a nuclear burst on electronics	Point	Periodic	Nitrogen-13 Oxygen-15	6.60E-04 6.60E-05
Ion Beam Laboratory, TA-I	Ion and electron accelerators used to study and modify materials systems	Point	Calculation	Tritium	16.8
Neutron Generator Facility, TA-I	Principal production facility used for neutron generators	Point	Continuous	Tritium	32.76
Process Research and Development Laboratory, TA-I	Small-scale laboratory operation involved in handling and researching sealed and unsealed tritiated materials	Point	Calculation	Tritium	2.0E-05
Radioactive and Mixed Waste Management Unit, TA-III	Facility used to handle radioactive and mixed waste	Point	Continuous and calculation	Americium-241 Cesium-137 Plutonium-238 Plutonium-239 Plutonium-240 Plutonium-241 Plutonium-242 Strontium-90 Tritium (elemental) Tritium (oxide) Tritium (particulate) Uranium-234 Uranium-235 Uranium-238	3.11E-09 5.02E-06 6.91E-10 2.03E-06 7.50E-09 1.66E-08 4.34E-13 5.02E-06 5.21E-04 4.89E-04 1.10E-03 1.18E-06 4.64E-08 3.70E-07
Z Accelerator Facility, TA-IV	Experimental facility used to research light-ion inertial confinement fusion	Point	Calculation	Tritium	1.05E-03

Note: Monitoring methods include periodic, calculation, and continuous. Periodic is based on periodic measurements; calculation is based on known parameters; and continuous is based on continuous air-monitoring results.
[a] Uranium-235m is an excited nuclear isomer.

5.4.3 Assessment of Potential Dose to the Public

In general, the radiation dose a person receives is dependent on the person's distance from the source, the available pathways in the environment (food, air, or water), radionuclide quantities and properties, and meteorological conditions. Historically, radioactive releases from Sandia facilities have resulted in doses to the public that are several orders of magnitude below the EPA and DOE standard of 10 mrem/year.

To assess compliance, all facilities with point releases must submit annual facility emission data. Emissions are modeled using version 4.1 of the EPA Clean Air Act Assessment Package-1988 (EPA) to estimate the annual dose to each of the identified public receptors.

Emission Sources

Radionuclide NESHAP regulations require DOE to monitor continuously any radionuclide air emission source that has the potential to produce a dose of 0.1 mrem/year to the maximally exposed individual; no Sandia facilities exceed this criterion. However, as a best management practice, stacks are monitored continuously at some facilities. At other facilities, emission estimates are based on periodic confirmatory measurements or engineering calculations. In 2021, as with previous years, the highest emissions were from argon-41 and tritium. Historically, argon-41 and tritium have been the most significant contributors to the effective dose equivalent to the maximally exposed individual. Figure 5-5 shows the annual reported release of argon-41 and tritium for 2017 through 2021. The atmosphere contains 78.09 percent nitrogen, 20.95 percent oxygen, 0.93 percent argon, 0.03 percent carbon dioxide, and minor concentrations of neon, methane, hydrogen, helium, and krypton. Some of these constituents are susceptible to isotope transformations during high-energy processes, which result in air-activation products such as argon-41. Emissions vary from year to year, based on the operations conducted at the various facilities.

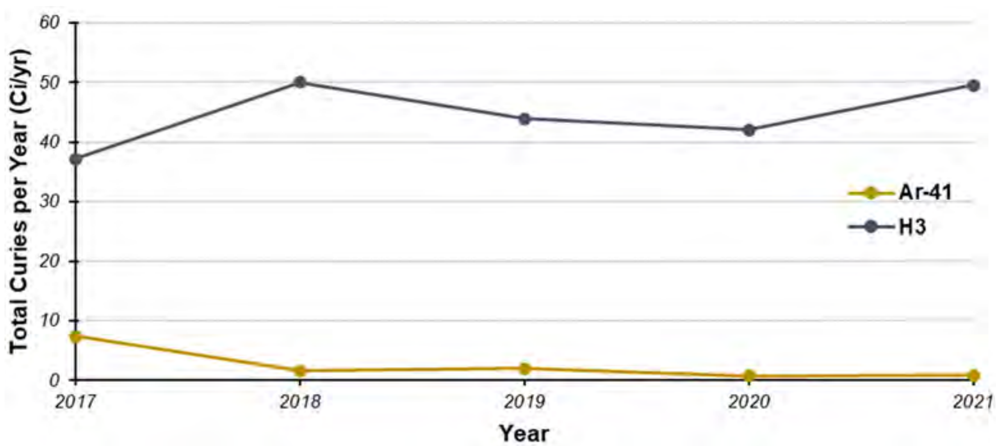


Figure 5-5. Atmospheric releases of argon-41 and tritium, 2017–2021

Demographic data include the resident population, the number of beef and dairy cattle, and the utilized food crop area fraction for a 50-mile radius study area. The densities for resident population, cattle, and food crops are calculated as the quotient of the most recent county data and the county land area (e.g., cows per acre). The radionuclide NESHAP calculation for the resident population was based on estimated urban and county population data and U.S. Census Bureau data (U.S. Census Bureau 2021). The 2020 census data was used to create a new population file for 2021 reporting. In addition, the beef and dairy cattle numbers and the food crop area fraction were updated using 2017 and 2019 agricultural statistics. The New Mexico Department of Agriculture supplied the statistics (USDA National Agricultural Statistics Service 2017; USDA and NMDOA 2019).

Off-Site and On-Site Public Receptors

Receptor locations in the vicinity of emission sources have been identified as potential locations of maximum exposure to a member of the public. Off-site receptor locations extend to the Isleta Resort Casino, the Four Hills subdivision north of KAFB, and areas near the Albuquerque International Sunport west of KAFB. On-site receptors include U.S. Air Force facilities, offices, and housing areas as well as other non-DOE and non-Unites States Department of Defense facilities on KAFB.

Meteorology

Data from three meteorological towers (A21, A36, and CW1) in the proximity of emission sources were used in 2021. Data from each tower consisted of approximately 35,000 hourly observations of wind direction, wind speed, and stability class (inferred from wind and solar insulation data). The data were compiled into a normalized distribution from which all wind and stability frequency-of-occurrence data were derived.

5.4.4 Dose Assessment Results

The Clean Air Act Assessment Package-1988 uses a Gaussian plume equation to estimate air dispersion in both horizontal and vertical directions (EPA 2020). Individual effective dose equivalents to on-site and off-site receptors from emission sources are presented as dose assessment results, which are summarized in Table 5-11.

Table 5-11. Calculated dose assessment results for on-site and off-site receptors and for collective populations, 2021

Dose to Receptor	Location	Calculated Dose	EPA and DOE Dose Limit for Air Pathway
Individual Dose			
On-site receptor effective dose equivalent to the maximally exposed individual	Honeywell Systems Support Site	4.43E-03 mrem/year	10 mrem/year
Off-site receptor effective dose equivalent to the maximally exposed individual	Eubank Gate area	8.52E-03 mrem/year	10 mrem/year
Collective Dose			
Collective regional population	Fifty-mile radius of KAFB	6.25E-03 person-rem/year	No standard available
Collective KAFB population	KAFB housing	3.32E-02 person-rem/year	No standard available

The total dose at each receptor location is determined by summing the individual doses resulting from each source. The dose to the maximally exposed individual member of the public is then compared to the EPA NESHAP limit of 10 mrem/year.

In 2021, as with previous years, the primary radionuclides released from SNL/NM facilities were tritium and argon-41. In 2021, the on-site maximally exposed individual was located on KAFB at the Honeywell Systems Support Site. The on-site maximally exposed individual dose of 4.43E-03 mrem/year resulted primarily from tritium releases at the Ion Beam Laboratory and the Neutron Generator Facility and from argon-41 releases at the Annular Core Research Reactor. The off-site maximally exposed individual dose of 8.52E-02 mrem/year was located at the KAFB Eubank Gate area and primarily resulted from tritium releases at the Ion Beam Laboratory and the Neutron Generator Facility. Both doses were well below the 10 mrem/year EPA NESHAP standard. By comparison, the average person in the United States receives 311 mrem/year from natural background radiation (NCRP 2009).

Collective Dose

The collective population dose resulting from all Sandia radiological emissions was calculated for both KAFB and the regional area (Table 5-11). Collective dose calculations are not required by NESHAP regulations; however, a collective calculation provides a useful numerical comparison with the public dose from year to year. Collective dose is calculated by multiplying a representative individual dose within a population by the total population. The collective population dose was calculated for both the KAFB housing areas and the general Albuquerque area population within a 50-mile radius of KAFB.

Regional

The Albuquerque regional collective population dose in 2021 was 6.25E-03 person-rem/year. This is comparable to the average over the past five years for regional collective population dose data. For the purpose of calculating the collective dose, all releases were assumed to occur at a location centered in TA-V.

Kirtland Air Force Base

A collective population dose for KAFB residents was calculated based on the main housing areas. The total population dose for the KAFB housing location was calculated by summing the total residential population. The 2021 calculation resulted in an estimated population dose of 3.32E-02 person-rem/year.

Unplanned Radionuclide Releases

In 2021, there was an alarm system failure after a low-level tritium release. In total, 10.8 Ci of tritium were released and included in EPA Clean Air Act Assessment Package-1988 modeling calculations (Table 5-11and Table 2-3).

Chapter 6. Water Quality Programs

Tadpole ripples

OVERVIEW ■ Water quality programs—which include the Environmental Release, Response, and Reporting Program; Oil Storage Program; Safe Drinking Water Protectio Program; Stormwater Program; Surface Discharge Program; and Wastewater Discharge Program—collectively ensure compliance with requirements established by federal, state, and local agencies.

Sandia personnel ensure water quality through numerous programs. Operations comply with water quality requirements established by federal, state, and local agencies. Groundwater programs are summarized in Chapter 3. Additional water quality programs discussed in this chapter include the following:

- Environmental Release, Response, and Reporting Program
- Oil Storage Program
- Safe Drinking Water Protection Program
- Stormwater Program
- Surface Discharge Program
- Wastewater Discharge Program

NMED and the ABCWUA implement EPA standards at the state and local levels. Currently, EPA Region 6 implements stormwater regulations under NPDES permits. Sandia personnel adhere to these regulations and to the water quality guidelines in DOE O 458.1 Change 4 (LtdChg), *Radiation Protection of the Public and the Environment*. Information is reported on a calendar-year basis unless otherwise noted.

6.1 Environmental Release, Response, and Reporting Program

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.

An *environmental release* is 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.

6.1.1 Events Reported to the New Mexico Environment Department

In 2021, there were no releases to the environment that required reporting to NMED.

6.1.2 Events Categorized as a DOE Reportable Occurrence

In 2021, no releases to the environment that were reported to outside agencies met the criteria for DOE-reportable occurrences under DOE O 232.2A, Chg1 (MinChg), *Occurrence Reporting and Processing of Operations Information* (see Chapter 2).

6.1.3 Chemical Inventory and Toxic Release Inventory Reporting

The chemical inventory report and the toxic release inventory report for 2021 were submitted to EPA and support compliance with EPCRA. The chemical inventory report documents toxic chemicals in use and all chemical purchases. Chemical use at SNL/NM was above the reporting threshold for submitting a toxic release inventory report for lead and lead compounds.

6.2 Oil Storage Program

Oil Storage Program activities support regulatory compliance associated with the management, operation, and maintenance of oil storage containers and equipment. As required by 40 CFR 112, *Oil Pollution Prevention*, Oil Storage Program personnel maintain and implement the *Sandia National Laboratories Spill Prevention, Control, and Countermeasure Plan* (SNL/NM 2016), which describes the oil storage facilities at SNL/NM and the mitigation controls in place to prevent inadvertent discharges of oil.

The oil storage capacity at SNL/NM is approximately 2.2 million gallons. The inventory of oil storage containers operating under the *Sandia National Laboratories Spill Prevention, Control, and Countermeasure Plan* includes 45 stationary aboveground storage tanks and 2 underground storage tanks. Additional oil storage capacity in 55-gallon drums, mobile and portable containers, mobile refuelers, and oil-filled operational equipment (e.g., transformers and hydraulic elevators) is used throughout the site on an as-needed basis. All oil storage locations with regulated containers are equipped with passive and/or active secondary containment. Passive secondary containment structures include concrete-lined basins, retaining walls, containment reservoirs, double-wall tanks, sloped pads, trenches, and containment pallets. Active secondary containment measures include sorbent materials, spill kits, and drain covers.

Two 20,000-gallon underground oil storage tanks were operational in 2021. These underground tanks are registered with the NMED Petroleum Storage Tank Bureau (PSTB). Although 45 stationary aboveground storage tanks were operational in 2021, only 7 are subject to NMED PSTB regulation and registration. Registration numbers for the 2 underground storage tanks and 7 aboveground storage tanks regulated by the Bureau are provided in Table 10-1. The NMED PSTB owner identification number for SNL/NM-registered tanks is 14109, and the operator identification number is 13476.

6.2.1 Oil Storage Program Activities in 2021

In 2021, Oil Storage Program personnel performed an annual inspection of all stationary shop-built oil storage tanks in accordance with the Steel Tank Institute/Steel Plate Fabricators Association standard SP001, *Standard for the Inspection of Aboveground Storage Tanks* (STI/SPFA 2001). In addition, four field-fabricated tanks were inspected in 2021 in accordance with the American Petroleum Institute Standard 653, *Tank Inspection, Repair, Alteration, and Reconstruction* (American Petroleum Institute 2014), for a five-year external inspection and ultrasonic thickness testing of tank shells.

In 2021, two aboveground storage tanks that were not in use and no longer needed were removed and disposed of. Two new generator base tanks were installed at the end of 2021; these will become operational in 2022. The *Sandia National Laboratories Spill Prevention, Control, and Countermeasure Plan* was amended to require a review of the plan every five years (SNL/NM 2016).

In June 2021, the NMED PSTB performed a site inspection of the Building 888 underground storage tanks. No violations were identified. However, in August 2021, the spill bucket on the Building 888-2 underground storage tank failed a required hydrostatic test. The NMED PSTB was notified, and the soil adjacent to the spill bucket was investigated for a suspected release. No evidence of a release was observed within the soils removed from the area of the spill bucket, and photographic evidence was used to support a No Further Action determination provided to the NMED PSTB.

6.3 Safe Drinking Water Protection Program

Safe Drinking Water Protection Program activities ensure the availability of safe drinking water for all people at Sandia-operated facilities. Program personnel work in conjunction with Infrastructure Operations personnel to maintain compliance with applicable federal, state, local, and DOE requirements. Program personnel coordinate operations that maintain, test, and inspect appropriate backflow-prevention activities, and submit the Annual Sandia Field Office Backflow/Cross Connection Certification to KAFB.

KAFB supplies water to the DOE-owned drinking water distribution system at SNL/NM. The KAFB water system is registered with the NMED Drinking Water Bureau as a Community Public Water System. Because KAFB is identified as the sole registered party, the NMED Drinking Water Bureau regulates the distribution system on KAFB. The distribution system on DOE property is operated and maintained by Sandia personnel as a component of the KAFB Public Water System. Safe Drinking Water Protection Program personnel coordinate with KAFB to support compliance activities such as sampling, inspections, or access to SNL/NM sites as agreed upon in a memorandum of understanding between the DOE National Nuclear Security Administration Sandia Field Office and the KAFB 377th Air Base Wing, which covers public water system operations (DOE and KAFB 2018).

KAFB publishes an annual summary of drinking water quality at Kirtland Air Force Base Environmental Assessments.

6.4 Stormwater Program

Stormwater Program personnel maintain regulatory compliance with federal, state, tribal, and local stormwater requirements via NPDES permit coverage consisting of the Construction General Permit (CGP), the Middle Rio Grande Municipal Separate Storm Sewer System (MS4) Permit, and the Multi-

Sector General Permit (MSGP). Activities include preparing stormwater pollution prevention plans and stormwater management plans, conducting routine inspections, monitoring stormwater quality, and training on stormwater pollution prevention practices. Compliance with NPDES permits reduces the impact of construction, industrial, and municipal activities on the environment. EPA maintains administrative and enforcement authority for NPDES permits in New Mexico.

6.4.1 Regulatory Criteria

Stormwater is regulated because it can potentially discharge to "waters of the United States" as defined under the Clean Water Act. Surface water discharged from SNL/NM is required to meet the State of New Mexico requirements listed in 20.6.4 NMAC, *Standards for Interstate and Intrastate Surface Waters*, in addition to federal requirements specific to individual stormwater permits.

6.4.2 Surface Waters and Stormwater Drainage

The primary surface water features in the vicinity of SNL/NM are the Tijeras Arroyo and its named tributary, Arroyo del Coyote (Figure 6-1). Both are designated as "waters of the United States" and are ephemeral, flowing only for short durations in response to direct precipitation. The Tijeras Arroyo originates to the northeast of SNL/NM and flows roughly to the west from DOE lands to the Rio Grande. The majority of stormwater that originates in TA-I, TA-II, and TA-IV is discharged to the Tijeras Arroyo. Some of the stormwater originating within remote areas of SNL/NM is discharged to either the Tijeras Arroyo or Arroyo del Coyote as well.

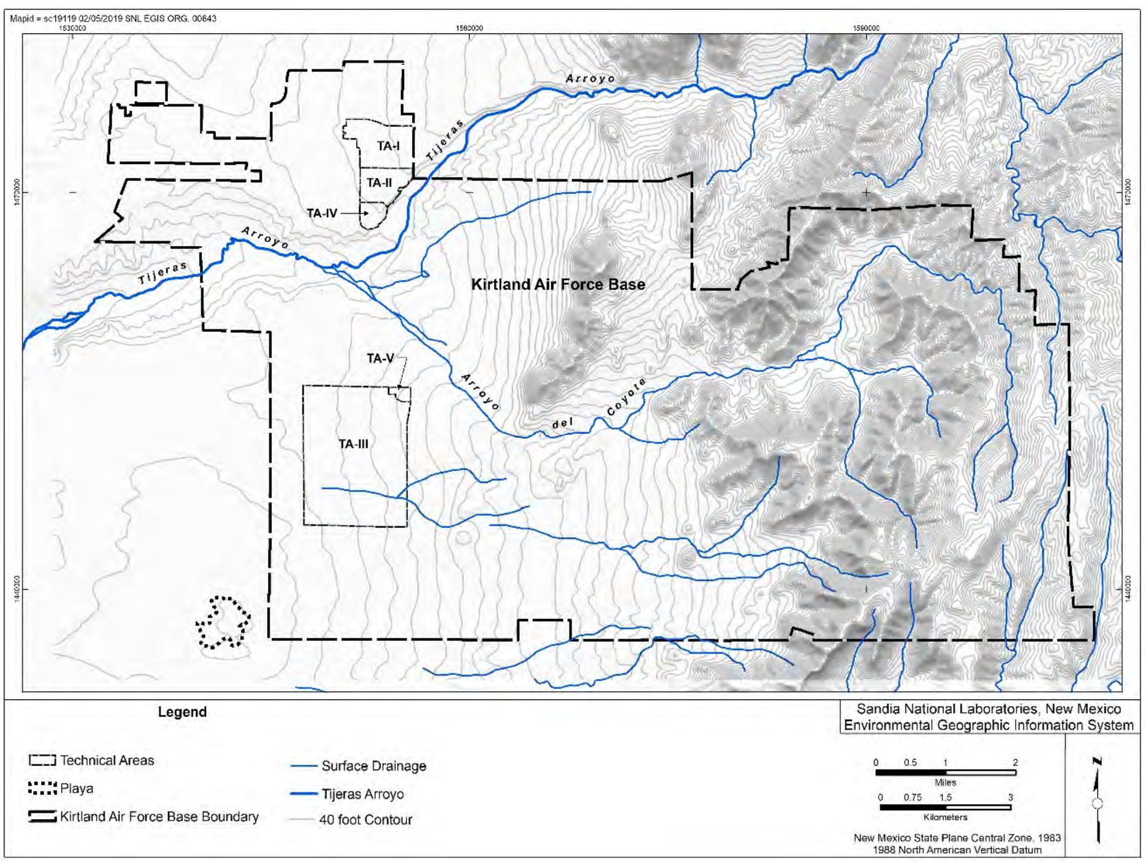


Figure 6-1. Location of primary surface water drainages and Waters of the United States that receive stormwater discharges from SNL/NM

6.4.3 Construction General Permit

The CGP regulates stormwater discharges associated with construction activities. Notices of Intent are submitted to EPA for coverage under the CGP every time it is anticipated that a construction project will disturb one or more acres of land. A site-specific stormwater pollution prevention plan is developed for each construction site, including details about installing best management practices, implementing pollution prevention measures, conducting site inspections on a routine basis and after storm events, and stabilizing all disturbed areas of a site upon completion of a project. During 2021, Sandia held active permit coverage for 23 construction sites (see Chapter 10); DOE and its management and operating contractor for Sandia held joint CGP coverage for four of these sites.

In April of 2021, Sandia stormwater personnel were informed that construction activity associated with the TA-IV Chilled Water Loop appeared to exceed the 1-acre in size and had not obtained a CGP coverage. The area of disturbance was measured and determined to be 1.8-acres. Work at the site was paused and the Environmental Protection Agency (EPA) was notified. Sandia personnel submitted a Notice of Intent and the EPA issued a CGP in May of 2021. No fines or violations were issued.

Stormwater Quality Monitoring

Water quality monitoring has not been historically and is not currently required under the CGP at SNL/NM. Certain construction activities and conditions, such as dewatering shallow groundwater, can lead to water quality monitoring requirements; however, these conditions have not been encountered at SNL/NM.

6.4.4 Middle Rio Grande Municipal Separate Storm Sewer System Permit

The MS4 Permit covers the entire centralized storm drainage system within TA-I, TA-II, and TA-IV, approximately 1.16 square miles. The permit establishes requirements to reduce non-point source municipal stormwater pollutants discharged to the Rio Grande. In effect since 2014, the permit entered administrative continuance on December 22, 2019, and remains in effect until EPA issues a new permit.

The Rio Grande provides a critical habitat for threatened and endangered species of birds and fish and serves as a municipal, agricultural, and recreational water resource for Albuquerque and surrounding communities.

Compliance with the MS4 Permit is maintained by developing and updating a stormwater management plan, implementing control measures, conducting inspections, sampling stormwater, submitting discharge monitoring reports, and submitting annual reports. The *MS4 Stormwater Management Plan* and other associated documents are available to the public in the digital repository at the University of New Mexico Digital Repository, Municipal Separate Storm Sewer System (MS4) Permit.

Stormwater Quality Monitoring and Results

The stormwater sampling points (SWSPs) established for compliance with the MS4 Permit are located at the MS4 inflow (SWSP-02) and four MS4 outflows (SWSP-05, SWSP-24, SWSP-35, and SWSP-36) as indicated in Figure 6-2. Inflow at SWSP-02 comes from SNL/NM areas upgradient of the MS4 boundary and from areas owned by KAFB, primarily residential housing areas. Approximately 90 percent of the stormwater discharge from the MS4 occurs at SWSP-05, which flows directly to the Tijeras Arroyo. The remaining approximately 10 percent of discharge occurs at SWSP-24, SWSP-35, and SWSP-36, which flow directly into the KAFB storm drain system and then to a large detention basin located near the Gibson Gate. The volume of inflow that enters the MS4 at

SWSP-02 is conveyed through the SNL/NM storm drain system and discharged at SWSP-05. It accounts for approximately 15 percent of the total stormwater discharged at SWSP-05.

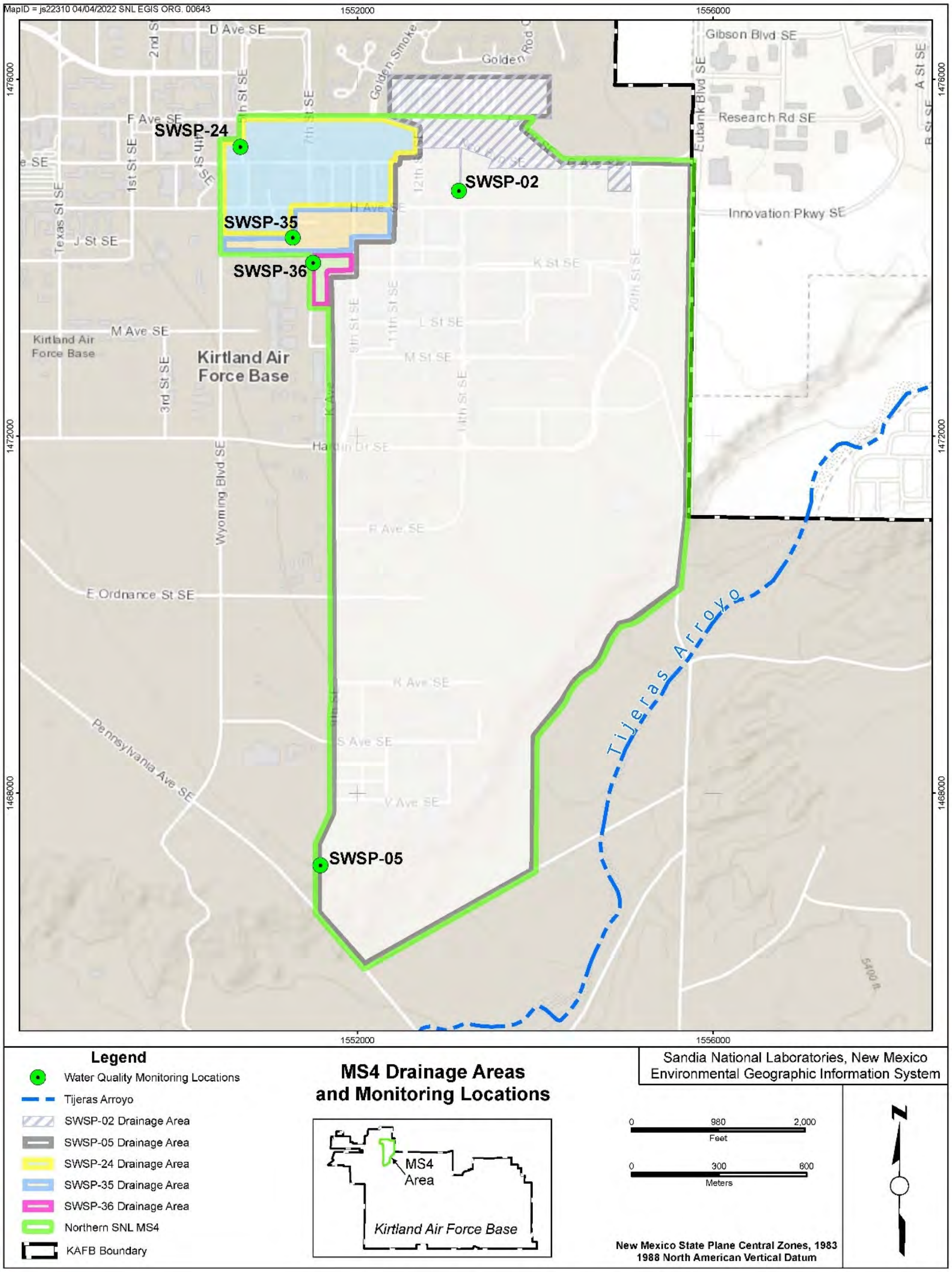


Figure 6-2. MS4 drainage areas and monitoring locations

MS4 Permit sampling can be conducted when a qualifying event occurs, which is specified as rainfall in excess of 0.25 inches during a 24-hour period. Required monitoring is to be conducted for a minimum of eight events during the permit term; at least four monitoring events must be conducted during the wet season (July 1 through October 31), and at least two events must be conducted during the dry season (November 1 through June 30). The permit term was initially 5 years (starting in December 2014) but has been extended indefinitely by EPA because they have not issued a new permit yet. The requirement for 8 samples has been met and exceeded at SWSP-02 and SWSP-05, where a total of between 10 and 14 samples have been collected for all constituents. Eight samples have been collected at SWSP-24, SWSP-35, and SWSP-36 for most required constituents; however, only 6 or 7 samples have been obtained for several constituents due to limited sample collection opportunities. These locations have small drainage areas, and samples are collected from subterranean storm drains; the combination of small drainage areas and difficult sampling locations require very large rainfalls to enable sample collection. Stormwater Program personnel strive to collect one dry season and one wet season sample per location each year, as precipitation allows, even though this is not a requirement of the permit. The monitoring constituents required by the MS4 Permit and associated water quality standards are listed in Appendix D.

Automatic samplers are installed at each sampling point and are programmed to collect four subsamples 15 minutes apart during the first hour of a discharge event. Field measurements of temperature, potential of hydrogen (pH), specific conductance, and dissolved oxygen are made for each subsample, and the subsamples are composited for laboratory analyses.

Only one complete sample was collected during the monitoring period (at SWSP-35) in 2021 due to sample volume limitations (low rainfall) and permit requirements. The sample from SWSP-35 met applicable water quality standards for all constituents except for PCBs and *Escherichia coli* (*E. coli*). In addition to the full sample collected at SWSP-35, multiple *E. coli* samples were collected from each of the five monitoring locations as part of a microbial source tracking investigation.

PCBs and *E. coli* regularly exceed applicable water quality standards in stormwater at SNL/NM. Data collected since the inception of the MS4 Permit were used to evaluate potential sources of PCBs and *E. coli*. The investigation reports are in the 2021 MS4 *Stormwater Management Plan* and are available to the public in the digital repository at the University of New Mexico Digital Repository, Municipal Separate Storm Sewer System (MS4) Permit.

The concentration of *E. coli* in samples varies substantially with both location and individual rain event as reported in *White Paper: The Occurrence of* E. coli *in Stormwater at SNL/NM* (SNL/NM 2020d). The median concentration at SNL/NM is below median concentrations reported for other stormwater drains throughout the Albuquerque area (Storms et al. 2015). The microbial source tracking investigation determined that there are essentially no human, avian, or canine sources of *E. coli* at SNL/NM. By process of elimination, the source of *E. coli* is likely wildlife (e.g., skunks, racoons, and rodents) that are known to exist within the vicinity of the storm drain system. Several measures being pursued to reduce *E. coli* at SNL/NM include precluding wildlife, reducing sediment, and decentralizing the storm drainage system.

The concentration of PCBs in samples also varies substantially with both location and individual rain event as reported in *White Paper: The Occurrence of Polychlorinated Biphenyls in Stormwater at SNL/NM* (SNL/NM 2020e). The median concentration of PCBs at SNL/NM is below median concentrations reported for other stormwater drains throughout the Albuquerque area (Shephard et al. 2019). The sources of PCBs in stormwater at SNL/NM are likely direct precipitation and diffuse deposition in soil and sediment from historic on-site and off-site activities. There are no known discrete sources of PCBs at SNL/NM. Recommendations for methods to decrease PCBs in stormwater at SNL/NM include increasing monitoring to characterize potential sources, reducing sediment in stormwater, and reducing flow to the storm drains through green stormwater infrastructure.

6.4.5 Multi-Sector General Permit

The MSGP regulates stormwater discharges associated with industrial activities that meet the criteria for one or more specific industrial sector as defined in the permit. In 2021, 18 facilities (also referred to as sites) at SNL/NM operated under the MSGP. The sites and the associated stormwater sampling points, located at the outfalls, are listed in Table 6-1 and shown in Figure 6-3.

In January 2021, a new MSGP was issued, replacing the previous MSGP that was issued in 2015. The same sites covered under the old permit are covered under the new permit. The permits are very similar, with two notable exceptions in the new permit:

- Additional Implementation Measures are included when a four-quarter annual average concentration exceeds the water quality standard.
- Per NMED, it is required to screen for polyfluoroalkyl substances (PFASs) in stormwater runoff from Sector K sites (Sector K sites at SNL/NM are listed in Table 6-1).

Compliance with the MSGP is maintained by developing and updating a stormwater pollution prevention plan that covers all eligible industrial activities at SNL/NM and documents permit requirements applicable to these activities. The annual MSGP stormwater pollution prevention plan and other MSGP associated documents are available to the public in the digital repository at the University of New Mexico Digital Repository, 2015 Multi-Sector General Permit.

Table 6-1. Sites with coverage under the MSGP and associated stormwater sampling points

Sector Title	Sector	Permitted Sites	Stormwater Sampling Point
Electronic and Electrical Equipment and Components, Photographic and Optical Goods	AC1	Advanced Manufacturing Process Laboratory	SWSP-05
Hazardous Waste Treatment, Storage, or Disposal Facilities	K1	Auxiliary Hot Cell Unit	SWSP-52
		Gun Facility (SWMU 84)	SWSP-46
		Hazardous Waste Handling Unit	SWSP-40
		Long Sled Track (SWMU 83)	SWSP-17
		Manzano Storage Bunkers	SWSP-51
		Radioactive and Mixed Waste Management Unit	SWSP-49
		Short Sled Track (SWMU 240)	SWSP-47
		TA-V Sandlot	SWSP-52
		Thermal Treatment Unit	SWSP-48
		Thunder Range 6 Detonation Site	No sampling point (emergency use only)
		Center for Integrated Nanotechnologies	SWSP-50
Landfills	L1 and L2	Classified Waste Landfill	SWSP-08
Local and Highway Passenger Transportation	P1	Fleet Services	SWSP-05
Nonmetallic Mineral and Mining Dressing; Construction Sand and Gravel	J1	TA-III Borrow Pit	No outfall

Sector Title	Sector	Permitted Sites	Stormwater Sampling Point
Scrap and Waste Recycling, Except Source-Separated Recycling	N1	TA-III Borrow Pit	No outfall
Source-Separated Recycling	N2	Reapplication Yard	SWSP-41
		Solid Waste Collection and Recycling Center	SWSP-42
		Sprung Tent 11 (Material Sustainability and Pollution Prevention)	SWSP-57

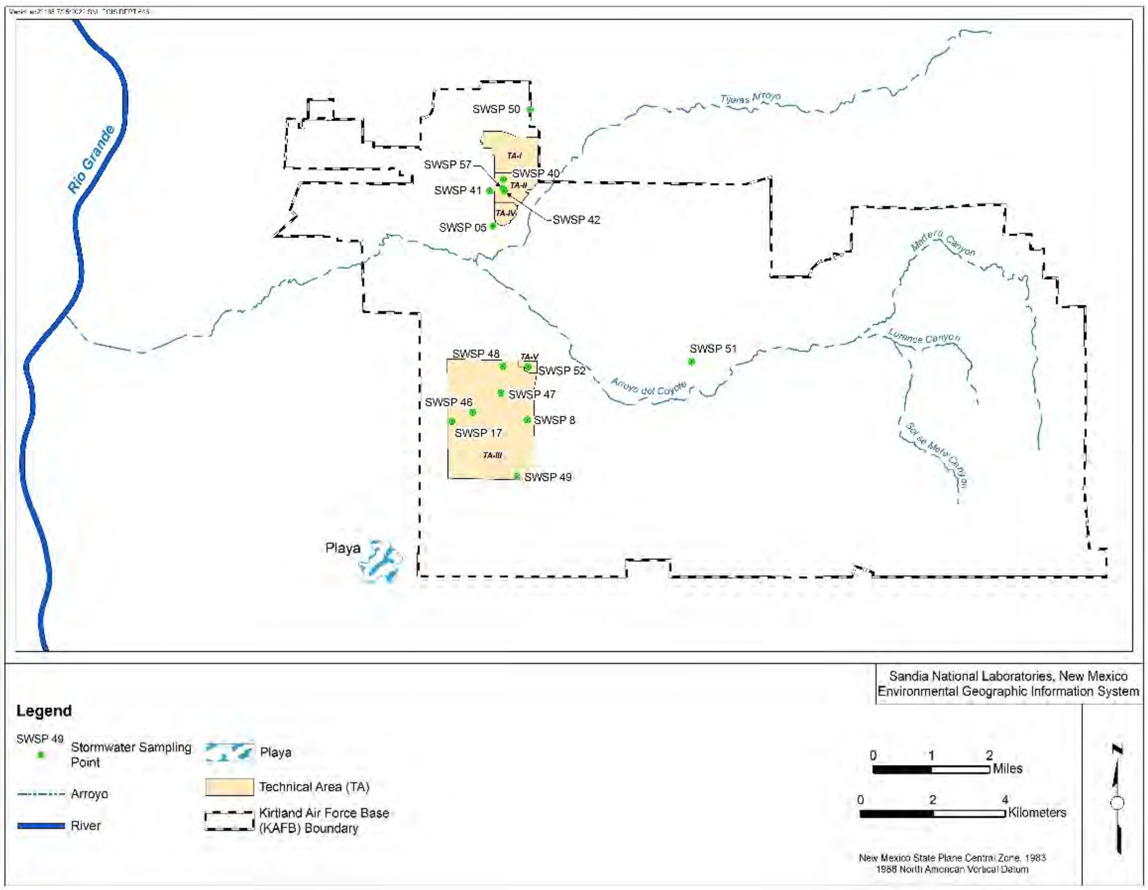


Figure 6-3. MSGP stormwater sampling point locations

Stormwater Quality Monitoring and Results

Quarterly sampling is required at the outfall of each facility or site permitted under the MSGP. The permit allows a monitoring quarter to be defined as one of the four months during the wet season; therefore, at SNL/NM, the four monitoring quarters are the months of July, August, September, and October. Monitoring is not required during the rest of the year (November through June). If the average of four consecutive samples is below the monitoring benchmark value, then monitoring of that constituent at that location is not required for the remainder of the permit term. For the 2021 wet season (the first year in the five-year permit term), monitoring was required at all 16 permitted sites where monitoring is conducted.

The water quality constituents sampled for laboratory analysis for each applicable industry sector and the applicable New Mexico benchmark values are provided in Appendix D, “Stormwater Sampling

Requirements and Results in 2021." In addition to collecting stormwater samples for laboratory analysis, visual assessments are performed at the outfalls to document observable pollutants, such as odor, clarity, solids, oils, and foam.

The analytical results for 2021, as submitted to EPA, are provided in Appendix D. One hundred and twenty-eight individual MSGP compliance parameters were analyzed, of which 15 exceeded water quality standards:

- Selenium was not detected in any of the 11 samples analyzed. However, the detection limit used by the laboratory during July, August, and September was 2.0 μg/L, which is above the water quality standard of 1.5 μg/L. Therefore, selenium had to be reported at the detection limit of 2.0 μg/L in 10 of the 11 samples, and this was considered an exceedance of the water quality standard. The laboratory detection limit was changed from 2.0 μg/L to 1.5 μg/L in October 2021, and selenium was not detected in the one sample collected during October. A detection limit of 1.5 μg/L will be used in the future, and it is anticipated that selenium will continue to be non-detect.
- Lead was detected above the water quality standard in three samples.
- Cadmium was detected above the water quality standard in one sample.
- Chemical oxygen demand was detected above the water quality standard in one sample.

Additional Implementation Measures based on lead concentrations were triggered for two sites: the Long Sled Track and the Short Sled Track. In compliance with Additional Implementation Measures requirements, the stormwater pollution prevention plan was reviewed to ensure proper control measures are being implemented at the sites. There are no current activities contributing lead to ground surface; however, historic testing activities are known to have dispersed lead at the site. Additional controls were implemented at the sites to slow and spread stormwater in an effort to prevent discharges from the sites.

In addition to the MSGP compliance samples discussed here, 10 PFAS screening samples were collected at eight of the 10 Sector K sites listed in Table 6-1 to comply with NMED state-specific requirements listed in the MSGP. Water quality samples were not collected at the Manzano Storage Bunkers or Gun Facilities because no stormwater was discharged from those sites. PFASs above the screening level of 0.070 μg/L was detected at six of the eight sites where samples were collected (Appendix D). PFAS sampling will continue for the duration of the permit at locations where the NMED screening level is exceeded. Section 9.6.2.1 of the MSGP states: "The screening level is not a standard of quality and purity for the surface waters of New Mexico but allows detection and further evaluation of the existence of PFASs in stormwater discharges to determine if more attention is warranted."

6.4.6 Stormwater Data Quality Assurance

Quality assurance, control, and assessment processes ensure that stormwater sampling produces reliable data to meet permit requirements and verify the effectiveness of implemented pollution control measures. Due to the heterogeneous nature of stormwater, there is a low expectation of reproducibility from one sample to the next; therefore, field duplicates are not collected. See Chapter 8 for more information on quality assurance.

6.5 Surface Discharge Program

Surface Discharge Program personnel evaluate all water and water-based compounds that discharge to the ground surface at SNL/NM for compliance with New Mexico Water Quality Control Commission regulations (20.6.2 NMAC, *Ground and Surface Water Protection*) as implemented by the

NMED Ground Water Quality Bureau. These regulations are designed to protect the state's groundwater and surface water.

6.5.1 Surface Discharge Approvals

Surface discharges are releases of water and water-based compounds to roads, open areas, or impoundments. Surface discharges are only made following approval by Surface Discharge Program personnel. Proposed discharges are evaluated for potential contaminants to determine whether the discharge complies with applicable requirements for surface releases. If any discharges do not meet surface water quality standards, alternative methods of disposal are found.

Surface discharge requests are made when access to a sanitary sewer line is not available, such as in remote locations on KAFB where no sewer lines exist. Typical surface discharges are requested as a result of fire-training activities, to control dust, and after cleaning building exteriors.

Surface discharges are releases of water and water-based compounds to roads, open areas, or confined areas such as reservoirs.

In 2021, 28 individual surface discharge requests were approved. Approved releases complied with applicable NMED requirements.

6.5.2 Activities at Evaporation Lagoons

Surface Discharge Program personnel routinely sample two evaporation lagoons at TA-IV for water quality. Both lagoons are permitted through NMED in Discharge Permit (DP) 530. The two evaporation lagoons (Lagoon 1 and Lagoon 2) are used to contain and evaporate water that collects in the secondary containments around seven outdoor oil storage tanks used to store dielectric oil. The secondary containments are designed to hold the entire content of the tanks in the event of an accidental release. Significant volumes of precipitation can collect in the containments during storm events. The water that has collected within the containments is inspected visually for oil contamination, and any oil present is removed prior to discharge to the TA-IV lagoons.

The original DP-530 was issued on March 8, 1988, for discharges from the pulsed power facilities located in TA-IV to Lagoon 1 and Lagoon 2. DP-530 was submitted pursuant to 20.6.2.3106 NMAC, *Application for Discharge Permits, Renewals, and Modifications*, and was approved pursuant to 20.6.2.3109 NMAC, *Secretary Approval, Disapproval, Modification or Termination of Discharge Permits, and Requirement for Abatement Plans*. On September 5, 2014, a new DP-530 was issued, which expired on September 5, 2019. Sandia personnel submitted a renewal application for DP-530 to DOE for transmittal to NMED on February 21, 2019, in compliance with a request from NMED dated September 5, 2014. Additional information was submitted at the request of NMED on May 24, 2019. NMED issued a public notice of the application renewal on August 23, 2019. A renewed permit for DP-530 has not yet been issued. The expired permit has been administratively extended until a new permit is issued. The monitoring and reporting requirements associated with DP-530 are listed in Table 6-2.

Table 6-2. DP-530 monitoring and reporting requirements

Action	Frequency	Reporting
Inspection of lagoons	Monthly	Documented in checklists
Inspection of sump pump stations	Quarterly	Annually
Lagoon water samples	Annually	Annually
Volume of wastewater discharged	Monthly	Annually

Samples were collected from Lagoon 1 and Lagoon 2 on August 17, 2021. Sample fractions were collected for major ions, total dissolved solids, and purgeable and extractable organics as specified in DP-530. All samples were transported with sample custody documentation to the analytical laboratory. The analytical laboratory prepares and analyzes quality control samples as described in Section 6.4.4. See Chapter 9 for more information on quality assurance and quality control.

An *ion* is an atom or molecule with a net electric charge due to the loss or gain of one or more electrons.

Although there were no discharges to Lagoon 2 in 2021, it was sampled to ensure that no residual or outside contamination had occurred. Laboratory analysis results indicated that all detected constituents met the standards in 20.6.2 NMAC, *Ground and Surface Water Protection*. In addition, both lagoons are inspected monthly to verify water levels and ensure that no damage to the lagoons exists.

6.6 Wastewater Discharge Program

Wastewater that is discharged to the public sewer system is divided into two categories: sanitary discharges and industrial discharges. Sanitary discharges include wastewater from restrooms and showers, food preparation activities, and other domestic-type activities. Industrial discharges are produced from general laboratory research operations, including electroplating, metal finishing, microelectronic development, and photographic processes.

Sanitary discharges include wastewater from restrooms and showers, food preparation activities, and other domestic-type activities. *Industrial discharges* are produced from general laboratory research operations.

Federal and local regulations establish the standards for sanitary sewer releases. Discharged wastewater effluent must meet the ABCWUA Sewer Use and Wastewater Control Ordinance requirements. Information on the ABCWUA Sewer Use and Wastewater Control Ordinance can be found at ABCWUA Industrial Pretreatment Overview.

Sanitary sewer releases must also meet requirements in DOE O 435.1, Change 1, *Radioactive Waste Management*, and DOE O 458.1 Change 4 (LtdChg), *Radiation Protection of the Public and the Environment*.

All wastewater discharges are monitored to meet regulatory compliance. Toxic discharges are further reduced by implementing toxic organic management plans, general good housekeeping, and engineering practices.

6.6.1 Requirements for Septic Tank System Discharges

Three active septic tank systems and one holding tank are maintained in remote areas on KAFB and are used only for domestic sanitary sewage collection. Since these tanks receive only domestic sewage and no industrial discharges, they do not require sampling prior to pumping or discharge to the public sewer. Septic holding tank pumping records are sent to NMED every six months.

6.6.2 Requirements for Technical Area V Wastewater Discharges

Research and engineering reactors are maintained in TA-V. These reactors and support facilities have the potential to produce radioactive process wastewater that includes liquids from floor drains, laboratory sinks, and other drains located in buildings that use, process, or store radioactive materials. To ensure that all wastewater from these facilities meets regulatory standards, liquid effluent is separated into two process streams: reactor and nonreactor wastewater. Nonreactor wastewater is water from restrooms and nonradioactive laboratory activities. Reactor wastewater is water from areas that use, process, or store radioactive materials and is channeled to holding tanks where it can be screened within the TA-V Liquid Effluent Control System for radiological constituents. The Liquid Effluent Control System was developed to maintain the integrity of the ABCWUA sanitary sewer system by collecting, analyzing, and handling reactor process wastewater from TA-V reactor activities. The system consists of three 5,000-gallon holding tanks with liquid level alarm systems, a sample processing area, and a data acquisition system that can be monitored remotely. Radiation Protection personnel survey the building for contamination annually. The Liquid Effluent Control System is an engineered facility operating within an established safety envelope.

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

TA-V wastewater samples are analyzed voluntarily for tritium, gross alpha, gross beta, and gamma spectroscopy to ensure that radionuclide levels meet regulatory standards established in the ABCWUA Sewer Use and Wastewater Control Ordinance. These analytical results are also provided to ABCWUA semiannually as part of the report for Permit 2069K (Table 6-3). If radionuclides are detected above regulatory limits, the water will not be released to the sanitary sewer system; an alternative disposal path will be found, or the radionuclides will be allowed to decay in place over a matter of days or weeks if determined to be appropriate. If the radioactivity level is determined to be at or below regulatory limits, the ABCWUA is notified at least 24 hours prior to the proposed discharge, and the batch is held until authorization to discharge is given. The ABCWUA may at its discretion request that the batch be held in order to conduct independent sampling of the tank. Once the ABCWUA has granted final approval, the water can be discharged safely to the public sewer system. Discharges to the sanitary sewer system from the Liquid Effluent Control System and all other TA-V activities did not exceed standards for radionuclides at any of the wastewater monitoring stations in 2021.

Table 6-3. Wastewater discharge permits and monitoring station characteristics

Permit	Station	Waste Stream Process
General Outfall		
2069A	WW001	All waste streams (includes effluent from Permit 2069G)
2069F	WW006	All waste streams (includes effluent from Permit 2238A)
2069G	WW007	Laboratory industrial process acid wastewater from Microsystems and Engineering Sciences Applications activities
2069I	WW008	All waste streams
2069K	WW011	All waste streams and radiological screening of TA-V process water at the Liquid Effluent Control System
Categorical		
2238A	Center for Integrated Nanotechnologies	Laboratory industrial process acid wastewater from Center for Integrated Nanotechnologies activities

Note: "All waste streams" includes both domestic and industrial discharges.

6.6.3 Albuquerque Bernalillo County Water Utility Authority Permitting and Reporting

The ABCWUA operates a publicly owned treatment works that discharges to the Rio Grande. The Sandia sewer system connects to the ABCWUA sanitary sewer system and eventually to the publicly owned treatment works through six permitted outfalls (Figure 6-4). Wastewater effluent discharged from any of the six outfalls must meet the permit-specific ABCWUA Sewer Use and Wastewater Control Ordinance requirements (Table 6-3).

DOE and Sandia personnel are required to report exceedances to the ABCWUA immediately in the event of accidental releases or slug discharges to the sanitary sewer (having the potential to violate publicly owned treatment works). In addition, Sandia personnel submit semiannual wastewater reports to the ABCWUA.

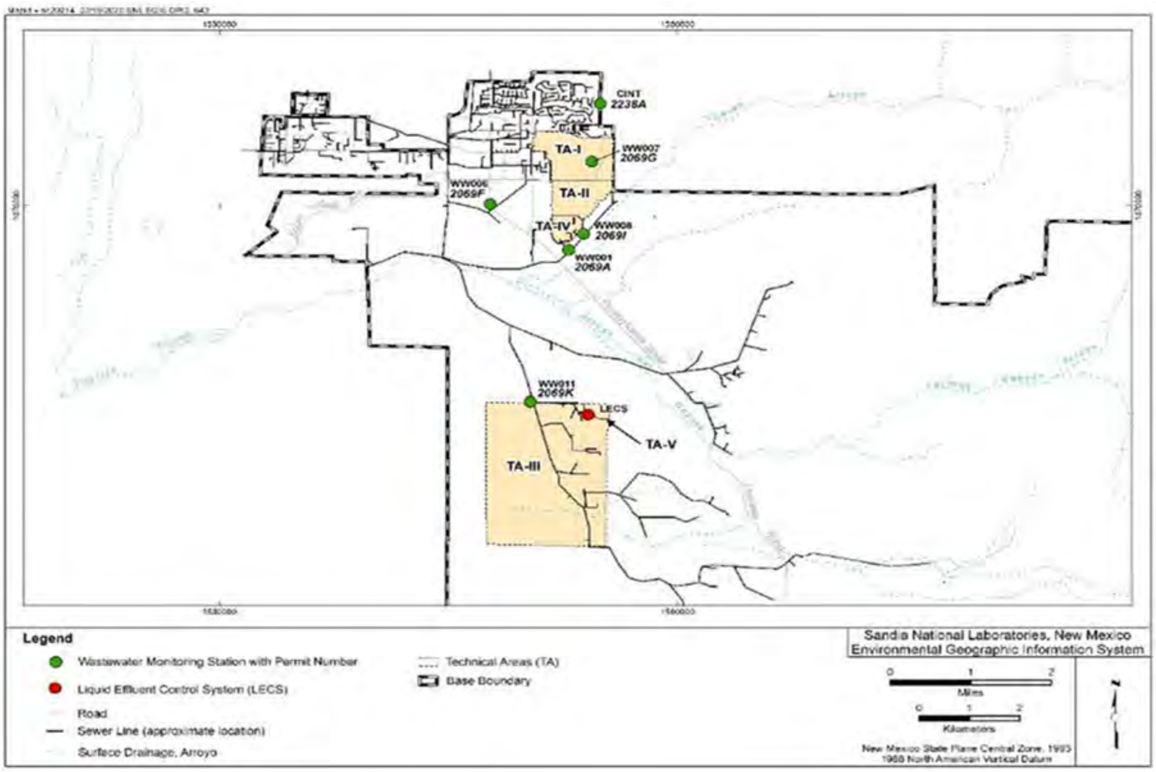


Figure 6-4. Wastewater monitoring station locations

Wastewater discharges resulting from ongoing chemical, manufacturing, and industrial processes conducted at Sandia facilities are tracked through the Wastewater Discharge Approval System before being discharged to the ABCWUA sanitary system. Facility processes are reviewed for contaminants, concentrations, and discharge frequencies to determine whether the effluent will meet regulatory criteria. Once approved, a facility is issued an internal permit, which is reviewed annually. Generally, processes are well characterized, and any constituents detected as being above the permit-specific limits at a wastewater monitoring station can be tracked back to the source facility. Corrective actions to mitigate further releases are implemented as necessary. One-time releases are approved on a case-by-case basis. In 2021, 426 wastewater discharge requests were approved. Wastewater discharge approvals are not required for buildings that only produce domestic sewage from restrooms, showers, sinks, and drinking fountains.

6.6.4 Wastewater Monitoring Stations and Sampling Parameters

There are six on-site wastewater monitoring stations permitted by the ABCWUA at SNL/NM (Figure 6-4). Wastewater monitoring station characteristics are listed in Table 6-3. Wastewater from the four permitted general outfall monitoring stations (WW001, WW006, WW008, and WW011) contains a mixture of sanitary and industrial wastewater, which discharges into the ABCWUA sanitary sewer system through the Tijeras Arroyo Intercept.

EPA has established categorical pretreatment standards for specified classes of industrial discharges. Categorical monitoring station WW007 monitors the wastewater discharged from the acid waste neutralization system in the Microelectronics Development Laboratory in TA-I. Laboratory discharges from the Microsystems and Engineering Sciences Applications Complex may also be configured to discharge to this acid waste neutralization system. An acid waste neutralization system is used to pretreat process wastewater at the Center for Integrated Nanotechnologies categorical monitoring station.

All general outfall monitoring stations are equipped with flow meters and pH sensors that monitor wastewater discharges continuously. The flow meters and pH sensors are connected to a central server system that has alarm processing, remote real-time display of data, and report-generating capabilities. If the wastewater pH approaches a set limit, an automated email protocol system notifies Sandia personnel before the pH regulatory limit is reached. Sandia personnel notify DOE when a pH limit is exceeded, and Sandia or DOE personnel are required to report an exceedance limit to the ABCWUA as soon as possible.

ABCWUA personnel sample wastewater from Sandia-permitted outfalls on a regular basis (usually quarterly) to determine compliance with permit requirements. All samples are obtained as 24-hour flow proportional or time-weighted composites. In addition, Sandia personnel collect split samples during ABCWUA sampling events, which are sent to an EPA-approved laboratory for analysis. The NMED DOE Oversight Bureau is also notified when sampling is scheduled to occur and is offered the opportunity to obtain split samples for analysis. The ABCWUA ultimately determines which parameters it plans to analyze, and Sandia personnel collect split samples for those same analytes as well as for any others requested by DOE. Wastewater was collected in 2021 to monitor the following parameters:

- Total metals—aluminum, arsenic, boron, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, and zinc
- Radiological constituents (collected for the Sandia samples only)—gamma spectroscopy, gross alpha, gross beta, and tritium
- General chemistry—ammonia, chemical oxygen demand, cyanide (for permits 2069F, 2069G, and 2238A only), fluoride, phosphorus, and total suspended solids

A *split sample* is a single sample that is separated into at least two parts so that each part is representative of the original sample.

Wastewater monitoring stations WW001, WW006, WW008, and WW011 are manhole-type installations with permanently installed continuous-flow measuring and pH-recording instrumentation. Wastewater monitoring station WW007 (Permit 2069G) and the Center for Integrated Nanotechnologies (Permit 2238A) are located within buildings and are also equipped with installed continuous-flow measuring and pH-recording instrumentation.

6.6.5 Wastewater Monitoring Results and Inspection Activities in 2021

During 2021, two ABCWUA sampling events were conducted. At the request of the ABCWUA, two additional routine sampling events that had been planned for 2021 were not scheduled by ABCWUA and did not occur. Sandia personnel collected wastewater split samples in April and October 2021 with ABCWUA and the NMED DOE Oversight Bureau. Laboratory analytical results for these split samples confirmed that Sandia operations were in compliance with ABCWUA requirements for permits 2069A, 2069F, 2069G, 2069I, 2069K, and 2238A (Table 6-3). All water discharged from the Liquid Effluent Control System in 2021 met requirements for radiological levels in wastewater. All analytical results from sampling conducted in 2021 met ABCWUA Sewer Use and Wastewater

Control Ordinance discharge requirements. Analytical results are provided in Appendix E, "Sanitary Outfalls Monitoring Results in 2021."

In April 2021, the ABCWUA performed annual inspections of facilities that discharge within permitted flow basins 2069A, 2069F, 2069G, 2069I, and 2069K. In addition, the ABCWUA performed a permit renewal inspection of industrial permit 2238A in April 2021. No issues or findings were identified during any of these inspections.

6.6.6 Sanitary Sewer System Releases in 2021

In 2021, no events reported to either the ABCWUA or DOE and accordingly, no notice of violation.

6.6.7 Pretreatment Gold Awards

The ABCWUA presented DOE and NTESS with six Pretreatment Gold Awards for 2021. Gold awards are given for 100 percent compliance with wastewater discharge permit reporting requirements, zero notices of violation, and an exceptional level of permit compliance. All of Sandia's wastewater discharge permits (2069A, 2069F, 2069G, 2069I, 2069K, and 2238A) were included in the awards.

Chapter 7. Ecology Program

Coyote Springs

OVERVIEW ■ Ecology Program personnel support compliance with regulations and laws, land use decisions, and ecological and wildlife awareness campaigns to ensure safe work environments and sustainable decision-making strategies.

Ecology Program personnel monitor and surveil vegetation and wildlife to support operations. Ecological compliance promotes conservation through the protection of native wildlife and their habitats. Conducting routine monitoring activities promotes an understanding of local population dynamics and temporal shifts through time. This knowledge is important for local land use decisions on a precise scale. Ecological monitoring activities are conducted on a calendar-year basis on DOE-permitted or fee-owned land as follows:

- Collect biological inventory data to support site activities and maintain regulatory compliance. Data collected include information on species diversity, abundance, and land use patterns. These data are used to support NEPA documentation, land use decisions, ecological and wildlife awareness campaigns, and to ensure safe work environments and sustainable decision-making strategies. Table 1-1 lists some of the more common plant and animal species identified at SNL/NM. Data are collected on plant, reptile, amphibian, mammal, bird, and vegetation species that currently inhabit DOE-controlled land:
  - Vegetation monitoring (Section 7.1)
  - Reptile and amphibian monitoring (Section 7.2)
  - Mammal monitoring (Section 7.3 and Section 7.5)
  - Bird monitoring (Section 7.4)
- Collect data on plant and animal species to advance the understanding of on-site ecological processes.

- Collect biota contaminant data on an as-needed basis in support of site projects and regulatory compliance. No data on wildlife has been collected with respect to contaminant radionuclides and metals since 2001, as no significantly elevated levels of radionuclides or metals have been observed in soil, sediment, or vegetation samples collected by Terrestrial Surveillance Program personnel (see Chapter 4 for details) during that time.
- Educate the Sandia community regarding ecological conservation.
- Provide support when biological issues arise (e.g., injured wildlife, nesting birds, snake relocation, or other wildlife encounter concerns).

Biota is the animal and plant life of a given region; *biotic* is relating to or resulting from living organisms.

Ecological monitoring and surveillance is conducted throughout the year for routine and nonroutine activities. Sampling locations and vegetation types or habitat descriptions are provided in Table 7-1.

Table 7-1. Sampling locations with vegetation type or habitat description

Sampling Site Name	Vegetation Type or Habitat Description
Grasslands	
Coyote Springs	Wetland
Dwarf Shrub Grassland Plot-009	Dwarf shrub grassland
Dwarf Shrub Grassland Plot-018	Dwarf shrub grassland
Golf Course	Urban area, ornamental landscaping
Robotics Vehicle Range	Grassland with sparse dwarf shrub
SC Dome	Shrub, open woodland, and grassland
West of TA-III	Large shrub grassland
Woodlands	
Madera Canyon Guzzler	Open woodland, shrub, and grassland
Range Wildlife Guzzler	Open woodland, shrub, and grassland
Scattered Piñon-Juniper Plot-068	Scattered piñon-juniper woodland

SC Dome = Scale Compatibility Dome

7.1 Vegetation Surveillance

Vegetation is a key ecosystem component. It is involved in essential processes, including cycling and regulating water, carbon, and nitrogen; converting solar energy into biomass to form the base of all food chains; and releasing oxygen while sequestering carbon. Vegetation also serves the critical roles of providing habitat and food for wildlife and mitigating local climate extremes by influencing the earth's surface energy balance and the lower atmosphere. Humans derive indirect socioeconomic services, such as soil and watershed protection, and direct socioeconomic products, such as timber and food, from vegetation. Vegetation affects soil development over time, generally contributing to a more productive soil (CNVC 2013).

Vegetation monitoring provides data to enhance understanding about various ecosystems and allow correlations to be examined between transformations in a vegetation habitat and other ecosystem changes. Vegetation monitoring is valuable in upholding compliance with EO 13751, *Safeguarding the Nation from the Impacts of Invasive Species*, and EO 13112, *Invasive Species*.

Vegetation type is a broad structural category of vegetation that dominates an area such as a grassland, woodland, desert, scrubland, or forest. The two main vegetation types at SNL/NM are grassland and woodland (Table 7-1). SNL/NM grasslands can have a shrub and/or scattered tree component to them and may be described in a variety of ways, such as a dwarf shrub grassland, a shrub-dominated grassland, a grassland containing shrubs and a scattered woodland component, or a meadow where a grassland area occurs as an opening within a woodland. Similarly, woodlands may be composed of tightly clustered trees dominated by piñon and juniper and described as closed piñon-juniper woodland, or the main structural vegetation type may be scattered piñon and juniper trees and described as a scattered piñon-juniper woodland.

Habitat is the environment that a plant or animal has adapted to and where it is normally found. The habitat for a species may be very broad, such as temperate North American grasslands, or the habitat for a species can be very narrow, such as a highly specific biotic composition with short, medium, or tall grassland that is composed of certain grass species with or without specific shrub components. Detecting invasive plant species is an important aspect of long-term monitoring across a variety of vegetation types. An invasive species is an organism that is not indigenous, or native, to an area. Of biota occurring at Sandia, invasive plants pose the greatest risk to the local ecology.

An ecosystem is a network of living organisms and nonliving components that interact to comprise an overall environment. An environment is the sum of all external conditions affecting an organism's life, development, and survival. Habitat is the place or environment where a plant or animal naturally or normally lives and grows.

The invasive plant of greatest concern at SNL/NM is cheatgrass (*Bromus tectorum*). It is able to maintain superiority over native plants through prolific seed production and the ability to germinate in autumn or spring, which gives it a competitive advantage over native warm season perennials. A hazardous aspect of cheatgrass is its ability to alter the local fire regime; wildfires occur more frequently—cheatgrass burns nearly four times more often than native vegetation types—and larger areas burn when cheatgrass is present. Cheatgrass was associated with 24 percent of the land area burned in the 50 largest fires in the 2000s in the western United States (Balch, Bradley, and Gómez-Dans 2013).

7.1.1 Vegetation Monitoring Strategy

Ecology Program personnel adopted the national Assessment, Inventory, and Monitoring (AIM) vegetation monitoring strategy. This long-term strategy provides a landscape-level, data-driven method for understanding ecosystem conditions that better supports management decisions, natural resources, and reporting.

AIM is a comprehensive and rigorous strategy that can serve many monitoring objectives and can also be aggregated for use across multiple scales of management. The AIM approach is built on five key elements: a standardized set of core and contingent indicators for both terrestrial and aquatic ecosystems, a statistically valid sampling design, a structured implementation process, electronic data capture, and integration with remote sensing (BLM 2011).

By using standardized monitoring indicators and methods to collect AIM data, land managers have a basis from which to (1) adaptively manage resources to achieve management goals and objectives, (2) improve understanding of the ecosystem, and (3) adjust monitoring efforts as necessary by using a well-documented and consistent approach (BLM 2011).

In 2021 three AIM plots were established and completed (Figure 7-1). Data collected at each of the AIM plots to date are important in providing baseline information; however, comparing plot assessments is not possible currently due to the variations between the plots. Each plot will be revisited on a rotating basis to monitor for changes, and data interpretation will become meaningful after each plot has been resampled multiple times, eventually providing insight into ongoing environmental conditions as indicators change or remain consistent across time.

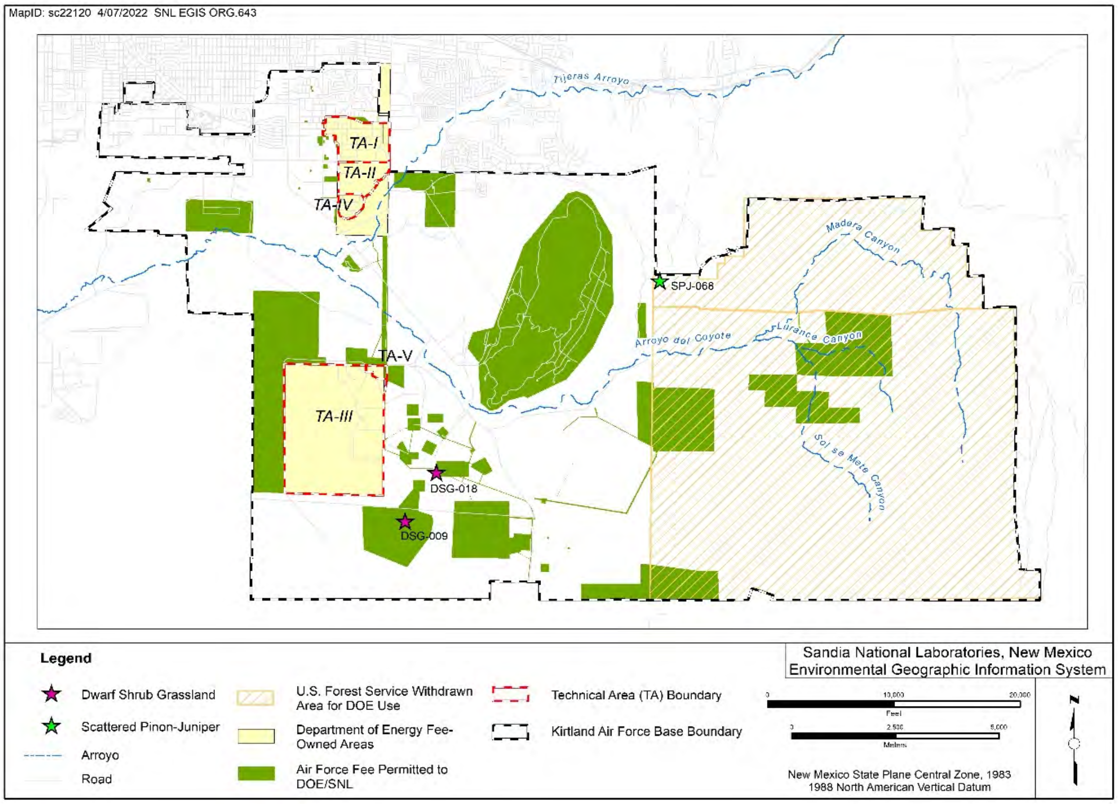


Figure 7-1. Three AIM monitoring plots established in 2021

7.1.2 Vegetation Monitoring

Each AIM plot covers approximately 0.7 acres, consisting of three 25 m-long transects arranged in a spoke design around the plot center. A vegetation transect is a path along which biologists count and record occurrences of plant species; a measuring tape is laid out on the ground surface to define the transect line. Data collected in each transect include all species of vegetation intercepted at a single, narrow 1 mm-wide point every 0.5 meters along a transect line (commonly referred to as a line-point intercept). Vegetation height, gaps between canopies of vegetation, gaps between vegetation bases (where vegetation emerges from the ground), and soil are tested to determine the vegetation's stability. A complete vegetation species inventory is also conducted throughout the entire AIM plot area.

A *transect* is a sample area usually in the form a long, continuous strip.

Species richness, the simplest measure of species diversity, is the number of plant species inhabiting a plot area. Canopy gaps and basal gaps indicate how protected soil is from the erosive effects of wind and water. The proportion of the plot covered by canopy gaps is related to the risk of wind erosion. Vegetation reduces wind energy, sheltering the soil downwind. Uneven gaps or large patches between vegetation canopies allows for increased wind erosion when vegetation is distributed evenly across a landscape. Similarly, plant bases affect the erosive action of water by slowing the movement of water down slopes. The proportion of each transect with large basal gaps reflects susceptibility to water erosion and runoff (Herrick et al. 2017).

Increases in the surface stability of soil reflects increased soil erosion resistance and resilience. The soil stability scale is 1 (very unstable) to 6 (highly stable). Sites with values of 5.5 or higher generally are very resistant to erosion, particularly if there is little bare background and few large gaps.

Two of the AIM plots were established in grasslands: Plot Dwarf Shrub Grassland-009 (DSG-009) and Plot Dwarf Shrub Grassland-018 (DSG-018). One AIM plot was established in piñon-juniper woodlands: Plot Scattered Piñon-Juniper-068 (SPJ-068).

Plot DSG-009

Plot DSG-009 is characterized by sandy soils on an alluvial fan slope in the dwarf shrub grassland vegetation type. The plot is dominated by native bunchgrasses within the larger overall landscape of dwarf shrub grassland (Figure 7-2). This plot has experienced a low level of off-road vehicle use. Sheet erosion is widespread across the plot area.

Foliar is of, relating to, or applied to leaves.

The 25 plant species in Plot DSG-009 are indicative of moderate grassland diversity (Table 7-2). Russian thistle (*Salsola tragus*), an annual weedy plant, is the dominant plant species in the plot with the highest foliar cover. However, this plant turns into tumbleweed after it dies in the fall, resulting in reduced foliar ground cover after death. All other dominant plant species listed in Table 7-3 are perennial native grasses.

Soil disturbances, such as previous vehicular driving in this plot, can remove soil-stabilizing native plants and create openings for weedy annual plants to become established.

Figure 7-2. Plot DSG-009 on an alluvial fan slope with deep sandy soils in dwarf shrub grassland vegetation

Table 7-2. Species richness and foliar cover at Plot DSG-009

Plot Area	Percent
Average foliar cover	48.6
Foliar Cover by Vegetation Type	
Grasses	32.5
Forbs	16
Sub-shrub	0
Shrubs	0
Trees	0

Table 7-3. Foliar cover of dominant plant species at Plot DSG-009

Common Name	Scientific Name	Percent
Russian thistle	*Salsola tragus*	14.7
Spike dropseed	*Sporobolus contractus*	11.3
Sand dropseed	*Sporobolus cryptandrus*	7.3
Galleta	*Pleuraphis jamesii*	4.7
Six-weeks three-awn	*Bouteloua barbata*	3.3
Black grama	*Bouteloua eriopoda*	2.0
Burrograss	*Scleropogon brevifolius*	1.3
Mesa dropseed	*Sporobolus flexuosus*	1.3
Sand muhly	*Muhlenbergia arenicola*	1.3

Canopy gap and basal gap data for Plot DSG-009 are shown in Table 7-4 and Table 7-5, respectively. More than half the length of the plot transects contain canopy gaps, a moderately high percent. Most of the transect length has basal gaps, with two-thirds of the basal gaps greater than 50 cm. These long stretches of gaps between plant bases increase the erosive effects of water.

Table 7-4. Canopy gaps between plants at Plot DSG-009

Size of Gap	Percent of Line
0–25 cm	3.0
25–50 cm	15.9
51–100 cm	24.9
101–200 cm	6.0
> 200 cm	7.0
Plot total	**56.8**

Table 7-5. Base gaps between plants at Plot DSG-009

Size of Gap	Percent of Line
0–25 cm	1.7
25–50 cm	16.5
51–100 cm	25.3
101–200 cm	28.5
> 200 cm	12.8
Plot total	**84.8**

The surface soil stability of Plot DSG-009 is shown in Table 7-6. Soils protected by plant cover were slightly more stable than bare soils and, overall, the soils for the plot are moderately stable, scoring a stability class of 3.6. These scores combined with the medium-high percent of canopy gaps and high percent of basal gaps indicate that the plot soils are moderately unstable.

Table 7-6. Soil stability of Plot DSG-009

Soil Surface Stability	Score
Overall plot soil stability	3.6
Soil stability of protected soils	3.9
Soils not protected by plant cover	3.4

Plot DSG-018

Plot DSG-018 is characterized by rocky soils on a slightly alkaline rocky outcrop in the dwarf shrub grassland vegetation type. The plot is dominated by native sub-shrubs, grasses, and forbs that tolerate moderately alkaline soils. This plot is highly representative of dwarf shrub grassland (Figure 7-3).

The 34 plant species in Plot DSG-018 generally indicate good species richness in a dwarf or sub-shrub grassland (Table 7-7). All the dominant plant species listed in Table 7-8 are native species.

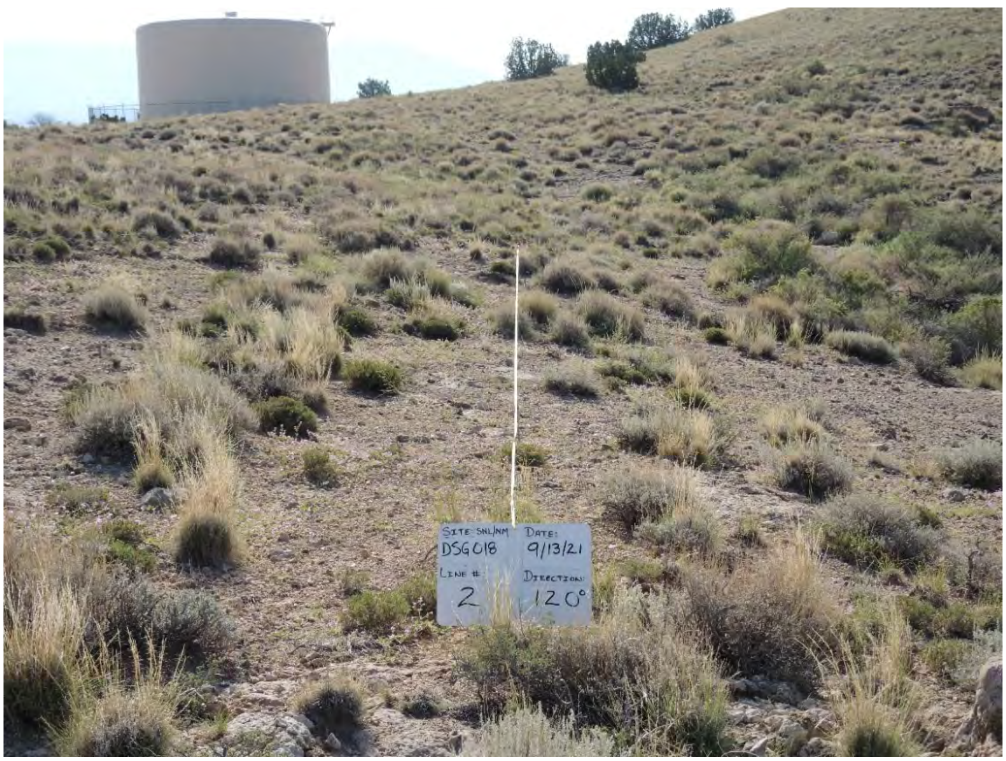


Figure 7-3. Plot DSG-018 on a rocky outcrop in dwarf shrub grassland vegetation

Table 7-7. Species richness and foliar cover at Plot DSG-018

Area	Percent
Average foliar cover	34.7
Foliar Cover by Vegetation Type	
Grasses	16.7
Forbs	6
Sub-shrub	12
Shrubs	0
Trees	0

Table 7-8. Foliar cover of dominant plant species at Plot DSG-018

Common Name	Scientific Name	Percent
Arizona poppy	*Kallstroemia grandiflora*	2.0
Bigelow sagebrush	*Artemisia bigelovii*	7.3
Black grama	*Bouteloua eriopoda*	4.0
Broom snakeweed	*Gutierrezia sarothrae*	3.3
Buffalograss	*Bouteloua dactyloides*	1.3
Bush muhly	*Muhlenbergia porteri*	2.0
Indigobush	*Dalea formosa*	1.3
Sand dropseed	*Sporobolus cryptandrus*	6.0
Trailing windmills	*Allionia incarnata*	2.7

Canopy gap and basal gap data for Plot DSG-018 are shown in Table 7-9 and Table 7-10, respectively. Overall, a low-medium portion of the plot transects contain canopy gaps of any size. Similarly, the plot contains a low-medium percent of basal gaps between plants.

Table 7-9. Canopy gaps between plants at Plot DSG-018

Size of Gap	Percent of Line
0–25 cm	0.6
25–50 cm	4.7
51–100 cm	7.6
101–200 cm	10.8
> 200 cm	13.4
Plot total	**37.1**

Table 7-10. Base gaps between plants at Plot DSG-018

Size of Gap	Percent of Line
0–25 cm	0.7
25–50 cm	2.4
51–100 cm	8.6
101–200 cm	12.3
> 200 cm	19.8
Plot total	**43.8**

Soil stability of the plot was moderate, with a consistent stability class of 3.1 on a scale of 1 to 6 (Table 7-11). Additionally, Plot DSG-018 has an average rock cover of 45 percent, which armors much of the area and increases resistance to erosion by wind or water. The soil stability scores in combination with the substantial rock cover and low-moderate canopy and basal gaps indicate that the plot has good erosion resistance.

Table 7-11. Soil stability of Plot DSG-018

Soil Surface Stability	Score
Overall plot soil stability	3.1
Soil stability of protected soils	3.1
Soils not protected by plant cover	3.1

Plot SPJ-068

Plot SPJ-068 is characterized by rocky soils on rolling hills in the scattered piñon-juniper vegetation type. The plot is dominated by native grasses with scattered juniper trees and sub-shrubs. This plot is highly representative of scattered piñon-juniper (Figure 7-4).

The 43 plant species in the plot area indicate good species richness (Table 7-12). All the dominant plant species listed in Table 7-13 are native species. Although the juniper trees are visually the most notable species, as is common for this vegetation type, perennial bunchgrasses have the greatest foliar cover.

Figure 7-4. Plot SPJ-068 on rocky soils in scattered piñon-juniper vegetation

Table 7-12. Species richness and foliar cover at Plot SPJ-068

Area	Percent
Average foliar cover	59.3
Foliar Cover by Vegetation Type	
Grasses	53.3
Forbs	0.7
Sub-shrub	5.3
Shrubs	0
Trees	7.3

Table 7-13. Foliar cover of dominant plant species at Plot SPJ-068

Common Name	Scientific Name	Percent
Black grama	*Bouteloua eriopoda*	21.3
Blue grama	*Bouteloua gracilis*	24.7
Broom snakeweed	*Gutierrezia sarothrae*	2.7
Bush muhly	*Muhlenbergia porteri*	1.3
Galleta	*Pleuraphis jamesii*	2.7
One-seed juniper	*Juniperus monosperma*	7.3
Prairie verbena	*Glandularia bipinnatifida*	0.7
Pricklypear cactus	*Opuntia phaeacantha*	2.0
Sand dropseed	*Sporobolus cryptandrus*	3.3

Canopy gap and basal gap data for Plot SPJ-068 are shown in Table 7-14 and Table 7-15, respectively. Overall, a low portion of the plot transects contain canopy gaps of any size. Similarly, the plot contains a low percent of basal gaps between plants.

Table 7-14. Canopy gaps between plants at Plot SPJ-068

Size of Gap	Percent of Line
0–25 cm	0.3
25–50 cm	5.6
51–100 cm	4.7
101–200 cm	2.2
> 200 cm	0
Plot total	**12.8**

Table 7-15. Base gaps between plants at Plot SPJ-068

Size of Gap	Percent of Line
0–25 cm	0.7
25–50 cm	6.4
51–100 cm	8.7
101–200 cm	7.7
> 200 cm	3.6
Plot total	**27.1**

Overall soil stability of Plot SPJ-068 was moderate with a stability class of 3.6 on a scale of 1 to 6 (Table 7-16). Plot SPJ-068 has an average rock cover of 49 percent, which armors half of the area and increases resistance to erosion by wind or water. The soil stability scores combined with the substantial rock cover and low canopy and basal gaps indicate that the plot has very good erosion resistance.

Table 7-16. Soil stability of Plot SPJ-068

Soil Surface Stability	Score
Overall plot soil stability	3.6
Soil stability of protected soils	4.3
Soils not protected by plant cover	3.3

7.1.3 Vegetation Establishment and Ecological Restoration

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed; it is an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity, and sustainability (SER 2004).

Ecology Program personnel provide ecological restoration guidance and support for a variety of projects, since 2009. The successful recovery of degraded lands in central New Mexico is extremely challenging. SNL/NM resides in an arid climate that receives less than nine inches of precipitation per year, experiences drying winds in the spring, and has hot summers and cold winters. Prior to Ecology Program personnel becoming involved with the restoration of degraded sites, reseeding efforts generally were unsuccessful. The Ecology Program approach has since shifted, recognizing that all biotic components need to be assessed and addressed in order to reestablish the historic native community of each site successfully.

The reestablishment of native vegetation is the first step in the restoration process. Biotic characteristics such as the absence or presence of healthy, living soils capable of supporting a native plant community determines the next steps in the restoration process. The process includes selecting the appropriate plant species and density, using proper implementation methods, providing seed protection, and eliminating or significantly reducing site competition from weeds and their seeds in the soil bank. Identifying appropriate project goals and applying approaches best suited to the degree of site impairment are part of the essential framework for each restoration project.

Ecological Restoration Projects

Ecological restoration projects are most often related to construction activities, commonly in support of the stormwater pollution prevention plan development process and, more specifically, the CGP, according to EPA guidelines. When possible, an area is evaluated to identify and document the native biological community prior to beginning activities that will disturb the earth. If an area cannot be evaluated prior to disturbance or if the area has existing disturbance, a reference ecosystem serves as a guide for planning the restoration work. The full scope of disturbance effects, either existing or planned, the anticipated final state of the site, and any other relevant factors are also assessed before planning the restoration work. Ecology Program personnel develop a detailed written restoration plan, or specification, for the project. This is provided to Infrastructure Operations personnel, who oversee work contracts. Ecology Program personnel continue to provide support and guidance throughout the restoration project, including conducting post-restoration site monitoring and biological evaluations of the recovery.

A Certified Ecological Restoration Practitioner provides ecological restoration support at SNL/NM. This certification is awarded by the Society for Ecological Restoration to practitioners who have met the society’s rigorous standards of knowledge and experience.

In 2021, Ecology Program personnel supported the following ecological restoration projects:

- **9940X.** The 9940X project was seeded in April 2021. The seeded species germinated evenly across the site and grew well during the warm season. In October 2021 the project area met the requirements for vegetative soil stabilization.
- **5kV Overhead.** The 5kV Overhead project is an 11-acre project located north of Thunder Range with alkaline postconstruction soils. The project was seeded in June 2021. The seeded species germinated evenly across the site and grew well during the warm season. In October 2021 the project area met the requirements for vegetative soil stabilization.
- **700K Gallon Tank.** The 700K Gallon Tank project is in a remote area south of TA-III. This four-acre project had extremely alkaline postconstruction soils due to the project depth churning up the caliche soil layer. The project intersects the 5kV Overhead project and was seeded at the same time, in June 2021. The seeded species germinated evenly across the site and grew well during the warm season. In October 2021 the project area met the requirements for vegetative soil stabilization.
- **Brayton Gas Line/Building 6630.** The Brayton Gas Line project was seeded in 2017. In October 2021, the project area met the requirements for vegetative soil stabilization.
- **Battery Test Facility/Building 1012.** The Battery Test Facility project was seeded in 2019. In October 2021, the project area met the requirements for vegetative soil stabilization.
- **Building 6534.** The 3-acre Building 6534 project is in TA-III. In June 2021, the project area was surveyed; a seeding specification was written and provided to the Facilities project manager.
- **Building 6505 Thermal Spray Research Laboratory.** The 0.65-acre Building 6505 Thermal Spray Research Laboratory project is in TA-III. In November 2021, the project area was surveyed; a seeding specification was written and provided to the Facilities project manager.

Note: In arid and semiarid environments, vegetative cover in a project area must meet or exceed 70 percent of the native background vegetative cover to meet the requirement for CGP permit termination.

Additional 2021 activities included monitoring restoration projects that were installed in previous years and instituting recommendations as necessary to improve their ecological recovery trajectories. These projects were evaluated during prime vegetation growth periods for the best evaluation of native plant cover and weed presence and to observe any potential issues present during the warm growing season.

7.2 Herpetofauna Surveillance

Snakes and lizards play principal roles in maintaining well-functioning natural ecosystems. Lizards, which are important prey species across all habitats at SNL/NM, are easily seen by predators due to diurnal activity patterns, are defenseless when captured, and are available in abundant numbers. Snakes are also important prey species, supporting medium- to large-sized mammal and bird populations. Lizards prey on insects, thus moderating ant, grasshopper, termite, beetle, and spider populations. Snakes regulate small mammal populations, which helps to control Hantavirus, a potentially lethal virus that is transmitted to humans through mouse excrement. Hantavirus control by snakes is a valuable ecosystem service for humans.

Amphibians largely eat invertebrates and play an important role in controlling insect populations. Tadpoles are often prey and are a significant part of nutrient cycling. Amphibians are very sensitive to changes in their environment and are widely regarded as ecological indicators.

7.2.1 Drift Fence Trapping

Many different techniques are available to detect the presence of reptiles and amphibians in the environment. In 2012, the Ecology Program advanced from implementing night spotting (a type of visual encounter survey) and coverboard arrays to using drift fence arrays with funnel traps.

A single drift fence array consists of six funnel traps made of wire mesh boxes placed along a 100-foot linear drift fence. The boxes have one-way entrances, whereby animals can easily enter the trap but not exit. Each field monitoring site contains four linear drift fence trapping arrays. Annual monitoring currently consists of three separate two-week trapping periods during spring and summer months. The traps are checked twice daily, and all animals are released after processing.

Two field sites were initially established in 2012 to monitor reptiles and amphibians at one grassland field site and one shrubland field site. An additional field site was added in 2016 to monitor a herpetofaunal community in an open woodland setting.

Herpetology is the study of reptiles and amphibians. *Herpetofauna* are the reptiles and amphibians of a particular region, habitat, or geological period.

Herpetofaunal communities were monitored at two sites in 2021: the Robotics Vehicle Range and the old Scale Compatibility Dome site.

7.2.2 Herpetofauna Survey Results

During 2021 herpetofaunal field monitoring, 149 individuals representing 12 species were recorded using drift fence arrays with funnel traps: 5 snake species, 6 lizard species, and 1 amphibian species (Table 7-17).

Table 7-17. Total herpetofaunal captures by site and trapping period, 2021

		Robotics Vehicle Range			Robotics Vehicle Range Total	SC Dome			SC Dome Total	Grand Total
		Trapping Period				Trapping Period				
Common Name	**Scientific Name**	**1**	**2**	**3**		**1**	**2**	**3**		
Chihuahuan spotted whiptail	*Aspidoscelis exsanguis*					16	14	4	34	**34**
Coachwhip	*Masticophis flagellum*	3	1	1	5					**5**
Common side-blotched Lizard	*Uta stansburiana*			3	3					**3**
Desert striped whipsnake	*Masticophis taeniatus*					2	1		3	**3**
Eastern collared lizard	*Crotaphytus collaris*					2			2	**2**
Great Plains skink	*Plestiodon obsoletus*	3	3	3	9					**9**
Mexican spadefoot toad	*Spea multiplicata*		1	2	3					**3**
New Mexico whiptail	*Aspidoscelis neomexicanus*	40	21	1	62	2		1	3	**65**
Prairie rattlesnake	*Crotalus viridis*	1	1	2	4					**4**
Sonoran gopher snake	*Pituophis catenifer affinis*	1		1	2					**2**

		Robotics Vehicle Range			Robotics Vehicle Range Total	SC Dome			SC Dome Total	Grand Total
		Trapping Period				Trapping Period				
Common Name	**Scientific Name**	**1**	**2**	**3**		**1**	**2**	**3**		
Southwestern fence lizard	*Sceloporus cowlesi*	2	9	6	17					**17**
Western diamond-backed rattlesnake	*Crotalus atrox*		1		1	1			1	**2**
Total		**50**	**37**	**19**	**106**	**23**	**15**	**5**	**43**	**149**

The following biodiversity measures were calculated using herpetofaunal monitoring data: species richness, species evenness, and the Shannon diversity index. Species richness is the number of unique species in a community and species evenness (or equitability) is a description of species' distribution of abundance. The Shannon diversity index is a common index used by ecologists to summarize the diversity of a community. Together these measures can be used to compare diversity between sites and analyze changes in biodiversity at a monitoring site over time (Table 7-18). Additionally, these measures allow ecologists to track the directionality and magnitude of change. For example, prolonged depressed biodiversity measures would warrant further analyses and may result in natural resource management recommendations.

Table 7-18. Herpetofaunal biodiversity monitoring data by site, 2021

Site	Total Number of Captures	Species Richness	Species Diversity	Species Evenness
Robotics Vehicle Range	106	9	1.41 *Average = 1.14* *Range 0.45–1.79*	0.64 *Average = 0.55* *Range 0.23–0.81*
Scale Compatibility Dome	43	5	0.79 *Average = 0.99* *Range 0.72–1.44*	0.49 *Average = 0.55* *Range 0.49–0.74*

Notes:
Averages and ranges were calculated from available 2012–2021 data.
Monitoring performed from 2012 to 2014 consisted of a single three-consecutive-week trapping session compared with the current spread trapping schedule.

7.3 Bat Surveillance

There are many threats to bats across the United States, most notably wind energy operations and white-nose syndrome, a fungal disease. A study of population projection models showed that under even conservative estimates, the entire North America population of hoary bats (*Lasiurus cinereus*) could decline up to 90 percent in the next 50 years (Frick et al. 2017). Deaths due to white-nose syndrome were reported at 5 to 6 million bats in 2015 (Leopardi, Blake, and Puechmaille 2015), and the fungus that causes white-nose syndrome was recently detected in New Mexico caves (National Park Service 2018). Given these serious threats, it is imperative that bat populations be monitored at SNL/NM so potential threats to their survival can be mitigated.

In 2021, 22 species of bats were documented at SNL/NM. This is two more species (*Myotis evotis* and *Myotis lucifugus*) than in 2020.

7.3.1 Passive Bat Monitoring

Passive bioacoustic recordings were used to monitor bats from January 2021 through December 2021, although occasional equipment failure resulted in some data gaps. Bat activity in the southwest is most concentrated around water sources where bats drop in for a drink and has shown to account for 66 percent of variation in capture rates (Geluso and Geluso 2012). As no such permanent water sources exist on DOE/SNL land, ultrasonic recorders are located at Coyote Springs and at the large pond at the KAFB Golf Course. Both are used with the KAFB Natural Resource Program manager's permission.

Once the digital cards were retrieved from the recorders, the data were processed using bioacoustic analysis software. The software suggests the species most likely to have been recorded according to the call amplitude, shape, and frequency. Calls are assigned a match ratio, which is the number of pulses in an individual call that match calls from the classifier library. For instance, if 10 out of 10 pulses from an individual call match silver-haired bat (*Lasionycteris noctivagans*) calls in the classifier library, that call is given a match ratio of 1.0. Only calls that had a match ratio of 0.8 and above were included in species results.

7.3.2 Bat Monitoring Results

Twenty-two bat species from two families were detected using ultrasonic recorders in 2021 (Table 7-19). Two of these species were not detected in 2020, and one species recorded in 2020 was not detected in 2021 (*Euderma maculatum*). Detections at Coyote Springs and the KAFB Golf Course are shown in Figure 7-5 and Figure 7-6, respectively.

Table 7-19. Bat species detected using ultrasonic recorders, 2021

Common Name	Scientific Name
Family Vespertilionidae	
Arizona myotis	*Myotis occultus*
Big brown bat	*Eptesicus fuscus*
California myotis	*Myotis californicus*
Canyon bat	*Parastrellus hesperusa*
Desert pallid bat	*Antrozous pallidus*
Eastern red bat	*Lasiurus borealis*
Evening bat	*Nycticeius humeralis*
Fringed myotis	*Myotis thysanodes*
Hoary bat	*Aeorestes cinereusa*
Little brown myotis	*Myotis lucifugus*
Long-eared myotis	*Myotis evotis*
Long-legged myotis	*Myotis volans*
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Silver-haired bat	*Lasionycteris noctivagansa*
Tricolored bat	*Perimyotis subflavusa*
Western red bat	*Lasiurus blossevillii*
Western small-footed bat	*Myotis ciliolabruma*
Western yellow bat	*Lasiurus xanthinus*
Yuma myotis	*Myotis yumanensisa*
Family Molossidae	
Big free-tailed bat	*Nyctinomops macrotis*
Mexican free-tailed bat	*Tadarida brasiliensisa*
Pocketed free-tailed bat	*Nyctinomops femorosaccus*

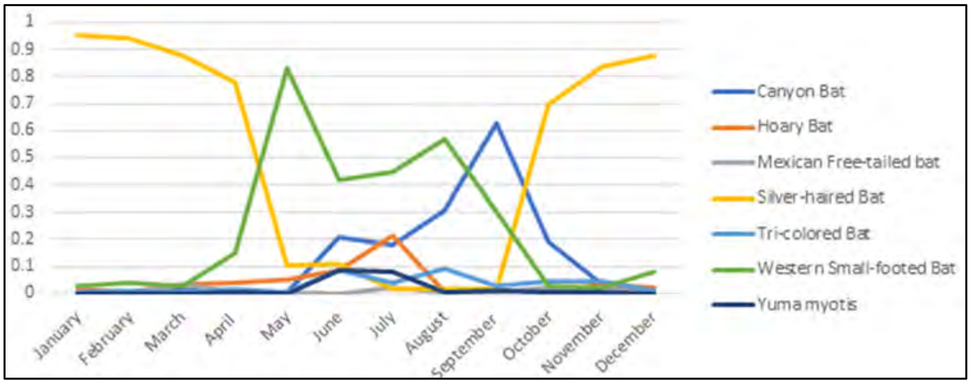


Figure 7-5. Bat species detections at Coyote Springs by month, 2021

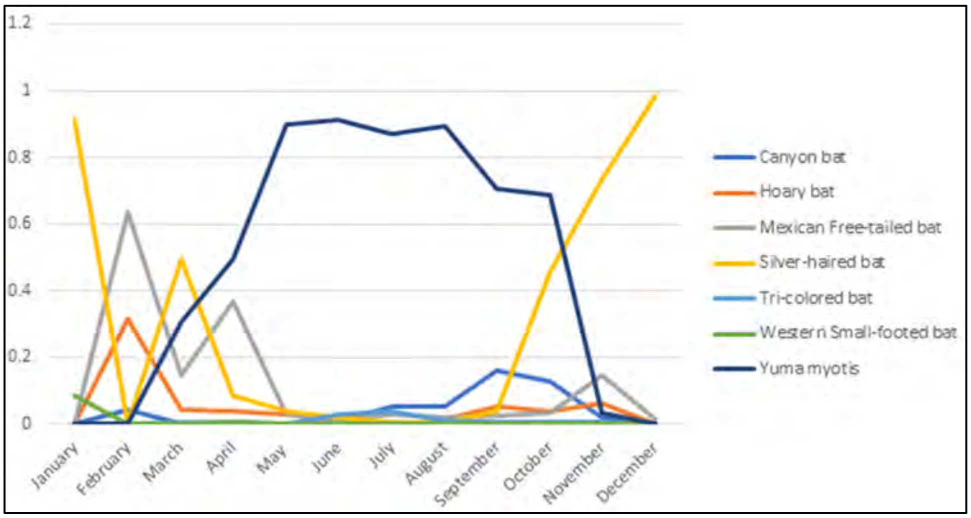


Figure 7-6. Bat species detections at the KAFB Golf Course by month, 2021

In 2021, four bats had to be relocated due to conflict with humans. These included a desert pallid bat (*Antrozous pallidus*) and a Western small-footed bat (*Myotis ciliolabrum*) (Figure 7-7).

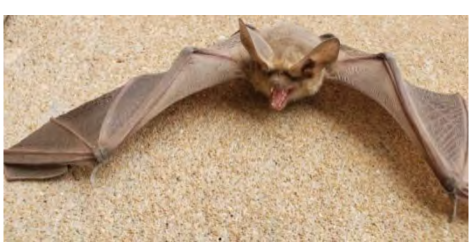


Figure 7-7. Desert pallid bat (*Antrozous pallidus*) found at the Solar Tower (left) and long-legged myotis (*Myotis Volans*) found at Building 9940 (right) (Desert pallid bat photo by an SNL Mechanical

Technologist.)

The following seven species were recorded most frequently in 2021:

- **Canyon bat.** The canyon bat is the smallest bat in North America with an average weight of only 4 g (Ammerman et al. 2012). Their disproportionate presence at the KAFB Golf Course is curious, as they typically prefer rocky outcrops such as those found at Coyote Springs.
- **Hoary bat.** This large tree bat is migratory and found throughout New Mexico from April through June and then again from August through October (Findley et al. 1975). Interestingly, males and females migrate separately (Cryan et al. 2003). Unfortunately, the acoustic recorders cannot differentiate between males and females. The detectors picked up hoary bats most often in May and September at the KAFB Golf Course and in May and July at Coyote Springs.
- **Mexican free-tailed bat.** The Mexican free-tailed bat is common in New Mexico and usually migrates to Mexico for the winter (Findley et al. 1975). The peak activity in April and May is consistent with colonies moving through while migrating north.
- **Silver-haired bat.** The silver-haired bat is known to migrate out of New Mexico in the summer (Findley et al. 1975) and to hibernate during the winter (Geluso et al. 1987). This is consistent with the recorded data, with very little activity from June through September and peak activity in March and October through November, indicating migration north in spring and hibernation or migration south in the fall.
- **Tri-colored bat.** The tri-colored bat was not included in a comprehensive publication on the mammals of New Mexico (Findley et al. 1975). Recent specimen records from Eddy, Chaves, and Union counties probably represent a range expansion (Valdez et al. 2009). As of now, there are no known tri-colored bat specimens in Bernalillo or surrounding counties, but the goal is to validate its presence in the spring and summer of 2022.
- **Western small-footed bat.** This small-footed bat had little presence at the KAFB Golf Course but logged over 1,700 calls on the recordings at Coyote Springs. There were over 1,000 calls in May and another activity spike in August. The small-footed bat is known to hibernate in other parts of the United States and that is likely also the case here in New Mexico (Bowers, Bowers, and Kaufman 2007).
- **Yuma myotis.** The Yuma myotis was barely represented at the KAFB Golf Course, but thousands of calls were recorded at Coyote Springs. Very few calls were recorded in the winter and fall, with call frequency was highest in May.

A *bird survey* is the process of counting birds visually and audibly; *bird banding* involves capturing a bird, adding a leg band, and then releasing the bird unharmed.

7.4 Avian Surveillance

Long-term monitoring of breeding and wintering birds can reveal population trends and dynamics. Collecting data aids land use decisions and provides documentation regarding bird population trends regionally and continentally. The two main monitoring methods used at SNL/NM are bird surveys, which is the process of counting birds visually and audibly, and bird banding, which involves capturing a bird, adding a leg band, and then releasing the bird unharmed. Bird banding is a useful tool to monitor environmental conditions because it provides estimates on survival and productivity of local bird populations.

7.4.1 Bird Surveys Using Transects

In 2021, the bird survey transects were changed to reflect the standardized North American Breeding Bird Survey route with 50 survey points separated by 0.5 mile. At each point, the observer notes any bird species seen or heard within a quarter mile radius in a 3-minute period before moving on to the next point. This year's breeding bird survey was conducted in June. Fifty-two species and 552 individuals were detected across the transect in 2021 (Table 7-20).

Table 7-20. Species totals detected during the breeding bird survey, 2021

Common Name	Scientific Name	Individuals
American robin	*Turdus migratorius*	10
Barn swallow	*Hirundo rustica*	2
Bewick's wren	*Thryomanes bewickii*	5
Black-chinned hummingbird	*Archilochus alexandri*	10
Black-chinned sparrow	*Spizella atrogularis*	4
Black-headed grosbeak	*Pheucticus melanocephalus*	3
Black-throated gray warbler	*Setophaga nigrescens*	3
Black-throated sparrow	*Amphispiza bilineata*	40
Blue-gray gnatcatcher	*Polioptila caerulea*	3
Blue grosbeak	*Passerina caerulea*	9
Brown-headed cowbird	*Molothrus ater*	1
Bullock's oriole	*Icterus bullockii*	4
Bushtit	*Psaltriparus minimus*	1
Canyon towhee	*Melozone fusca*	5
Cassin's kingbird	*Tyrannus vociferans*	6
Cassin's sparrow	*Peucaea cassinii*	11
Chihuahuan raven	*Corvus cryptoleucus*	2
Cliff swallow	*Petrochelidon pyrrhonota*	2
Common raven	*Corvus corax*	6
Curve-billed thrasher	*Toxostoma curvirostre*	1
Eastern meadowlark	*Sturnella magna*	13
Eurasian collared-dove	*Streptopelia decaocto*	7
Gray vireo	*Vireo vicinior*	15
Horned lark	*Eremophila alpestris*	19
House finch	*Haemorhous mexicanus*	75
House sparrow	*Passer domesticus*	9
House wren	*Troglodytes aedon*	1
Juniper titmouse	*Baeolophus ridgwayi*	6
Ladder-backed woodpecker	*Dryobates scalaris*	6
Lark sparrow	*Chondestes grammacus*	6
Lesser goldfinch	*Spinus psaltria*	3
Loggerhead shrike	*Lanius ludovicianus*	1
Mourning dove	*Zenaida macroura*	23
Northern mockingbird	*Mimus polyglottos*	135
Pine siskin	*Spinus pinus*	1
Plumbeous vireo	*Vireo plumbeus*	2
Red-tailed hawk	*Buteo jamaicensis*	2
Red-winged blackbird	*Agelaius phoeniceus*	1

Common Name	Scientific Name	Individuals
Rock pigeon (feral pigeon)	*Columba livia*	4
Rock wren	*Salpinctes obsoletus*	3
Rufous-crowned sparrow	*Aimophila ruficeps*	2
Say's phoebe	*Sayornis saya*	10
Scaled quail	*Callipepla squamata*	2
Scott's oriole	*Icterus parisorum*	6
Spotted towhee	*Pipilo maculatus*	13
Swainson's hawk	*Buteo swainsoni*	1
Western/eastern meadowlark	*Sturnella magna/neglecta*	2
Western kingbird	*Tyrannus verticalis*	20
Western meadowlark	*Sturnella neglecta*	17
Western tanager	*Piranga ludoviciana*	2
Western wood-pewee	*Contopus sordidulus*	5
Woodhouse's scrub-jay	*Aphelocoma woodhouseii*	12
Total		**552**

7.4.2 Bird Banding and Monitoring

Ecology Program personnel implemented two projects that use bird banding to monitor bird diversity and abundance: the Monitoring Avian Productivity and Survivorship (MAPS) protocol and fall migration. A banding permit is maintained through the U.S. Geological Survey Bird Banding Laboratory.

To make comparisons among seasons, days, and net sites, personnel calculate birds captured per net hour (one standard mist net operated for one hour). For this computation, the number of birds captured in a day or season is divided by the number of total net hours in that period.

Monitoring Avian Productivity and Survivorship Banding: Results

MAPS banding sessions have been conducted annually since 2003 at SNL/NM. The MAPS method for banding birds was developed by the Institute for Bird Populations (DeSante et al. 2010). In addition, the MAPS organization hosts a collaborative effort among public agencies in North America that seeks to derive population and productivity trends for nesting birds through mist netting (stringing mesh nets between two poles) during the breeding season (May through mid-August). This data, collected all over North America since 1989, has helped ornithologists better understand population trends, dynamics, gender ratios, and productivity for more than 200 species of breeding birds.

In 2021, MAPS banding sessions were run from May to August with five sessions completed in that timeframe. Twenty species were captured, and 64 individuals were newly banded (Table 7-21).

Table 7-21. Species composition and total numbers of birds banded during the MAPS season, 2021

Common Name	Scientific Name	Individuals
Ash-throated flycatcher	*Myiarchus cinerascens*	5
Bewick's wren	*Thryomanes bewickii*	3
Black-throated gray warbler	*Setophaga nigrescens*	2
Black-throated sparrow	*Amphispiza bilineata*	9
Blue grosbeak	*Passerina caerulea*	1
Brewer's sparrow	*Spizella breweri*	1
Bullock's oriole	*Icterus bullockii*	2

Common Name	Scientific Name	Individuals
Bushtit	*Psaltriparus minimus*	1
Chipping sparrow	*Spizella passerina*	1
Dusky flycatcher	*Empidonax oberholseri*	2
Gray flycatcher	*Empidonax wrightii*	4
Gray vireo	*Vireo vicinior*	7
Green-tailed towhee	*Pipilo chlorurus*	1
House finch	*Haemorhous mexicanus*	2
Juniper titmouse	*Baeolophus ridgwayi*	4
Lark sparrow	*Chondestes grammacus*	3
Northern mockingbird	*Mimus polyglottos*	13
Plumbeous vireo	*Vireo plumbeus*	1
Warbling vireo	*Vireo gilvus*	1
Woodhouse's scrub-jay	*Aphelocoma woodhouseii*	1
Total		**64**

Fall Migration Banding: Results

Ecology Program personnel monitor birds weekly from early August through early November. These annual monitoring activities are an effort to document breeding bird productivity and investigate fall migration patterns of songbirds in shrub, open woodland, and grassland habitats.

In 2021, four fall migration banding sessions were run from October to November. Sixteen species were captured, and 40 individuals were banded this fall (Table 7-22). A Woodhouse's scrub-jay was a highlight of the fall banding season (Figure 7-8).

Table 7-22. Species composition and total birds banded, fall 2021 season

Common Name	Scientific Name	Individuals
Audubon's warbler	*Setophaga auduboni*	2
Bewick's wren	*Thryomanes bewickii*	3
Chipping sparrow	*Spizella passerina*	3
Dark-eyed junco	*Junco hyemalis*	6
Dusky flycatcher	*Empidonax oberholseri*	1
House finch	*Haemorhous mexicanus*	3
Juniper titmouse	*Baeolophus ridgwayi*	10
Lesser goldfinch	*Spinus psaltria*	1
Mountain bluebird	*Sialia currucoides*	3
Northern flicker	*Colaptes auratus*	1
Ruby-crowned kinglet	*Corthylio calendula*	1
Sage thrasher	*Oreoscoptes montanus*	2
Townsend's solitaire	*Myadestes townsendi*	1
White-crowned sparrow	*Zonotrichia leucophrys*	1
Williamson's sapsucker	*Sphyrapicus thyroideus*	1
Woodhouse's scrub-jay	*Aphelocoma woodhouseii*	1
Total		**40**

Figure 7-8. Woodhouse's scrub-jay caught during the banding season at SNL/NM, 2021

7.5 Remote Camera Surveillance of Mammals and Other Wildlife

Ecology Program personnel have conducted passive surveillance with remote-sensor cameras for a diversity of wildlife in various habitats.

Remote-sensor camera *trapping* refers to the use of motion-activated cameras to document the occurrence and behaviors of wildlife in a particular habitat or study area. The cameras work by detecting moving objects that have a differing temperature (i.e., hotter) from the surrounding ambient environment. There is a *detection* each time the camera is triggered and an *observation* each separate time an individual is present and recorded within a frame.

Overall, the main goal of remote-sensor camera monitoring at SNL/NM is to document small-, medium-, and large-sized mammals while minimizing incidental observations of other species, such as birds, amphibians, reptiles, and insects. Although mammals are the targeted wildlife, when birds, reptiles, and amphibians are captured in camera images, those observations are also recorded.

Remote-sensor camera traps have become an increasingly popular tool, especially during the last several decades, for inventorying and monitoring wildlife populations around the world (Rovero, Tobler, and Sanderson 2010). With major technological advances in remote-sensor cameras, including digital photography and infrared sensors, there has been increased reliability on the cameras to detect both commonplace and elusive wildlife (Kucera and Barrett 2011). These cameras provide a noninvasive, cost-effective method for developing estimates of common population-level and community-level indices, including the richness, composition, and structure of mammal communities (Cusack et al. 2015).

Ecology Program personnel maintain two wildlife water guzzlers on DOE-permitted or fee-owned land: the Madera Canyon Guzzler and the Range Guzzler. The Madera Canyon Camera Station is set up at the Madera Canyon Guzzler, and the Range Camera Station is set up at the Range Guzzler. Because many mammal species use artificial water sources, remote-sensor cameras provide an excellent means of documenting the diversity and abundance of mammals at these locations.

7.5.1 Madera Canyon Camera Station Results

COVID-19 site restrictions continued to have some impact on the Ecology Program team's ability to check and maintain the Madera Canyon Camera Station remote-sensor cameras consistently throughout the year. These restrictions affected trail-camera functionality, battery deficits and resultant functionality issues, and follow-up after extended weather impacts, among other issues.

These circumstances resulted in some gaps in the data collected in 2021. Data collected at the Madera Canyon Camera Station is missing for September 29, 2021 through October 7, 2021.

In 2021, 40 different species were observed at the Madera Canyon Camera Station (Table 7-23), including 13 mammal species, 26 bird species, and 1 invertebrate species. No amphibians or reptiles were observed at the Madera Canyon Camera Station during 2021.

Since June 2005, 70 species have been recorded and identified at the Madera Canyon Guzzler. Seven of these species have been documented in each calendar year since monitoring with remote-sensor cameras began, including the American black bear (*Ursus americanus*), common raven (*Corvus corax*), coyote (*Canis latrans*), gray fox (*Urocyon cineroargentus*), mourning dove (*Zenaida macroura*), mule deer (*Odocoileus hemionus*), and northern flicker (*Colaptes auratus*).

An additional 14 species have been documented at the Madera Canyon Guzzler that have not been documented at the Range Guzzler. The species are: Audubon's warbler (*Setophaga coronata auduboni*), brown-headed cowbird (*Molothrus ater*), brown thrasher (*Toxostoma rufum*), Clark's nutcracker (*Nucifraga columbiana*), curve-billed thrasher (*Toxostoma curvirostre*), eastern bluebird (*Sialia sialis*), Eurasian-collared dove (*Stretopelia decaocto*), hepatic tanager (*Piranga flava*), javelina (*Pecari tajacu*), Steller's jay (*Cyanocitta stelleri*), turkey vulture (*Cathartes aura*), white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*).

Table 7-23. Wildlife species observed at the Madera Canyon Camera Station, 2021

Common Name	Scientific Name	Month											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mammals													
American black bear	*Ursus americanus*					●		●	●	●			
Black-tailed jackrabbit	*Lepus californicus*			●				●					
Bobcat	*Lynx rufus*					●							
Coyote	*Canis latrans*	●	●	●	●	●	●	●	●	●	●	●	●
Desert cottontail	*Sylvilagus audubonii*			●									
Gray fox	*Urocyon cinereoargenteus*	●	●	●	●	●	●	●	●		●		●
Javelina	*Pecari tajacu*	●											
Mountain lion	*Puma concolor*									●			
Mule deer	*Odocoileus hemionus*	●	●	●	●	●	●	●	●	●	●	●	●
Raccoon	*Procyon lotor*					●							
Rock Squirrel	*Otospermophilus variegatus*			●	●								
Striped skunk	*Mephitis mephitis*			●									
Unidentified bat	*Unidentified*								●				
Birds													
American robin	*Turdus migratorius*			●	●					●	●	●	●
Black-headed grosbeak	*Pheucticus melanocephalus*						●	●					
Canyon towhee	*Melozone fusca*				●								
Cedar waxwing	*Bombycilla cedrorum*				●		●						
Common raven	*Corvus corax*				●	●	●		●	●	●	●	●
Cooper's hawk	*Accipiter cooperii*				●			●					
Curve-billed thrasher	*Toxostoma curvirostre*				●								
Dark-eyed junco	*Junco hyemalis*											●	●
Evening grosbeak	*Coccothraustes vespertinus*			●	●								
Great horned owl	*Bubo virginianus*		●		●	●	●			●			

Common Name	Scientific Name	Month											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Hepatic tanager	*Piranga flava*						●						
House finch	*Haemorhous mexicanus*						●						●
Hummingbird spp.								●					
Lesser goldfinch	*Spinus psaltria*				●								
Mourning dove	*Zenaida macroura*				●	●	●	●		●			
Northern flicker	*Colaptes auratus*				●						●	●	
Northern mockingbird	*Mimus polyglottos*				●		●						
Pinyon jay	*Gymnorhinus cyanocephalus*				●	●							
Red-tailed hawk	*Buteo jamaicensis*		●							●	●	●	
Sharp-shinned hawk	*Accipiter striatus*						●	●					
Townsend's solitaire	*Myadestes townsendi*				●							●	●
Turkey vulture	*Cathartes aura*				●	●							
Unidentified bird	*Unidentified*					●					●		
Western bluebird	*Sialia mexicana*			●	●						●	●	●
White-winged dove	*Zenaida asiatica*				●	●	●	●					
Woodhouse's scrub-jay	*Aphelocoma woodhouseii*			●	●	●		●			●		●
Reptiles													
None													
Amphibians													
None													
Invertebrates													
Unidentified butterfly								●					

On May 18, 2019, a single javelina was documented at the Madera Canyon Camera Station. This was a sighting outside the species' normal range within the state of New Mexico. No subsequent observations of this species were made from June 2019 to July 2020. The species was detected again from August 2020 through December 2020. In 2021, this species was only observed during the month of January, with two separate sets of observations (Figure 7-9). Given the lack of observations in 2021, it is possible that this individual has moved out of the area.

Figure 7-9. An individual javelina visiting the Madera Guzzler, 2021

American black bears have been documented at the Madera Canyon Guzzler each year since monitoring began in 2005. In 2021, bears appeared to be most active during the months of August and September. At least three different bears visited the guzzler as identified in camera images. One of the bears was large with brown hair and lighter ends. Another one was a large, dark brown-colored bear with a light brown muzzle; this bear did not have any ear tags. The third bear had two ear tags, one in each ear. Figure 7-10, Figure 7-11, and Figure 7-12 show the individual bears that frequented the guzzler in 2021. No cubs were recorded visiting the guzzler in 2021. American black bear observation data helps to determine local population and behavioral trends. Additionally, this information helps to estimate relative species' abundance

Figure 7-10. A large, brown-colored American black bear (*Ursus americanus*) getting ready to bathe in the trough

Figure 7-11. An American black bear (*Ursus americanus*) bathing in the Madera Canyon Guzzler

Figure 7-12. An American black bear (*Ursus americanus*) with two ear tags, one in each ear

7.5.2 Range Camera Station Results

COVID-19 site restrictions continued to have some impacts on the Ecology Program team's ability to check and maintain the Range Camera Station remote-sensor cameras consistently throughout the year. This affected trail-camera functionality, battery deficits and resultant functionality issues, and follow-up after extended weather impacts, among other issues. These circumstances resulted in some gaps in the data collected in 2021. Data collected at the Range Camera Station is missing for January 25, 2021 through March 2, 2021.

In 2021, 36 different species were observed at the Range Camera Station (Table 7-24), including 8 mammal species, 22 bird species, 2 reptile species, 1 amphibian species, and 3 invertebrate species.

Table 7-24. Wildlife species observed at the Range Camera Station, 2021

Common Name	Scientific Name	Month											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mammals													
American badger	*Taxidea taxus*					●							
Black-tailed jackrabbit	*Lepus californicus*			●			●						
Bobcat	*Lynx rufus*			●	●	●	●	●	●				
Coyote	*Canis latrans*	●		●	●	●	●	●	●	●	●	●	●
Gray fox	*Urocyon cinereoargenteus*	●		●	●	●	●	●	●		●	●	
Mountain lion	*Puma concolor*			●						●			
Mule deer	*Odocoileus hemionus*	●		●	●	●	●	●	●	●	●	●	●
Rock squirrel	*Otospermophilus variegatus*				●		●	●					
Birds													
American robin	*Turdus migratorius*	●		●	●					●	●		
Black-headed grosbeak	*Pheucticus melanocephalus*						●						
Canyon towhee	*Melozone fusca*			●							●		
Common raven	*Corvus corax*			●	●	●				●	●	●	
Cooper's hawk	*Accipiter cooperii*			●	●	●	●						
Dark-eyed junco											●		●

Common Name	Scientific Name	Month											
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Golden eagle	*Aquila chrysaetos*			●			●			●	●	●	●
Great horned owl	*Bubo virginianus*				●								
House finch	*Haemorhous mexicanus*					●	●		●	●	●		
Lark sparrow	*Chondestes grammacus*						●						
Mountain bluebird	*Sialia currucoides*			●		●					●	●	●
Mourning dove	*Zenaida macroura*					●	●	●	●	●			
Northern flicker	*Colaptes auratus*				●	●				●	●	●	●
Northern mockingbird	*Mimus polyglottos*					●	●		●				
Pinyon jay	*Gymnorhinus cyanocephalus*	●		●	●	●							
Red-tailed hawk	*Buteo jamaicensis*						●		●				
Scott's oriole	*Icterus parisorum*						●						
Townsend's solitaire	*Myadestes townsendi*			●	●	●	●				●	●	
Unidentified bird	*Unidentified*				●				●		●		
Western bluebird	*Sialia mexicana*			●						●	●		●
White-winged dove	*Zenaida asiatica*				●								
Woodhouse's scrub-jay	*Aphelocoma woodhouseii*			●	●			●	●	●	●		
Reptiles													
Unidentified snake							●			●			
Western diamondback	*Crotalus atrox*							●	●				
Amphibians													
Spadefoot ssp.							●	●		●			
Invertebrates													
Cloudless sulphur	*Phoebis sennae*									●			
Orange sulphur	*Colias eurytheme*									●	●		
Unidentified butterfly									●				

ssp. = subspecies

Since monitoring began, remote-sensor cameras have captured images of 73 species at the Range Camera Station. In addition, toads, bats, and other small mammals have been observed but were not identified to the species level.

The abbreviation sp. is used when the actual specific name cannot or need not be specified, and spp. (plural) indicates several species. The abbreviation ssp. refers to a subspecies.

Two species have been observed in images at the Range Guzzler in every year of monitoring: gray fox and mule deer. At most, 36 species have been documented in a single calendar year. In addition, 16 species have been documented at the Range Guzzler that have not been documented at the Madera Canyon Guzzler. These include American badger (*Taxidea taxus*), ash-throated flycatcher (*Myiarchus cinerascens*), European starling (*Sturnus vulgaris*), gopher snake (*Pituophis catenifer*), greater roadrunner (*Geococcyx californianus*), hog-nosed skunk (*Conepatus leuconotus*), ladder-backed woodpecker (*Dryobates scalaris*), mountain chickadee (*Poecile gambeli*), ringtail (*Bassariscus astutus)*, rock wren (*Salpinctes obsoletus*), rufous-crowned sparrow (*Aimophila ruficeps*), scaled quail (*Callipepla squamata*), Texas antelope squirrel (*Ammospermophilus interpres),* western spotted skunk (*Spilogale gracilis)*, Williamson's sapsucker (*Sphyrapicus thyroideus*), and woodrat (*Neotoma* spp.).

Mule deer were documented at the Range Guzzler every month during 2021 (Figure 7-13). As with the Madera Canyon Guzzler, mule deer were detected and observed more than any other species at the Range Guzzler. Observations of this species indicate that they were most active at the Range Guzzler during December, followed by November, and then January.

Figure 7-13. A small herd of mule deer (*Odocoileus hemionus*) visiting the Range Guzzler

Coyotes (*Canis latrans*) were documented at the Range Guzzler every month during 2021 (Figure 7-14). Coyotes seemed to be most active at the Range Guzzler during the spring and summer months. It is unclear how many unique individuals visited during this period of time.

Figure 7-14. Three coyotes (*Canis latrans*) visiting the Range Guzzler

There were only two observations of an American badger at the Range Guzzler in 2021, both taking place in May (Figure 7-15). Each of the visits were short, lasting no more than two seconds. As is normal behavior for this crepuscular species, each visit took place in the twilight hours of early morning and late evening.

Figure 7-15. Daytime observation of an American badger (*Taxidea taxus*) at the Range Guzzler

7.6 Federally Listed and State-Listed Endangered, Threatened, and Other Species of Concern

As stated in Chapter 2, the Endangered Species Act is intended to protect all animal and plant species that are federally listed as endangered or threatened. Currently, no known federally listed as endangered or threatened species breed in or reside within DOE-permitted and fee-owned areas. Several federally listed species are found in Bernalillo County, New Mexico (Table 7-25).

Ecosystem services are the natural resources and processes that occur in a well-functioning environment, which benefit humans at no cost.

A few mammal species protected by the State of New Mexico have been encountered (Table 7-25). One bird species, the gray vireo (*Vireo vicinior*), is well known as a breeding bird on DOE-permitted and fee-owned areas and listed as threatened (New Mexico Department of Game and Fish 2018). The gray vireo's primary breeding habitat is open piñon-juniper woodlands within the foothills of the Manzano Mountains.

Table 7-25. Federally listed and state-listed endangered, threatened, and other species of concern potentially occurring in Bernalillo County, New Mexico

Species		Federal Endangered Species Act Status	New Mexico Status	Previously Observed within KAFB and SNL/NM
Common Name	Scientific Name			
Mammals				
Arizona myotis	*Myotis occultus*	No designation	Sensitive	●
Big free-tailed bat	*Nyctinomops macrotis*	No designation	Sensitive	
Common hog-nosed skunk	*Conepatus leuconotus*	No designation	Sensitive	●
Fringed myotis	*Myotis thysanodes*	No designation	Sensitive	
Gunnison's prairie dog	*Cynomys gunnisoni zuniensis*	No designation	Sensitive	●
Long-legged myotis	*Myotis volans*	No designation	Sensitive	

Species		Federal Endangered Species Act Status	New Mexico Status	Previously Observed within KAFB and SNL/NM
Common Name	Scientific Name			
Meadow jumping mouse	*Zapus luteus luteus*	Endangered and critical habitat	Endangered	
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	No designation	SGCN	●
Red fox	*Vulpes vulpes*	No designation	Sensitive	
Ringtail	*Bassariscus astutus*	No designation	Sensitive	●
Spotted bat	*Euderma maculatum*	No designation	Threatened	●
Western small-footed myotis	*Myotis ciliolabrum*	No designation	Sensitive	
Western spotted skunk	*Spilogale gracilis*	No designation	Sensitive	●
Yuma myotis	*Myotis yumanensis*	No designation	Sensitive	
Birds				
Baird's sparrow	*Ammodramus bairdii*	Species of concern	Threatened	
Bald eagle	*Haliaeetus leucocephalus*	No designation	Threatened	●
Bell's vireo	*Vireo bellii*	Species of concern	Threatened	●
Burrowing owl	*Athene cunicularia*	Species of concern	SGCN	●
Common black hawk	*Buteogallus anthracinus*	Species of concern	Threatened	●
Gray vireo	*Vireo vicinior*	No designation	Threatened	●
Least tern	*Sternula antillarum*	No designation	Endangered	
Loggerhead shrike	*Lanius ludovicianus*	No designation	SGCN	●
Mexican spotted owl	*Strix occidentalis lucida*	Threatened and critical habitat	SGCN	
Mountain plover	*Charadrius montanus*	No designation	SGCN	
Neotropic cormorant	*Phalacrocorax brasilianus*	No designation	Threatened	
Northern goshawk	*Accipiter gentilis*	Species of concern	Sensitive	
Peregrine falcon	*Falco peregrinus*	Species of concern	Threatened	●
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered and critical habitat	Endangered	●
Sprague's pipit	*Anthus spragueii*	No designation	SGCN	●
Western yellow-billed cuckoo	*Coccyzus americanus*	Threatened	SGCN	
Reptiles				
Desert massasauga	*Sistrurus catenatus dewardsii*	Under review	SGCN	●
Southwestern fence lizard	*Sceloporus cowlesi*	No designation	Sensitive	●
Fish				
Rio Grande chub	*Gila pandora*	No designation	SGCN	
Rio Grande silvery minnow	*Hybognathus amarus*	Endangered and critical habitat	Threatened	
Invertebrates				
Monarch butterfly	*Danaus plexippus*	Candidate	No designation	
Socorro mountain snail	*Oreohelix neomexicana*	No designation	Sensitive	

Source: Biota Information System of New Mexico. Accessed February 2020. http://www.bison-m.org.
SGCN = Species of Greatest Conservation Need

7.7 Eco Ticket Request System

Ecology Program personnel use a web-based ticketing system. This system, named Eco Ticket, is used to report wildlife issues or concerns and to request biological surveys. Prior to using Eco Ticket, individuals contacted Ecology Program personnel via numeric pagers, phone calls, and/or emails. This outdated system led to delays in response time, difficulty coordinating support for an increasing workforce and growing workload, and the inability to track trends effectively.

Using Eco Ticket, individuals can easily place a request that is sent to all Ecology Program personnel instantaneously. Requests are prioritized in a queue and then responded to accordingly. Once an action is completed, a biologist will close out the ticket, moving the request and associated data from the queue to a searchable database. The request database is used to track wildlife encounters and ultimately to inform decisions and practices aimed at managing human-wildlife interactions effectively. Ongoing outreach campaigns have increased awareness of the Eco Ticket tool since its inception. Infrastructure Operations personnel use the system most frequently, requesting biological surveys to support work orders. Requests have been split nearly evenly between biological survey requests and animal service calls until 2021, when survey requests were more than three times higher than animal service calls (Figure 7-16). The rise in survey calls was due to continuous improvement activities. Sorting and analyzing ticket types aids understanding of the dynamics of wildlife issues at SNL/NM as discussed below.

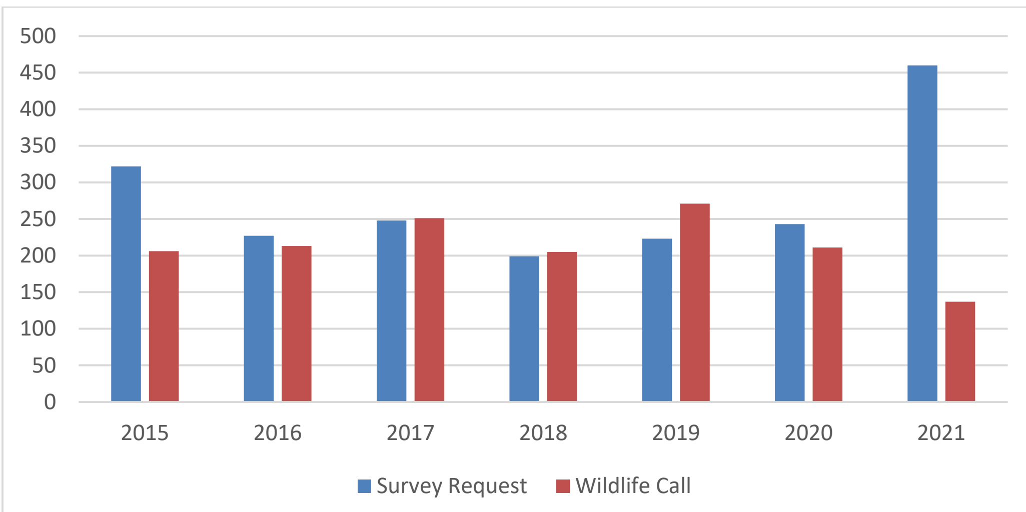


Figure 7-16. Two major categories of Eco Ticket requests, 2015–2021

7.7.1 Eco Ticket Results

Wildlife Response

Eco Ticket is used to report wildlife issues or concerns, which may include snakes, bird nests, injured wildlife, trapped wildlife, and dead wildlife. Reported wildlife includes mammals, reptiles, amphibians, birds, and some insects, all of which are monitored through the Eco Ticket system.

If an animal is injured, it is taken to wildlife rescue. Wildlife trapped inside a building are captured and then released in appropriate habitats.

For Eco Tickets pertaining to a wildlife issue, Ecology Program personnel call the individual who placed the ticket to gather information. Requested information may include the type of animal, the location, the time last seen, and any pertinent safety information. For nonvenomous wildlife outside buildings, Ecology Program personnel typically leave the animal alone unless it is trapped, sick, or injured. Venomous snakes are always relocated due to the risk they pose to personnel. If an animal is injured, it is taken to wildlife rescue. Wildlife trapped inside a building are captured and then released in an appropriate habitat.

One hundred and thirty-seven animal requests were received through Eco Ticket in 2021. The "Other" category was requested most often with 41 tickets. Insects and non-urgent wildlife sightings made up a large portion of this category. Seven insect or house mouse requests were rerouted through the Integrated Pest Management system when applicable, and all wildlife sightings were documented.

There were 32 snake removal tickets in 2021, a small decrease from 2020. Of the 32 tickets, 13 were for venomous snakes. Prairie rattlesnakes (*Crotalus viridis*) continue to be the most common venomous snakes encountered; however, one plains black-headed snake (*Tantilla nigriceps*) was encountered in 2021. While venomous, the plains black-headed snake is not considered dangerous to humans due to their small mouths, rear fangs, and mild venom.

In 2020 and 2021, raccoons (*Procyon lotor*) were a commonly reported sight across TA-I. Lower levels of human traffic (with increased telecommuting in response to COVID-19 restrictions) likely drove this increase as animals appeared more comfortable foraging through outdoor trash receptacles during normal working hours. In response to this uptick, the old-style trash receptacles will be replaced with new wildlife-proof bins in 2022. Proactively removing attractants is the best way to reduce unwanted human interactions with urban wildlife.

A plains black-headed snake was found inside a lab in Building 858 (Figure 7-17). It was safely captured and relocated to a more appropriate habitat. A striped skunk (*Mephitis mephitis*) was observed inside a knocked over trash can outside Building 822. The trash can was covered with a plywood plank and a blanket to prevent the animal escaping or spraying, and then the can was set right side up and wheeled to a low traffic area with a dolly. The skunk self-released later that day.

Figure 7-17. A plains black-headed snake (*Tantilla nigriceps*) captured and relocated near TA-I (left) and a striped skunk (*Mephitis mephitis*) causing mischief (right)

Work Orders and Projects

Before certain outdoor work is initiated, Ecology Program personnel survey the work site. These biological surveys are performed to conserve protected species, most often birds and their nests, which are protected under the Migratory Bird Treaty Act.

In 2021, Ecology Program personnel received 460 Eco Ticket requests for biological surveys (Figure 7-18). That is an increase of 52 percent from 2020. Of these 460 tickets, 273 came in as "Facilities Work Orders." These are routine, small-scope requests generated by Infrastructure Operations personnel. Campus maintenance activities—such as tree trimming; building, walkway, and waterline repairs; and mowing—are included in this work order category. The remaining 167 requests came in as "NEPA ID" requests or as projects that didn't fall under routine maintenance activities. Outdoor testing and large-scale construction activities made up the majority of the "NEPA ID" requests for biological surveys.

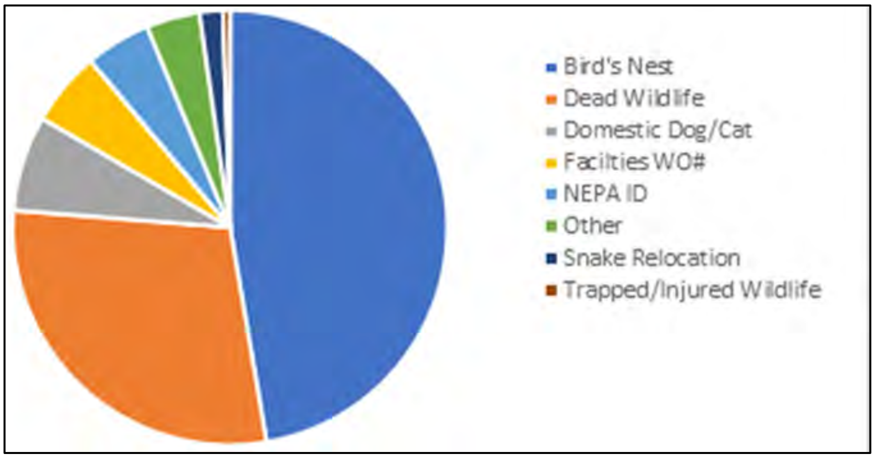
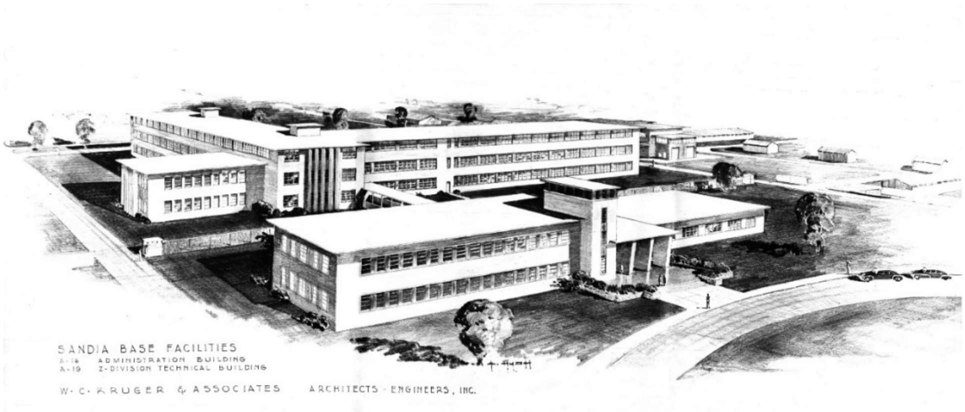


Figure 7-18. Eco Ticket requests by type, 2021

Chapter 8. Cultural Resource Management Program



W. C. Kruger & Associates’ original sketch of the now-historic Building 800, Bulidng 801, and Building 802

OVERVIEW ■ Cultural Resource Management Program personnel coordinate cultural resource compliance, including review of archaeological resources and historic buildings. Actions that could affect cultural resources adversely are analyzed initially in a NEPA 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 an area and its landscape are maintained. Long-term preservation and protection also ensure that data are available to make proper land use decisions and to assist with environmental planning. The Cultural Resource Management Program is composed of two main parts: archeological resources and historic buildings.

Cultural resources are places and physical evidence of past human activity: a site, a structure, an object, or a natural feature of significance to a group of people traditionally associated with it.

Between 1977 and 2021, 59 archaeological surveys—covering more than 6,000 acres of land—were conducted at KAFB, including on Sandia-controlled property. Currently, 2,150 historical sites (sites having cultural heritage value) at KAFB have been recommended as eligible for inclusion in the National Register of Historic Places; approximately 70 percent of those sites are on Sandia-controlled property.

8.1 Cultural History

The prehistoric and historic time periods in the Albuquerque area consist of four major cultural and temporal periods: the Paleoindian Period, Archaic Period, Ancestral Puebloan Period, and current Historic Period (AD 1540 to present) (Cordell 1997).

The earliest well-documented human occupation in New Mexico—the Paleoindian Period (10,000–5500 BC)—was developed when the climate was cool and precipitation was high, and it is characterized by stylistically distinct, large, often fluted, lanceolate projectile points (arrowheads).

The Archaic Period (5500 BC to AD 400) is best defined as the continued adaptation of Paleoindian groups to the changing climatic conditions. The Ancestral Puebloan Period (AD 400–1540) was an era of change and an increasing dependence on cultigens (cultivated plants), such as maize, beans, and squash. It was marked by population growth, greater residential sedentism (staying in one place), the appearance of the bow and arrow, the appearance of pottery, increasing dependence on storing foods, and developments in architecture and sociopolitical organization. The 1540–1542 *entrada* of Francisco Vasquez de Coronado was the first official European entry into the present Albuquerque area and denotes the beginning of the current Historic Period. The expedition found 12 large pueblos clustered along the Rio Grande between present-day Bernalillo and Isleta and several smaller villages to the south.

Although Spanish settlement of the Rio Grande Valley and adjacent areas increased steadily between 1610 and 1680, life was far from peaceful. Quarreling between religious and civil leaders was common. The Apaches and the Comanches often used Tijeras Canyon and the Sandia and Manzano mountains to stage raids on Spanish and Pueblo communities. Due to the high frequency of these raids, the Spanish governor authorized the settlement of San Miguel del Laredo (San Miguel) at the western end of Tijeras Canyon for protection. Some families who settled at San Miguel in 1817 settled along San Antonio Creek, which is a tributary of Tijeras Creek.

Obsidian projectile point (arrowhead)

8.2 Historical Context

By the nineteenth century, the area along the Rio Grande between present-day Bernalillo and Isleta Pueblo and including the east side of the Sandia Mountains was occupied primarily by ranchers and miners; however, a small community, Coyote Springs, was established in the vicinity of a natural spring along the Arroyo del Coyote. Mining began in the nineteenth century and extended well into the twentieth century. The Tijeras Mining District extended southward into the northern portion of what is now KAFB, the Coyote Canyon District was situated within the U.S. Forest withdrawn land in the eastern portion of KAFB (Fulp et al. 1982), and the Hell Canyon District was located within the southern edge of KAFB (Lintz et al. 1988). Between 1910 and 1923 and again during World War II, lead and fluorspar were mined in Coyote Canyon (Elston 1967); Tijeras Canyon was mined for gold into the 1930s (Northrop 1975); and gold, silver, and copper were mined from Hell Canyon from about 1880 to 1910 and again in 1975 through 1976 (Fulp et al. 1982). Most of the mining at KAFB ended in the early 1930s (Lintz et al. 1988).

In 1928, Oxnard Field was built on the East Mesa, to the southeast of Albuquerque. It served as an airport for the next few years, until the West Mesa Airport was built further to the west and Oxnard

Field became a private airfield. By 1939, Oxnard Field was seeing frequent use by military flights for refueling. Two years later, the U.S. Army acquired the site and the land around it, eventually renaming it Albuquerque Army Air Field and using it as a training depot for aircraft mechanics. By 1943, the training program concluded, and the area was converted to a convalescent center.

By June 1942, the U.S. Army had acquired additional land slightly to the west of Oxnard Field to be used as an Army Air Forces air depot training station. New runways were built at what became Kirtland Army Air Field. When the U.S. Air Force was created in 1947, Kirtland became an Air Force base (TLI Solutions 2006).

Beginning in 1941 and continuing until 1954, land south of that acquired by the U.S. Army and north of Isleta Pueblo was used as the New Mexico Proving Ground/New Mexico Experimental Range as a test site for developing the proximity fuze, the research and technical design of which was based at Johns Hopkins University. E. J. Workman, a physicist at the University of New Mexico, took on the assignment and the contracts for testing the fuze. He arranged for acquisition of the land, increasing the size of the test site over time with a series of leases and purchases. When the New Mexico Proving Ground closed, the federal government kept the land, which is now part of KAFB.

A *proximity fuze* (or *fuse*) is an explosive ignition device used in bombs, artillery shells, and mines, which detonates automatically when the distance to the target becomes smaller than a predetermined value.

In July 1945, Los Alamos Scientific Laboratory, part of the Manhattan Engineer District, created Z Division as part of a Lab-wide reorganization. Z Division included the ordnance engineering activities involved in turning the nuclear physics package developed by Los Alamos into a deliverable nuclear weapon. Expected to grow, Z Division was moved to a site within the Albuquerque Army Air Field, which was selected because it was not too far from Los Alamos, was near an airfield that could support testing, and was sited with the military to facilitate training. The Air Field was renamed Sandia Base (Furman 1990).

When the Manhattan Engineer District was dissolved and the Atomic Energy Commission took over all nuclear energy and related research and development, Los Alamos and Z Division became civilian enterprises. The land and all other property owned by the Manhattan Engineer District transferred to the new Atomic Energy Commission, including the land on which Z Division sat (Furman 1990). However, Sandia Base itself remained a military base. In 1971, Sandia Base was merged into KAFB. Today, DOE owns the Sandia technical areas and the built environment on land permitted by the U.S. Air Force and land withdrawn for its use from Cibola National Forest.

In 1948, Z Division was renamed Sandia Laboratory. In 1949, it was separated from its parent lab and placed under the management of Sandia Corporation, a wholly owned subsidiary of Western Electric. The management and operating contract has changed hands twice since then, with NTESS, a Honeywell company, currently managing Sandia.

Over time, Sandia operations grew from one main technical area (TA-I) to five technical areas. TA-II, established as part of Z Division's weapon assembly assignment, opened in 1948. TA-III, established in 1954 for environmental and developmental testing, houses large environmental test facilities. TA-IV was created in the 1980s to house pulsed power machines. Originally part of TA-III, TA-V contains reactor research and testing facilities.

DOE owns the land occupied by all five technical areas. Sandia also has facilities on land within the Coyote Test Field (formerly the location of Workman's proximity fuze testing) mostly via land permits with the U.S. Air Force and on some land withdrawn from the U.S. Forest Service to DOE.

8.3 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 New Mexico Historic Preservation Division. See Chapter 2.

Cultural resources are places and physical evidence of past human activity: a site, a structure, an object, or a natural feature of significance to a group of people traditionally associated with it.

8.4 Archaeological Resources

The Sandia archaeologist helps Sandia personnel and DOE maintain compliance with National Historic Preservation Act, Section 106, 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/NM.

The archaeologist reviews projects through the Sandia NEPA module that involve land disturbances and provides recommendations for monitoring field activities so archeological resources are not impacted adversely. The archaeologist also makes site eligibility recommendations for inclusion in the National Register of Historic Places.

Sandia's full-time archaeologist, works with   teams throughout Sandia to consider operational effects on historic properties. (Photo by Bret Latter.)

8.4.1 Field Methods

Archaeological personnel conduct pedestrian surveys (walking the natural landscape on foot) and record prehistoric and historic sites in accordance with New Mexico Archaeological Council guidelines (4.10.8 NMAC, *Permits to Conduct Archaeological Investigations on State Land*; 4.10.15 NMAC, *Standards for Survey and Inventory*). The archaeologist provides 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.

A pedestrian survey lightly impacts surface soils. Survey transects are spaced 50 feet apart, with no more than 40 acres surveyed per person per day. All cultural resources that are at least 50 years old are recorded on field forms. Archaeological sites are defined by the presence of either a cultural feature or 10 or more artifacts that are at least 50 years old and are separated by no more than 66 feet. Areas where cultural materials are sparse (fewer than 10 items) and are at least 50 years old are recorded as isolated occurrences. The archaeologist generates a New Mexico Laboratory of Anthropology Inventory Form for archaeological sites in New Mexico. Archaeological sites are mapped both manually on graph paper and digitally. Digital maps are created using a global positioning system unit with sub-meter accuracy. Each map includes the site boundary and the locations of the datum, any features identified, artifact concentrations, important or diagnostic artifacts, drainages or other landscape features, and topographic contours. Each site, including any cultural features or tools, is photographed. All artifacts are analyzed in the field unless more than 50 artifacts of a given class (e.g., lithic [stone], prehistoric ceramic, or historic) are present, in which case a sample of at least 50 is analyzed. Lithic and prehistoric ceramic artifacts are analyzed using standard in-field techniques. Ceramics, projectile points, and other diagnostic artifacts are identified by type and cultural affiliation when sufficient attributes for a reliable determination are present. Isolated occurrences and their location coordinates are recorded and analyzed. The archaeologist writes all reports of findings and associated documentation.

8.4.2 Archaeological Assessments and Analysis in 2021

In 2021, the archaeologist completed 17 pedestrian surveys, reviewing more than 165 outdoor projects and surveying more than 24 acres. Projects included utility work, building modifications, road grading, ongoing operational activities, and the proposed construction of a new facility. Multiple archaeological reviews were conducted on DOE land in the Cibola National Forest in the U.S. Forest Service withdrawn area, as well as on and near DOE-permitted property and environmental restoration sites. This resulted in 17 memos to both DOE and the project owner that identified cultural resource concerns. The memos identified the archaeological work that was conducted and made note of any resources that had been recorded during pedestrian surveys. A consultation letter and associated documents were provided to DOE for correspondence with the New Mexico State Historic Preservation Officer and to Isleta Pueblo for the construction of a proposed new facility. Concurrence was received from the New Mexico State Historic Preservation Officer and is still pending from Isleta Pueblo. In addition, six conceptual analyses were completed to support site planning. These reviews included research that identified any potential effects that might result from the proposed site plans.

Additionally in 2021, the archaeologist was performing oversight and discovered that the 5 kV Overhead Feeder project had realigned the electric feeder outside the assessed boundary area described in the NEPA determination. The Project manager did not communicate this realignment and thus this realignment did not have a completed archaeological survey. Sandia NEPA personnel informed the DOE National Nuclear Security Administration, Sandia Field Office personnel. This event met the occurrence reporting criteria as defined by DOE O 232.2A, Chg 1 (MinChg) (see Table 2-3).

8.5 Historic Buildings

The Sandia historian surveys and assesses historic buildings in support of the National Historic Preservation Act, Section 106, for all properties owned by DOE and used by Sandia personnel at SNL/NM, whether the properties sit on land owned by DOE or are permitted to it. This includes all elements of the built environment from the Historic Period but is primarily focused on properties built for and used by Sandia since 1945.

8.5.1 Methods

While a NEPA checklist is in subject matter expert review, the historian reviews the project details, visits the work site, reviews existing photographs of and documents about the facilities involved, conducts research in the archival and building drawing collections, and obtains new photographs if needed. The properties potentially affected by a proposed project are evaluated within the established Cold War themes (weapon design, field testing, environmental testing, weapon assembly, military liaison, stockpile surveillance, non-weapons research, and administration/community) defined by the 2010 context statement (Section 8.5.2), which provides the framework for evaluating a property for historical significance (SNL/NM 2010). Note is made of any previous surveys and resulting determinations as to the 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 any 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 as a historic property are captured on a New Mexico Historic Cultural Properties Inventory form. The Historic Cultural Properties Inventory form is submitted along with a consultation letter and any related attachments to DOE to support correspondence with the New Mexico State Historic Preservation Office. The historian's recommendation is also captured in the NEPA checklist subject matter expert review.

8.5.2 Previous Building Surveys, Assessments, and Determinations

The Cold War arms race provides the primary historic context for Sandia's built environment through 1989. Sandia drafted a Cold War Context Statement for the New Mexico site in 2002 and updated it in 2007. This document was used to support property evaluations and historic building recommendations in support of the National Historic Preservation Act, Section 106, during DOE consultation with the State Historic Preservation Office.

In 2010, the context statement was updated and extended to reflect the site and its built environment in the post-Cold War period. That same year, Sandia personnel performed a site-wide survey and assessment to identify properties that might be eligible for the National Register of Historic Places. The final recommendation to DOE identified eight historic districts and three individually eligible buildings. DOE did not consult with the State Historic Preservation Office regarding the 2010 recommendation; however, the assessments have been used by DOE in National Historic Preservation Act, Section 106, consultation with the State Historic Preservation Office regarding proposed undertakings to individual properties. The site survey and assessment will be revised prior to any future DOE consultations with the State Historic Preservation Office regarding the SNL/NM site as a whole. Table 8-1 provides a list of SNL/NM properties determined to be historic and their current status.

If a historic property faces adverse effects from a proposed project, DOE and the State Historic Preservation Office agree on what type of mitigation will occur. Often, the design of new or replaced building elements (e.g., doors, windows, or entrances) are in keeping with the building's original design and no further mitigation is required. If the adverse effect will harm the building's historic status—if the building will be torn down or significantly modified—DOE and the State Historic Preservation Office establish a memorandum of agreement specifying the actions needed to ensure that the building will be preserved. In most instances, the historian prepares Historic American Building Survey/Historic American Engineering Record documentation, including large- and medium-format photographs, photographic descriptions, and a written historical and architectural summary of a property. All photography is completed prior to any demolition or other undertaking that threatens the property's integrity. Completed documentation is held in the Sandia Corporate Archives and the New Mexico State Historic Preservation Office.

Table 8-1. Properties previously determined to be historic and their current status

Property	Facilities That Were Contributing Elements to the Historic Property Determination	State Historic Preservation Office Concurrence	Still Extant?	Still Considered Historic?	Documentation Needed?[a]
300-Foot Drop Tower (S6510)	S6510, S6510C (impact pool), 6510E, 6523B	01/12/2004	Yes	Yes	No
10,000-Foot Sled Track	S6740, 6741, 6742, 6743, 6744, 6745, 6746, 6751	12/17/2003	Yes	Yes	No
Aerial Cable Facility	9831, 9832, 9834	12/17/2003	Yes	Yes	Yes
Building 800		12/21/2000	Yes	Yes	No
Building 801		12/21/2000	Yes	Yes	No
Building 802		12/21/2000	Yes	Yes	No
Building 804		11/02/2006	Yes	Yes	No
Building 808		12/21/2000	Yes	Yes	No
Building 809		05/18/2017	Yes	Yes	No
Building 835		12/21/2000	Yes	Yes	No
Building 840		12/21/2000	Yes	Yes	No
Building 852		2002	No	No	Yes
Building 860		12/21/2000	Yes	Yes	No
Building 864		11/07/2017	Yes	Yes	No
Building 871		11/02/2006	Yes	Yes	No
Building 884		2005	No	No	Yes
Building 892		11/02/2006	Yes	Yes	No
Building 981		11/07/2017	Yes	Yes	No
Building 983		2012	Yes	Yes	No
Building 986		11/07/2017	Yes	Yes	No
Building 6523	6523B	12/17/2003	Yes	Yes	No
Building 6560		12/17/2003	Yes	Yes	No
Building 6570		12/17/2003	Yes	Yes	No
Building 6588	6593, 6594	11/30/2017	Yes	Yes	No
Building 6590		5/28/2019	Yes	Yes	No

Property	Facilities That Were Contributing Elements to the Historic Property Determination	State Historic Preservation Office Concurrence	Still Extant?	Still Considered Historic?	Documentation Needed?[a]
Building 6610		12/17/2003	Yes	Yes	No
Building 6620	6620	11/7/2017	Yes	Yes	No
Building 8895		07/29/2008	No	No	Yes
Building 9920		06/03/2017	Yes	Yes	No
Building 9939	9939	11/07/2017	Yes	Yes	No
Building 9990	9990, 9991, 9992, 9993, 9994	12/12/2005	Yes	No	Yes
Coronado Club		2011	No	No	Yes
Gun Site	S6624, 6625	2017	Yes	Yes	Yes
Hydraulic Centrifuge Facility	6520, 6526, 6527	12/17/2003			
Old Centrifuge	Centrifuge and control shelter	2011	No	No	Yes
S9800B		2001			Yes
Technical Area II		1988	No	No	Complete
Telescope Facility—Laser Applications Facility	952, 952A, 952G, 952L	03/22/2017	Yes	Yes	No

[a] Historic American Building Survey/Historic American Engineering Record documentation, including large- and medium-format photographs, photographic descriptions, and a written historical and architectural summary of a property.

8.5.3 Historic Building Assessments in 2021

In 2021, the historian completed historic building assessments in response to 49 proposed actions at 53 properties. The ongoing DOE-sponsored Roof Asset Management Project resulted in proposals to reroof 13 buildings. Consultation is ongoing for seven of these actions, although none are anticipated to have an adverse effect on any historic properties. The roof work generally involves replacement in kind and does not affect the design, appearance, or operation of any historic property.

The other projects involving multiple properties included technical security system upgrades; electrical upgrades; heating, ventilation, and air conditioning replacements; the expansion of the distributed chilled water system in TA-IV; and the cleanup of miscellaneous supporting test structures in TA-III. Consultation was completed on all these projects, with determinations of no adverse effects.

Consultation on a 2020 proposal to add a ramp that is compliant with the American Indian Religious Freedom Act of 1978 (42 USC § 1996).

Americans with Disabilities Act to the front of Building 809 extended through 2021 and is expected to be completed in 2022 with a determination of no adverse effect. Similarly, proposals to demolish buildings 862, 6592, S6624, and 6625 remain in consultation between DOE and the New Mexico State Historic Preservation Officer.

8.6 Quality Check and Validation of Process

Each fiscal year, Cultural Resource Management Program personnel validate a minimum of 20 NEPA checklists from the previous fiscal year. The review focuses on archaeological concerns and requirements for at least 10 checklists and on historic buildings for at least 10 more. The validation activity verifies that cultural resources were addressed in each checklist, that the projects did not include an activity that should have but did not receive cultural resources review, and that projects that did receive cultural resources review were carried out as expected. The goal is to ensure that all projects needing cultural resources review are identified during the NEPA checklist review and that reviewed projects are keeping to their agreed-upon scope and impact. This is also an opportunity to verify that any mitigating actions were taken and/or are on schedule for completion. The review of 2021 checklists indicated no issues with the process.

8.7 Additional Activities

To provide information to the public about cultural resources, a website (Sandia's Cultural Resources in New Mexico) was created to provide historical information and photographs of properties determined to be historic that have been demolished. Building on the mitigation documentation prepared for the demolished sites, the website provides details regarding the origin, purpose, evolution, and reasons for disuse of five properties and one district that were eligible for the National Register of Historic Places. Sandia personnel plan to continue adding properties to the site at Sandia Historic Buildings.

Chapter 9. Quality Assurance

Desert tarantula *(Aphonopelma chalcodes)*

OVERVIEW ■ Personnel in various programs collect environmental samples and analyze them for radiological and 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, *Quality Management Systems–Requirements* (ISO 9001:2015); DOE O 414.1D, Change 2 (LtdChg), *Quality Assurance*, Attachment 1, "Contractor Requirements Document"; and 10 CFR 830, *Nuclear Safety Management*, Subpart A, "Quality Assurance Requirements"—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.

9.1 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. These documents meet applicable federal, state, and local requirements for conducting sampling and analysis activities. Personnel in various programs collect environmental samples and submit the samples for analysis of radiological and 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.

9.1.1 Sample Management Office

Sample Management Office personnel are responsible for quality assurance and quality control of samples relinquished from field team members; they also 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. Sample Management Office personnel package, ship, and track environmental samples to off-site contracted laboratories.

9.1.2 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* (SNL/NM 2020b). All contract 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 (SNL/NM 2020c). 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.

Contract 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/NM 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).

9.1.3 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 control criteria that is statistically established 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 (SNL/NM 2020c). Reanalysis is then performed for samples in the analytical batch 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.

Environmental dosimetry is provided by optically stimulated luminescence technology. Dosimeters are issued and analyzed by an accredited off-site laboratory and measure x-ray, gamma, and beta radiation. Quality control dosimeters are used, and standard laboratory procedures are followed for processing all dosimeters.

9.1.4 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 as follows:

- 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 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. Groundwater monitoring data and 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*.

9.2 Sample Management Office Activities

Sample Management Office activities in 2021 included sample packaging, shipping, and tracking to off-site contracted laboratories, and reviewing all data deliverables for compliance with contract and data quality requirements.

In 2021, Sample Management Office personnel processed 3,678 samples in support of programs and projects at SNL/NM.

9.2.1 Sample Handling and Analyses

In 2021, Sample Management Office personnel processed 3,678 samples in support of programs and projects at SNL/NM. Of the 3,678 samples, 1,087 were submitted as field and analytical quality control samples to assist with data validation and decision-making. The following programs and projects were supported in 2021:

- Air Quality Compliance
- Decontamination and Demolition
- Environmental Restoration Operation

- Long-Term Stewardship
- Terrestrial Surveillance
- Waste Management
- Water Quality

During 2021, the following contract laboratories were employed to analyze samples from:

- ALS Environmental in Salt Lake City, Utah, and Cincinnati, Ohio
- Cape Fear Analytical, LLC, in Wilmington, North Carolina
- Eurofins Test America in West Sacramento, California, and Knoxville, Tennessee
- General Engineering Laboratories in Charleston, South Carolina
- Hall Environmental Analysis Laboratory in Albuquerque, New Mexico
- Landauer, Inc., in Glenwood, Illinois
- New Mexico Department of Health in Albuquerque, New Mexico
- Pace Analytical Gulf Coast Laboratory in Baton Rouge, Louisiana
- Radonova Laboratories in Westmont, Illinois
- SiREM in Knoxville, Tennessee
- Southwest Research Institute in San Antonio, Texas
- Trace Analytics, LLC, in Austin, Texas

9.2.2 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 used by SNL/NM program and project personnel. Specific checks were made for documentation completeness, proper equipment calibration, proper laboratory practices, and batch quality control data. These assessments focused on data defensibility and regulatory compliance requirements specific to work at SNL/NM.

9.2.3 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 the requirements of the *DOD/DOE Consolidated Quality Systems Manual (QSM) for Environmental Laboratories* (DOD/DOE 2021), which guides DOECAP audits.

In 2021, DOECAP and/or the accrediting bodies conducted assessments at eight contracted laboratories using *Quality Systems Manual* 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/NM samples were issued in 2021 in DOECAP assessment reports or other applicable DOE programs.

Chapter 10. Environmental Permits and Mixed Waste History

Tree cholla (*Cylindropuntia imbricata*)

OVERVIEW ■ Sandia personnel maintain current environmental-related permits and information on the history and quantities of mixed waste at SNL/NM.

Table 10-1 presents environmental-related permits. Table 10-2 summarizes the compliance history of mixed waste at SNL/NM, and Table 10-3 lists the quantity of mixed waste subject to the Federal Facility Compliance Order at the end fiscal year 2021.

Table 10-1. Summary of environmental permits and registrations in effect, 2021

Permit Type and/or Facility Name	Location	Permit or Registration Number	Issue Date	Expiration Date	Regulatory Agency
Sewer Wastewater					
General	WW001 Station Manhole, south of TA-IV at Tijeras Arroyo	2069A	2/28/2018	1/31/2023	ABCWUA
General	WW006 Station Manhole, at Pennsylvania Avenue	2069F	8/12/2019	7/1/2024	ABCWUA
Microsystems and Engineering Sciences Applications Complex	WW007 Station Manhole, TA-I	2069G	2/19/2020	12/31/2024	ABCWUA
General	WW008 Station Manhole, south of TA-II at Tijeras Arroyo	2069I	8/12/2019	7/1/2024	ABCWUA
General	WW011 Station Manhole, north of TA-III (includes TA-III and TA-V sewer lines and Coyote Test Field sewer lines)	2069K	9/27/2019	8/31/2024	ABCWUA
Center for Integrated Nanotechnologies	Center for Integrated Nanotechnologies	2238A	5/1/2021	3/31/2026	ABCWUA

Permit Type and/or Facility Name	Location	Permit or Registration Number	Issue Date	Expiration Date	Regulatory Agency
Surface Discharge					
Pulsed Power Development Facilities (Discharge Permit)	TA-IV, Lagoon I and Lagoon II	DP-530	9/5/2014	9/5/2019[a]	NMED
Ground Water (Discharge Permit)	TA-V	DP-1845	5/20/2017	5/29/2022	NMED
Underground Storage Tanks					
Underground Storage Tank (20,000 gallons)	TA-I	1687	7/1/2021	6/30/2022	NMED
Underground Storage Tank (20,000 gallons)	TA-I	1688	7/1/2021	6/30/2022	NMED
Aboveground Storage Tanks					
Aboveground Storage Tank (3,020 gallons)	TA-I	1684	7/1/2021	6/30/2022	NMED
Aboveground Storage Tank (2,119 gallons)	TA-I	1685	7/1/2021	6/30/2022	NMED
Aboveground Storage Tank (2,000 gallons)	TA-I	1686	7/1/2021	6/30/2022	NMED
Aboveground Storage Tank (5,000 gallons)	TA-III	1689	7/1/2021	6/30/2022	NMED
Aboveground Storage Tank (5,500 gallons)	Coyote Test Field	1690	7/1/2021	6/30/2022	NMED
Aboveground Storage Tank (4,500 gallons)	TA-IV	1691	7/1/2021	6/30/2022	NMED
Aboveground Storage Tank (1,500 gallons)	TA-I	1692	7/1/2021	6/30/2022	NMED
NPDES Rio Grande Watershed-Based Municipal Separate Storm Sewer System Permit					
NPDES Municipal Separate Storm Sewer System Permit	TA-I, TA-II, and TA-IV	NTESS: NMR04A012 DOE: NMR04A011	12/22/2015 11/18/2015	12/19/2019 (the permit has entered into administrative continuance and remains in effect until EPA issues a new permit)	EPA
NPDES Multi-Sector General Permit					
NPDES Multi-Sector General Permit	SNL/NM industrial discharge locations	NTESS: NMR04A012 DOE: NMR04A011	5/31/2021	5/31/2026	EPA
NPDES Construction General Permit					
Dynamic Explosives Test Site North	Thunder Range	NTESS: NMR1000FE DOE: NMR1000F1	5/30/2017 5/16/2017	CGP expires 2/16/2022	EPA
Building 905 Addition	TA-II	NTESS: NMR1000FF	5/30/2017	Permit coverage terminated 3/26/2021	EPA
Brayton Cycle Gas Line	TA-III	NTESS: NMR1000FG	5/30/2017	CGP expires 2/16/2022	EPA
Long Sled Track	TA-III	NTESS: NMR1000FH	5/30/2017	Permit coverage terminated 10/11/2021	EPA
6000 Igloos	6000 Igloos	NTESS: NMR1000FJ	5/30/2017	Permit coverage terminated 7/16/2021	EPA
Battery Test Facility	TA-II	NTESS: NMR1000XA	11/27/2017	CGP expires 2/16/2022	EPA

Permit Type and/or Facility Name	Location	Permit or Registration Number	Issue Date	Expiration Date	Regulatory Agency
TA-III to TA-V Waterline Replacement	TA-III and TA-V	NTESS: NMR1001BR	5/16/2018	CGP expires 2/16/2022	EPA
Coyote Test Field Volt Feeder	Coyote Test Field	NTESS: NMR1001GL	7/18/2018	Permit coverage terminated 7/16/2021	EPA
TA-IV Escarpment	TA-IV	NTESS: NMR1001X4	2/27/2019	CGP expires 2/16/2022	EPA
Building 706 (High Bay)	TA-I	NTESS: NMR10027C	6/26/2019	Permit coverage terminated 7/16/2021	EPA
Building 812	TA-I	NTESS: NMR1002DJ	9/12/2019	CGP expires 2/16/2022	EPA
20th and G Intersection	TA-I	NTESS: NMR1002F3 DOE: NMR1002EY	9/26/2019	CGP expires 2/16/2022	EPA
TA-II Escarpment	TA-II	NTESS: NMR1002LR	12/9/2019	CGP expires 2/16/2022	EPA
Building 972	TA-IV	NTESS: NMR10020U	3/29/2019	Permit coverage terminated 3/26/2021	EPA
Thunder Range 5K Overhead Feeder	TA-III, Coyote Test Field	NTESS: NMR1002XE DOE: NMR1002YL	6/25/2020 5/1/2020	Permit coverage terminated 11/30/2021	EPA
700K Water Tank Feeder	Coyote Test Field	NTESS: NMR1002XF DOE: NMR1002YK	4/17/2020 5/1/2020	Permit coverage terminated 11/30/2021	EPA
Contractor Laydown Yards	TA-I and TA-II	NTESS: NMR1003CF	9/12/2020	CGP expires 2/16/2022	EPA
TA-IV Chilled Water Loop	TA-IV	NTESS: NMR1003X4	5/27/2021	CGP expires 2/16/2022	EPA
825 Parking Lot	TA-I	NTESS: NMR1003X1	8/12/2021	CGP expires 2/16/2022	EPA
Building 814	TA-I	NTESS: NMR10042Y	7/30/2021	CGP expires 2/16/2022	EPA
960 Parking Lot	TA-II	NTESS: NMR10047F	9/30/2021	CGP expires 2/16/2022	EPA
897 Parking Lot	TA-I	NTESS: NMR10047G	9/30/2021	CGP expires 2/16/2022	EPA
Ecological					
New Mexico Department of Game and Fish Nuisance Permit	Site-wide ecological monitoring activity	119	1/12/2021	12/31/2021	New Mexico Department of Game and Fish
New Mexico Department of Game and Fish for Scientific/Educational Purposes Authorization for Taking of Protected Wildlife	Site-wide ecological monitoring activity	3757	1/16/2020	12/31/2022	New Mexico Department of Game and Fish
United States Fish and Wildlife Service Special Purpose-Miscellaneous	Site-wide ecological monitoring activity	MB47978D	8/13/2020	8/31/2023	United States Fish and Wildlife
United States Fish and Wildlife Service Special Purpose-Salvage	Site-wide ecological monitoring activity	MB40881D	5/16/2019	3/31/2022 renewal application submitted 1/2022	United States Fish and Wildlife
United States Department of the Interior Federal Bird Banding Permit	Site-wide ecological monitoring activity	24206	7/2/2019	9/30/2022	United States Department of the Interior

Permit Type and/or Facility Name	Location	Permit or Registration Number	Issue Date	Expiration Date	Regulatory Agency
New Mexico Department of Game and Fish Authorization For Taking Protected Wildlife For Scientific Purposes	Site-wide ecological monitoring activity	3749	11/22/2019	12/31/2022	New Mexico Department of Game and Fish
Resource Conservation and Recovery Act					
Hazardous Waste Permit (Post-Closure Care)	Chemical Waste Landfill	NM5890110518	Issued 10/15/2009; effective 6/2/2011	6/2/2021; remains in effect until permit is renewed	NMED
RCRA Facility Operating Permit	• Hazardous Waste Handling Unit • Thermal Treatment Unit • Radioactive and Mixed Waste Management Unit • Auxiliary Hot Cell Unit • Manzano Storage Bunkers (five) • Corrective Action Management Unit	NM5890110518	Issued 1/27/2015; effective 2/26/2015	2/26/2025	NMED
Open Burning and/or Detonation					
Multiple Event Open Burn Permit	National Solar Thermal Test Facility	21-0002	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Terminal Ballistics Facility	20-0003	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Terminal Ballistics Facility	20-0004	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Terminal Ballistics Facility	21-0005	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Terminal Ballistics Facility	21-0006	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Thermal Treatment Unit	21-0007	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	9920 Test Site	21-0009	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	9930 Test Site	21-0010	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	9939 Test Site	21-0011	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Dynamic Explosive Training Site Complex	21-0012	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Thunder Range Test Site	21-0013	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Rocket Sled Track	21-0014	1/1/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Aerial Cable Facility	21-0024	2/24/2021	12/31/2021	City of Albuquerque
Multiple Event Open Burn Permit	Lurance Canyon Burn Site	21-0047	7/30/2021	12/31/2021	City of Albuquerque
Stationary Source (Air)					
Document Disintegrator	TA-III	Permit 144-M1	9/28/2006	N/A	City of Albuquerque
Neutron Generator Facility	TA-I	Permit 374-M2-1TR	9/25/2017	N/A	City of Albuquerque
Standby Diesel Generators at Substation 41	TA-I	Permit 402-M1	10/27/2017	N/A	City of Albuquerque

Permit Type and/or Facility Name	Location	Permit or Registration Number	Issue Date	Expiration Date	Regulatory Agency
Radioactive and Mixed Waste Management Unit	TA-III	Permit 415-M2-RV1	9/23/2011	N/A	City of Albuquerque
Title V Operating Permit	Site-wide	Permit 515 (pending)	Submitted 3/1/1996	N/A	City of Albuquerque
Emergency Generator at Building 702	TA-I	Permit 924-RV1	2/8/2012	N/A	City of Albuquerque
Processing and Environmental Technology Laboratory Emergency Generator	TA-I	Permit 925-M2	4/11/2012	N/A	City of Albuquerque
Thermal Test Complex	TA-III	Permit 1712-RV2	5/20/2016	N/A	City of Albuquerque
Center for Integrated Nanotechnologies	Sandia Science and Technology Park	Permit 1725-M1	4/12/2012	N/A	City of Albuquerque
Microsystems and Engineering Sciences Applications Facility Boilers and Generators	TA-I	Permit 1820-M2	2/18/2021	N/A	City of Albuquerque
Southeast TA-I Generator	TA-I	Permit 1828	9/28/2006	N/A	City of Albuquerque
Strategic Defense Facility, Building 963	TA-IV	Permit 1900	1/11/2008	N/A	City of Albuquerque
Site-Wide Chemical Use	Site-wide	Permit 1901-M1	10/10/2016	N/A	City of Albuquerque
Building 962 Generator	TA-IV	Permit 1930-RV1	2/3/2012	N/A	City of Albuquerque
Building 833 Generator	TA-I	Permit 2097-M3	12/4/2019	N/A	City of Albuquerque
Building 880 Boiler and Generator	TA-I	Permit 2116-M1	9/10/2015	N/A	City of Albuquerque
Lurance Canyon Burn Site Igloo and Fire Laboratory for Accreditation of Modeling by Experiment	Remote	Permit 3216-M1	7/1/2016	N/A	City of Albuquerque
Building 810 Generator	TA-1	Permit 3436	8/4/2021	N/A	City of Albuquerque
Building 726 Generator	TA-1	Permit 3435	8/18/2021	N/A	City of Albuquerque
Explosives Components Facility	TA-II	Registration 547-RV1	9/27/2011	N/A	City of Albuquerque
Advanced Manufacturing Prototype Facility	TA-I	Registration 1406-M1-RV1	10/4/2011	N/A	City of Albuquerque
Building 899A Boiler	TA-I	Registration 1823-RV1	9/30/2011	N/A	City of Albuquerque
Building 878 Boiler	TA-I	Registration 1888-RV1	5/11/2011	N/A	City of Albuquerque
Building 865 Boiler	TA-I	Registration 1902-RV1	11/30/2010	N/A	City of Albuquerque
Building 802 Boiler	TA-I	Registration 2109	10/28/2010	N/A	City of Albuquerque
Building 804 Boiler	TA-I	Registration 2110	11/8/2010	N/A	City of Albuquerque
Building 823 Boiler	TA-I	Registration 2112	11/8/2010	N/A	City of Albuquerque
Building 840 Boiler	TA-I	Registration 2113	11/8/2010	N/A	City of Albuquerque

Permit Type and/or Facility Name	Location	Permit or Registration Number	Issue Date	Expiration Date	Regulatory Agency
Building 857 Boiler	TA-I	Registration 2114	11/8/2010	N/A	City of Albuquerque
Building 860 Boiler	TA-I	Registration 2115	11/8/2010	N/A	City of Albuquerque
Building 890 Boiler	TA-I	Registration 2117	11/29/2010	N/A	City of Albuquerque
Building 887 Boiler	TA-I	Registration 2118	11/29/2010	N/A	City of Albuquerque
Building 891 Boiler	TA-I	Registration 2119	11/29/2010	N/A	City of Albuquerque
Building 892 Boiler	TA-I	Registration 2120	11/30/2010	N/A	City of Albuquerque
Building 894 Boiler	TA-I	Registration 2121	11/30/2010	N/A	City of Albuquerque
Building 897 Boiler	TA-I	Registration 2122	11/30/2010	N/A	City of Albuquerque
Building 960 Boiler	TA-IV	Registration 2169	9/27/2011	N/A	City of Albuquerque
Building 895 Boiler	TA-I	Registration 2170	9/27/2011	N/A	City of Albuquerque
Building 800 Boiler	TA-I	Registration 2171	9/27/2011	N/A	City of Albuquerque
Building 6585 Boiler	TA-V	Registration 2172-RV1	1/26/2012	N/A	City of Albuquerque
Building 6597 Boiler	TA-V	Registration 2173	2/10/2012	N/A	City of Albuquerque
Building 6580 Boiler	TA-V	Registration 2174-RV1	2/26/2012	N/A	City of Albuquerque
Building 981 Boiler	TA-IV	Registration 2175	9/22/2011	N/A	City of Albuquerque
Building 983 Boiler	TA-IV	Registration 3111	9/13/2013	N/A	City of Albuquerque
Building 963 Boiler	TA-IV	Registration 3211	2/15/2015	N/A	City of Albuquerque
Building 970 Boiler	TA-IV	Registration 3302	12/29/2016	N/A	City of Albuquerque
Fugitive Dust Control Construction, Demolition, and Programmatic, as of 12/31/2021					
Fugitive Dust Control Programmatic Permit	Site-wide	8683-P	6/12/2017	6/12/2022	City of Albuquerque
2K Sled Track Paving Project	TA-III	9700-C	1/7/2019	1/7/2021	City of Albuquerque
TA-IV Escarpment	TA-IV	9815-C	3/18/2019	3/18/2021	City of Albuquerque
Building 972	TA-II	9831-C	4/4/2019	4/4/2021	City of Albuquerque
20th Street Parking Lot	TA-II	9842-C	4/4/2019	4/4/2021	City of Albuquerque
TA-IV Temporary Building	TA-IV	9956-C	6/27/2019	6/27/2021	City of Albuquerque
Building 9940H	Coyote Test Field	9917-C	6/6/2019	6/6/2022	City of Albuquerque
Building 706	TA-I	9987-C	7/5/2019	7/5/2021	City of Albuquerque
Contractor Laydown Yard	TA-II	0001-C	7/11/2019	7/11/2021	City of Albuquerque

Permit Type and/or Facility Name	Location	Permit or Registration Number	Issue Date	Expiration Date	Regulatory Agency
Groundwater Well Installation	Coyote Test Field	0050-C	9/9/2019	9/9/2021	City of Albuquerque
Building 812	TA-I	0059-C	9/18/2019	9/18/2023	City of Albuquerque
TA-IV Modular Building	TA-IV	0061-C	9/20/2019	9/20/2023	City of Albuquerque
20th and G Realignment	TA-I	0066-C	10/2/2019	10/2/2023	City of Albuquerque
9940X	Coyote Test Field	0428-C	3/1/2020	5/8/2022	City of Albuquerque
5 kV Overhead Feeder	Remote	0460-C	6/15/2020	6/15/2022	City of Albuquerque
Sled Track Monuments	TA III	0634-C	9/3/2020	9/3/2022	City of Albuquerque
700K Water Tank Feed	Coyote Test Field	0646-C	9/22/2020	9/22/2022	City of Albuquerque
TA-IV Chilled Water Loop	TA-IV	1069-C	4/28/2021	4/28/2023	City of Albuquerque
Building 814	TA-I	1248-C	8/13/2021	8/13/2026	City of Albuquerque
897 Parking Lot	TA-I	1325-C	10/4/2021	10/4/2024	City of Albuquerque
960 Parking Lot	TA-IV	1342-C	10/4/2021	10/4/24	City of Albuquerque

[a] Renewal for Surface Discharge Permit DP-530 was submitted to DOE for transmittal to NMED on February 21, 2019, in compliance with a request from NMED dated September 5, 2014. Additional information was submitted at the request of NMED on May 24, 2019. NMED issued a public notice of the application renewal on August 23, 2019. A new permit for DP-530 has not yet been issued. The expired permit has been administratively extended until a new permit is issued.

N/A = not applicable

Table 10-2. Summary of compliance history with regard to mixed waste

Date	Milestone	Comment
November 1984	1984 HSWA to RCRA	Experienced an issue with extended storage after HSWA established land disposal restrictions and a prohibition on storage of wastes for more than one year.
August 1990	RCRA Part A interim status permit application submitted	Submitted the RCRA Part A interim status permit application to NMED for mixed waste storage. Later revisions to the interim status application were added to include proposed mixed waste treatment processes.
October 1992	FFCA passed	The FFCA allows storage of mixed waste that does not meet the applicable treatment standard beyond the one-year RCRA time limit. This required DOE to submit a site treatment plan for mixed waste.
December 1992	Notice of Noncompliance issued	EPA issued a Notice of Noncompliance for storage of RCRA-regulated mixed waste over the one-year maximum period.
October 1993	Conceptual site treatment plan submitted	DOE submitted a conceptual site treatment plan for mixed waste to NMED; subsequent drafts followed.
March 1995	Final site treatment plan submitted	DOE submitted a final site treatment plan for mixed waste to NMED.
June 1995	HDRV Project initiated	The HDRV Project was initiated to characterize and sort legacy mixed waste. The project continued into 1997, when it was replaced with new sorting procedures.
October 1995	FFCO signed	The FFCO—an agreement between NMED, DOE, and Sandia personnel—detailed specific actions required with regard to mixed waste management, including the requirement to develop a site treatment plan to be updated annually.
March 1996	Site treatment plan milestones met	Updated the site treatment plan to reflect fiscal year 1995 activities.
September 1996	First mixed waste shipment made FFCO Amendment No. 1	The first mixed waste shipment was made; mixed waste was sent to Perma-Fix/Diversified Scientific Services, Inc., for treatment. The FFCO was amended.
December 1996	N/A	DOE and Sandia personnel resubmitted the RCRA Part A and Part B permit application to reflect revisions to proposed on-site treatment methods.
May 1997	FFCO Amendment No. 2	The FFCO was amended.
December 1997	On-site mixed waste treatment	On-site treatment of mixed waste began at the Radioactive and Mixed Waste Management Unit in compliance with regulatory requirements.
1997–2001	Site treatment plan milestones met	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements, meeting all treatment and disposal milestones. Updated the site treatment plan annually to reflect activities and changes to proposed treatment technologies. NMED approved revisions 1 through 5 to the site treatment plan, which revised waste volumes, revised treatment and disposal technologies, and established new deadlines.
May 2001	FFCO Amendment No. 3	The FFCO was amended.
February 2002	N/A	DOE and Sandia personnel submitted the updated RCRA Part A and Part B permit application to NMED to reflect revisions to on-site waste management operations. Permit application for mixed waste management units was combined with permit renewal requests for hazardous waste management units.

Date	Milestone	Comment
2002–2003	Site treatment plan milestones met	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements, meeting all treatment and disposal milestones. Updated the site treatment plan annually to reflect activities and changes to proposed treatment technologies. NMED approved revisions 6 and 7 to the site treatment plan, which revised waste volumes, revised treatment and disposal technologies, and established new deadlines.
April 2003, November 2003	N/A	DOE and Sandia personnel revised the RCRA Part A and Part B permit application in response to NMED comments.
April 2004	FFCO Amendment No. 4	The FFCO was amended.
November 2004	N/A	DOE and Sandia personnel revised the RCRA Part A and Part B permit application in response to NMED comments.
2004–2007	Site treatment plan milestones met	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements, meeting all treatment and disposal milestones. Updated the site treatment plan annually to reflect activities and changes to proposed treatment technologies. NMED approved revisions 8 through 11 to the site treatment plan, which revised waste volumes, revised treatment and disposal technologies, and established new deadlines.
June 2005, October 2005, May 2006, March 2007	N/A	DOE and Sandia personnel revised the RCRA Part A and Part B permit application to reflect changes in waste management operations.
August 2007	N/A	NMED issued a draft RCRA permit to DOE and Sandia personnel and made it available for public comment.
January 2008	N/A	DOE and Sandia personnel submitted extensive comments on the draft permit to NMED and requested resolution of comments.
2008–2010	Site treatment plan milestones met	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements, meeting all treatment and disposal milestones. Updated the site treatment plan annually to reflect activities and changes to proposed treatment technologies. NMED approved Revision 12 to the site treatment plan, which revised waste volumes, revised treatment and disposal technologies, and established new deadlines.
October 2009, November 2010	N/A	DOE and Sandia personnel revised the RCRA Part B permit application to reflect changes in waste management operations.
December 2010	FFCO Amendment No. 5	The FFCO was amended to extend certain compliance deadlines.
2011	Site treatment plan milestones met	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements, meeting all treatment and disposal milestones. Completed disposition of all mixed wastes subject to the site treatment plan in compliance with applicable deadlines. Updated the site treatment plan to reflect fiscal year 2010 activities.
October 2011, May 2012	N/A	DOE and Sandia personnel revised the RCRA Part A and Part B permit application to reflect changes in waste management operations.
September 2012	N/A	NMED issued a draft RCRA permit to DOE and Sandia personnel and made it available for public comment.

Date	Milestone	Comment
November 2012	N/A	DOE and Sandia personnel submitted comments on the draft permit to NMED and requested resolution of comments.
2012–2014	N/A	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements. Updated the site treatment plan annually to reflect waste management activities and waste volumes. Requested approval of Revision 14 to the site treatment plan to revise waste volumes, establish new deadlines, and provide continuity.
December 2014	N/A	NMED approved Revision 14 to the site treatment plan, which revised waste volumes and established new deadlines.
January 2015	N/A	NMED issued the RCRA Facility Operating Permit for SNL/NM. The permit includes mixed waste storage and treatment units.
2015–2016	N/A	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements. Updated the site treatment plan annually to reflect waste management activities and waste volumes. Requested approval of Revision 15 to the site treatment plan to establish new deadlines, update waste management technologies, and provide continuity.
October 2016	N/A	NMED approved Revision 15 to the site treatment plan, which revised waste volumes and technologies, and established new deadlines.
2017–2021	N/A	Treated wastes on-site and shipped mixed wastes to off-site treatment and disposal facilities in compliance with regulatory requirements. Updated the site treatment plan to reflect waste management activities and waste volumes. Requested approval of Revision 16 to the site treatment plan to revise waste volumes, update waste management technologies, establish new deadlines, and provide continuity.

FFCA = Federal Facility Compliance Act
FFCO = Federal Facility Compliance Order
HDRV = Historical Disposal Requests Validation
HSWA = Hazardous and Solid Waste Amendment
N/A = not applicable

Table 10-3. Quantity of mixed waste subject to the Federal Facility Compliance Order, end of fiscal year 2021

Waste Category	Volume (m^3)	Description	Status and Plans
TG 1	0	Inorganic debris with an explosives component	No waste currently in inventory
TG 2	0	Inorganic debris with a water-reactive component	No waste currently in inventory
TG 3	0	Reactive metals	No waste currently in inventory
TG 4	0	Elemental lead	No waste currently in inventory
TG 5	0	Aqueous liquids (corrosive)	No waste currently in inventory
TG 6	0	Elemental mercury	No waste currently in inventory
TG 7	0	Organic liquids I	No waste currently in inventory
TG 8	0	Organic debris with organic contaminants	No waste currently in inventory
TG 9	0	Inorganic debris with TCLP metals	No waste currently in inventory
TG 10	0	Heterogeneous debris	No waste currently in inventory
TG 11	0	Organic liquids II	No waste currently in inventory
TG 12	0	Organic debris with TCLP metals	No waste currently in inventory
TG 13	0	Oxidizers	No waste currently in inventory
TG 14	0	Aqueous liquids with organic contaminants	No waste currently in inventory
TG 15	0	Soils < 50 percent debris and particulates with TCLP metals	No waste currently in inventory
TG 16	0	Cyanide waste	No waste currently in inventory
TG 17	0	Liquid or solid with organic and/or metal contaminants	No waste currently in inventory
TG 18	0	Particulates with organic contaminants	No waste currently in inventory
TG 19	0	Liquids with metals	No waste currently in inventory
TG 20	0	Propellant with TCLP metals	No waste currently in inventory
TG 21	0	Sealed sources with TCLP metals	No waste currently in inventory
TG 22	0	Reserved	N/A
TG 23	0	Thermal batteries	No waste currently in inventory
TG 24	0	Spark gap tubes with TCLP metals	No waste currently in inventory
TG 25	0	Classified items with TCLP metals	No waste currently in inventory
TG 26	0	Debris items with reactive compounds and TCLP metals	No waste currently in inventory
TG 27	0	High mercury solids and liquids	No waste currently in inventory
MTRU	1.76	Mixed transuranic waste	Stored at SNL/NM; awaiting shipment to the Waste Isolation Pilot Plant

N/A = not applicable
TCLP = toxicity characteristic leaching procedure

Appendix A. Summary of Groundwater Monitoring in 2021

Short-horned lizard (*Phrynosoma hernandesi*)

Table A-1. Sample collection events for groundwater quality monitoring at SNL/NM, 2021

Sampling Event	Groundwater Monitoring Program (16 wells plus 1 spring)	Chemical Waste Landfill (4 wells)	Mixed Waste Landfill (4 wells)	TA-V Groundwater Area of Concern (17 wells)	Tijeras Arroyo Groundwater Area of Concern (21 wells)	Burn Site Groundwater Area of Concern (14 wells)
January		√				√
February				√	√	
March	√				√	
April						√
May			√	√		
June				√	√	
July		√		√		√
August				√	√	
September					√	
October						√
November			√	√		
December				√	√	

Table A-2. SNL/NM groundwater monitoring analytical results, 2021

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Summary of Field Water Quality Parameters Prior to Sample Collection (units as indicated below)						
pH in SU	170	0	6.18	7.93	7.41	NE
Specific conductivity in μmhos/cm	170	0	312.9	4,836.6	698.8	NE
Temperature in °C	170	0	11.17	27.42	19.08	NE
Turbidity in NTU	170	0	0.11	7.79	1.05	NE
Detected Organic Compounds in μg/L						
Acetone	6	152	1.77	5.12	2.78	NE
Bromodichloromethane	1	176	1.71	1.71	1.71	80.0[a]
Chloroform	12	170	0.550	11.6	1.782	80.0[a]
Dibromo-3-chloropropane, 1,2-	1	166	0.440	0.440	0.440	0.200
Dibromochloromethane	1	176	1.26	1.26	1.26	80.0[a]
Dichloroethane, 1,1-	9	168	0.410	6.28	3.749	NE
Dichloroethene, 1,1-	10	172	0.480	2.59	1.552	7.0
Dichloroethene, cis-1,2-	40	137	0.340	6.28	1.742	70.0
Diesel range organics	1	46	351	351	351	NE
Dioxane, 1,4-	1	16	0.121	0.121	0.121	NE
Tetrachloroethene	14	168	0.350	9.65	3.890	5.0
Toluene	8	169	0.340	1.21	0.594	1,000
Trichloroethene	80	107	0.360	18.5	4.624	5.0
Detected Inorganic Parameters in mg/L						
Alkalinity as $CaCO_3$	81	0	82.8	1,050	209.4	NE
Bromide	81	0	0.152	2.84	0.536	NE
Chloride	81	0	10.2	473	51.2	NE
Fluoride	81	0	0.173	2.73	0.953	4.0
Nitrate plus nitrite	191	2	0.160	39.8	8.202	10.0
Sulfate	81	0	15.7	1,950	119.4	NE
Total organic halogens	9	12	0.00402	0.0844	0.01762	NE
Total Phenols	4	17	0.00179	0.00286	0.00209	NE
Detected Metals in mg/L						
Aluminum	16	65	0.0197	0.594	0.0999	NE
Antimony	19	62	0.00101	0.00305	0.00151	0.006
Arsenic	95	52	0.00200	0.00758	0.00274	0.010
Barium	81	0	0.00895	0.242	0.07012	2.0
Beryllium	4	77	0.00241	0.00683	0.00376	0.004
Cadmium	4	87	0.000314	0.000427	0.000357	0.005
Calcium	81	0	37.9	302	86.0	NE
Chromium	7	94	0.00331	0.0545	0.01455	0.100
Cobalt	5	76	0.000340	0.00987	0.002660	NE
Copper	23	58	0.000303	0.00125	0.000497	NE
Iron	30	117	0.0338	0.517	0.0857	NE
Magnesium	81	0	3.20	62.5	20.16	NE
Manganese	35	109	0.00100	1.45	0.05390	NE
Mercury	1	101	0.000185	0.000185	0.000185	0.002

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Molybdenum	8	0	0.00303	0.00562	0.00373	NE
Nickel	14	87	0.000640	0.0233	0.003480	NE
Potassium	81	0	1.28	30.2	3.42	NE
Selenium	56	25	0.00202	0.0295	0.00528	0.050
Silver	1	80	0.00106	0.00106	0.00106	NE
Sodium	81	0	14.0	1,030	56.3	NE
Thallium	1	80	0.00133	0.00133	0.00133	0.002
Uranium	64	0	0.000216	0.0166	0.003955	0.030
Vanadium	51	30	0.00367	0.0102	0.00632	NE
Zinc	24	57	0.00330	0.165	0.01944	NE
Detected Radiological Parameters in pCi/L						
Alpha, gross (corrected)	92	0	−4.30	16.3	1.59	15.0[b]
Americium-241	1	90	0.0952	0.0952	0.0952	NE
Beta, gross	87	5	1.32	21.9	4.87	4 mrem/yr
Potassium-40	4	77	47.3	67.9	57.4	NE
Radium-226	7	14	0.183	0.546	0.363	5.0[c]
Radium-228	11	10	0.342	2.21	0.902	5.0[c]
Radon-222	10	0	108	519	313	4,000
Uranium-233/234	33	0	0.45	33.5	10.8	NE
Uranium-235/236	27	6	0.0675	0.616	0.2152	NE
Uranium-238	32	1	0.194	5.59	2.208	NE

Note: Number of active wells sampled was 77, number of analyses performed was 13,436, and percent of non-detected results was 85 percent.
[a]The 80.0 μg/L MCL is for combined trihalomethanes.
[b]The 15.0 pCi/L MCL is for corrected gross alpha activity.
[c]The 5.0 pCi/L MCL is for combined radium-226 and radium-228.
4 mrem/yr = any combination of beta- and/or gamma-emitting radionuclides (as dose rate)
$CaCO_3$ = calcium as carbon carbonate
corrected = gross alpha results reported as corrected values (uranium activities subtracted out)
MCL = maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Drinking Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards (EPA March 2018)
N/A = not applicable
N = nitrogen
NE = not established
NTU = nephelometric turbidity unit
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration)
SU = standard unit

Table A-3. Exceedances for SNL/NM groundwater monitoring wells and springs sampled, 2021

Analyte	Well	Exceedance	Date
Beryllium MCL = 0.004 mg/L	Coyote Springs	0.00683 mg/L[a]	March 2021
Nitrate plus nitrite (as nitrogen) MCL = 10.0 mg/L	AVN-1	10.1 mg/L	June 2021
	CYN-MW9	37.3 mg/L	April 2021
		39.8 mg/L	October 2021
	CYN-MW9 (duplicate)	37.3 mg/L	April 2021
	CYN-MW12	16.0 mg/L	April 2021
		16.3 mg/L	October 2021
	CYN-MW12 (duplicate)	16.5 mg/L	April 2021
	CYN-MW13	30.6 mg/L	April 2021
		29.9 mg/L	October 2021
	CYN-MW13 (duplicate)	30.2 mg/L	October 2021
	CYN-MW14A	12.3 mg/L	April 2021
		12.6 mg/L	October 2021
	CYN-MW14A (resample)	14.6 mg/L	October 2021
	CYN-MW15	20.6 mg/L	April 2021
		19.6 mg/L	October 2021
	CYN-MW15 (duplicate)	19.6 mg/L	October 2021
	LWDS-MW1	11.9 mg/L	February 2021
		12.8 mg/L	June 2021
		13.2 mg/L	August 2021
		12.0 mg/L	December 2021
	LWDS-MW1 (duplicate)	13.5 mg/L	August 2021
	TA1-W-08 (duplicate)	12.4 mg/L	September 2021
	TA2-W-19	12.3 mg/L	March 2021
		12.4 mg/L	June 2021
		12.8 mg/L	September 2021
		12.2 mg/L	December 2021
	TA2-W-19	12.4 mg/L	March 2021
	TA2-W-28	17.6 mg/L	March 2021
		18.0 mg/L	June 2021
		17.4 mg/L	September 2021
		18.3 mg/L	December 2021
	TAV-MW10	11.4 mg/L	February 2021
		12.2 mg/L	June 2021
		13.2 mg/L	August 2021
		12.6 mg/L	December 2021
	TAV-MW10 (duplicate)	13.9 mg/L	August 2021
	TJA-2	11.8 mg/L	March 2021
		12.1 mg/L	June 2021
		11.4 mg/L	September 2021
		11.9 mg/L	December 2021
	TJA-4	30.1 mg/L	March 2021
		31.3 mg/L	June 2021
		31.7 mg/L	September 2021

Analyte	Well	Exceedance	Date
		30.4 mg/L	December 2021
	TJA-4 (duplicate)	31.2 mg/L	June 2021
	TJA-5	16.4 mg/L	September 2021
	TJA-7	22.2 mg/L	March 2021
		23.0 mg/L	June 2021
		21.6 mg/L	September 2021
		21.6 mg/L	December 2021
Dibromo-3-chloropropane, 1,2- MCL = 0.200 µg/L	TA1-W-05	0.440 µg/L	August 2021
Tetrachloroethene MCL = 5.0 µg/L	TA2-W-26	6.26 µg/L	September 2021
		9.58 µg/L	December 2021
	TA2-W-26 (duplicate)	5.12 µg/L	March 2021
		9.28 µg/L	June 2021
		6.89 µg/L	September 2021
		9.65 µg/L	December 2021
Trichloroethene MCL = 5.0 µg/L	LWDS-MW1	15.2 µg/L	February 2021
		5.42 µg/L	June 2021
		7.78 µg/L	August 2021
		11.3 µg/L	December 2021
	LWDS-MW1 (duplicate)	9.14 µg/L	August 2021
	TA2-W-26	13.2 µg/L	September 2021
		18.5 µg/L	December 2021
	TA2-W-26 (duplicate)	13.8 µg/L	March 2021
		15.9 µg/L	June 2021
		14.4 µg/L	September 2021
		18.2 µg/L	December 2021
	TAV-MW4	5.08 µg/L	February 2021
		5.45 µg/L	June 2021
		5.37 µg/L	November 2021
	TAV-MW4 (duplicate)	5.20 µg/L	February 2021
		5.17 µg/L	November 2021
	TAV-MW10	11.5 µg/L	February 2021
		9.26 µg/L	June 2021
		11.3 µg/L	August 2021
		10.3 µg/L	December 2021
	TAV-MW10 (duplicate)	11.3 µg/L	August 2021

[a]Analytical result for filtered groundwater sample. All other analytical results are for unfiltered groundwater samples.

Appendix B. Terrestrial Surveillance Analytical Results in 2021

Cougar (*Puma concolor*)

Table B-1. Radiological results in soil, 2021

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
C-9	Actinium-228	pCi/g	1.09	± 0.176	0.108	0.0504		None	SA	HASL 300
	Americium-241	pCi/g	0.0033	± 0.0261	0.042	0.0205	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.118	± 0.0367	0.0337	0.016		None	SA	HASL 300
	Tritium	pCi/L	179	± 131	203	91.4	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.113	± 0.169	0.127	0.0618	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.681	± 0.558	0.424	0.208		J	SA	HASL 300
C-10	Actinium-228	pCi/g	1.01	± 0.186	0.096	0.0454		None	SA	HASL 300
	Americium-241	pCi/g	−0.0245	± 0.0853	0.135	0.0663	U	BD	SA	HASL 300
	Cesium-137	pCi/g	1.01	± 0.112	0.0294	0.0141		None	SA	HASL 300
	Tritium	pCi/L	96.7	± 123	207	93.3	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	−0.012	± 0.109	0.156	0.0767	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.691	± 1.32	1.12	0.547	U	BD	SA	HASL 300
C-25	Actinium-228	pCi/g	0.703	± 0.153	0.0973	0.045		None	SA	HASL 300
	Americium-241	pCi/g	0.00202	± 0.0734	0.123	0.0595	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.101	± 0.0272	0.0254	0.0118		None	SA	HASL 300
	Tritium	pCi/L	67.1	± 123	215	96.8	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0155	± 0.0929	0.141	0.0681	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.05	± 1.08	0.978	0.472	X	R	SA	HASL 300
P-4	Actinium-228	pCi/g	0.925	± 0.139	0.0775	0.0366		None	SA	HASL 300
	Americium-241	pCi/g	−0.0253	± 0.0434	0.0693	0.0339	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.164	± 0.0301	0.0224	0.0107		None	SA	HASL 300
	Uranium-235	pCi/g	0.0517	± 0.111	0.115	0.0563	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.799	± 0.794	0.601	0.294		J	SA	HASL 300
P-5	Actinium-228	pCi/g	0.599	± 0.133	0.0782	0.0368		None	SA	HASL 300
	Americium-241	pCi/g	0.00631	± 0.049	0.0887	0.0431	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.129	± 0.031	0.0197	0.00931		None	SA	HASL 300
	Uranium-235	pCi/g	−0.015	± 0.0675	0.11	0.0537	U	BD	SA	HASL 300
P-5	Uranium-238	pCi/g	0.911	± 1.01	0.726	0.353	X	R	SA	HASL 300
P-16	Actinium-228	pCi/g	1.57	± 0.233	0.0921	0.0431		None	SA	HASL 300
	Americium-241	pCi/g	0.00194	± 0.0957	0.162	0.0789	U	BD	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-16	Cesium-137	pCi/g	0.0744	± 0.0317	0.0309	0.0148		J	SA	HASL 300
	Uranium-235	pCi/g	−0.0791	± 0.108	0.171	0.0837	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.58	± 1.75	1.29	0.627	X	R	SA	HASL 300
P-19	Actinium-228	pCi/g	1.24	± 0.203	0.101	0.0478		None	SA	HASL 300
	Americium-241	pCi/g	0.0201	± 0.0485	0.091	0.0443	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.103	± 0.0412	0.0286	0.0136		None	SA	HASL 300
	Tritium	pCi/L	180	± 90	126	56.8		J	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.163	± 0.13	0.128	0.0623		J	SA	HASL 300
	Uranium-238	pCi/g	0.912	± 0.975	0.781	0.381	X	R	SA	HASL 300
P-58	Actinium-228	pCi/g	1.08	± 0.154	0.0675	0.0318		None	SA	HASL 300
	Americium-241	pCi/g	0.00275	± 0.0153	0.0264	0.0129	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0629	± 0.0257	0.019	0.00905		None	SA	HASL 300
	Tritium	pCi/L	268	± 137	194	87.3		J	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.00783	± 0.0645	0.0993	0.0485	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.958	± 0.428	0.263	0.129		None	SA	HASL 300
P-59	Actinium-228	pCi/g	0.845	± 0.16	0.093	0.0439		None	SA	HASL 300
	Americium-241	pCi/g	0.0589	± 0.0926	0.153	0.0745	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.187	± 0.0329	0.0249	0.0119		None	SA	HASL 300
	Uranium-235	pCi/g	0.0612	± 0.156	0.13	0.0632	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.13	± 1.47	1.16	0.564	U	BD	SA	HASL 300
P-61	Actinium-228	pCi/g	0.629	± 0.156	0.0991	0.0452		None	SA	HASL 300
	Americium-241	pCi/g	0.00537	± 0.0858	0.15	0.072	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.012	± 0.0193	0.0321	0.0151	U	BD	SA	HASL 300
	Tritium	pCi/L	145	± 115	182	82.7	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0184	± 0.168	0.153	0.0734	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.42	± 1.73	1.25	0.604	X	R	SA	HASL 300
P-63	Actinium-228	pCi/g	0.958	± 0.184	0.127	0.0595		None	SA	HASL 300
	Americium-241	pCi/g	−0.0672	± 0.102	0.158	0.077	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.127	± 0.0404	0.0338	0.016		None	SA	HASL 300
	Tritium	pCi/L	182	± 91	128	57.5		J	SA	GL-RAD-A-002
	Uranium-235	pCi/g	−0.0417	± 0.121	0.178	0.0866	U	BD	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-63	Uranium-238	pCi/g	1.36	± 1.78	1.29	0.63	X	R	SA	HASL 300
P-64	Actinium-228	pCi/g	1.79	± 0.233	0.093	0.044		None	SA	HASL 300
	Actinium-228	pCi/g	1.72	± 0.235	0.0926	0.0446		None	DU	HASL 300
	Actinium-228	pCi/g	1.67	± 0.213	0.0809	0.0386		None	DU	HASL 300
	Americium-241	pCi/g	0.0358	± 0.0679	0.118	0.0575	U	BD	SA	HASL 300
	Americium-241	pCi/g	−0.0249	± 0.0974	0.16	0.0785	U	BD	DU	HASL 300
	Americium-241	pCi/g	0.00559	± 0.064	0.115	0.0562	U	BD	DU	HASL 300
	Cesium-137	pCi/g	0.207	± 0.0396	0.0267	0.0128		None	SA	HASL 300
	Cesium-137	pCi/g	0.231	± 0.0357	0.0232	0.0112		None	DU	HASL 300
	Cesium-137	pCi/g	0.232	± 0.0326	0.0208	0.01		None	DU	HASL 300
	Uranium-235	pCi/g	0.124	± 0.143	0.142	0.0692	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.161	± 0.167	0.159	0.0783	X	R	DU	HASL 300
	Uranium-235	pCi/g	0.0709	± 0.113	0.116	0.0569	U	BD	DU	HASL 300
	Uranium-238	pCi/g	1.62	± 1.17	0.953	0.465		J	SA	HASL 300
	Uranium-238	pCi/g	1.94	± 1.62	1.28	0.629		J	DU	HASL 300
	Uranium-238	pCi/g	1.86	± 1.22	0.914	0.448		J	DU	HASL 300
P-81	Actinium-228	pCi/g	0.767	± 0.166	0.0776	0.0359		None	SA	HASL 300
	Americium-241	pCi/g	−0.0036	± 0.0561	0.0968	0.047	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.166	± 0.0304	0.0254	0.0121		None	SA	HASL 300
	Uranium-235	pCi/g	0.0855	± 0.123	0.121	0.0587	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.71	± 1.26	0.784	0.381		J	SA	HASL 300
P-82	Actinium-228	pCi/g	1.03	± 0.184	0.102	0.0471		None	SA	HASL 300
	Americium-241	pCi/g	0.0722	± 0.0992	0.165	0.0796	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.13	± 0.0402	0.0316	0.0149		None	SA	HASL 300
	Tritium	pCi/L	82	± 125	211	102	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0271	± 0.154	0.158	0.0767	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.583	± 1.92	1.29	0.627	U	BD	SA	HASL 300
P-95	Actinium-228	pCi/g	0.756	± 0.134	0.0718	0.0337		None	SA	HASL 300
	Americium-241	pCi/g	−0.005	± 0.0408	0.0715	0.0348	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.301	± 0.0428	0.0196	0.0093		None	SA	HASL 300
	Uranium-235	pCi/g	0.0981	± 0.0888	0.103	0.05	U	BD	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
P-95	Uranium-238	pCi/g	0.561	± 0.924	0.622	0.303	U	BD	SA	HASL 300
S-1	Actinium-228	pCi/g	1.02	± 0.168	0.0894	0.042		None	SA	HASL 300
	Americium-241	pCi/g	0.00203	± 0.0209	0.0348	0.0171	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.118	± 0.0263	0.0253	0.012		None	SA	HASL 300
	Uranium-235	pCi/g	0.086	± 0.121	0.108	0.0526	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.03	± 0.536	0.345	0.169		J	SA	HASL 300
S-6	Actinium-228	pCi/g	0.795	± 0.148	0.0957	0.0444		None	SA	HASL 300
	Americium-241	pCi/g	−0.0034	± 0.0223	0.038	0.0185	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0171	± 0.0269	0.0297	0.0141	U	BD	SA	HASL 300
	Tritium	pCi/L	181	± 136	221	107	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0376	± 0.13	0.132	0.0637	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.816	± 0.493	0.384	0.187		J	SA	HASL 300
S-33	Actinium-228	pCi/g	0.777	± 0.173	0.108	0.0507		None	SA	HASL 300
	Actinium-228	pCi/g	0.872	± 0.169	0.122	0.0578		None	DU	HASL 300
	Actinium-228	pCi/g	0.89	± 0.185	0.114	0.0537		None	DU	HASL 300
	Americium-241	pCi/g	0.071	± 0.103	0.159	0.0774	U	BD	SA	HASL 300
	Americium-241	pCi/g	0.0036	± 0.0253	0.0393	0.0192	U	BD	DU	HASL 300
	Americium-241	pCi/g	−0.0137	± 0.122	0.198	0.096	U	BD	DU	HASL 300
	Cesium-137	pCi/g	0.318	± 0.0454	0.0294	0.0139		None	SA	HASL 300
	Cesium-137	pCi/g	0.274	± 0.0495	0.0352	0.0168		None	DU	HASL 300
	Cesium-137	pCi/g	0.312	± 0.0458	0.0313	0.0149		None	DU	HASL 300
	Tritium	pCi/L	108	± 119	199	96.3	U	BD	SA	GL-RAD-A-002
	Tritium	pCi/L	152	± 125	204	99	U	BD	DU	GL-RAD-A-002
	Tritium	pCi/L	150	± 128	210	102	U	BD	DU	GL-RAD-A-002
	Uranium-235	pCi/g	−0.0932	± 0.118	0.166	0.0808	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.00669	± 0.12	0.128	0.0623	U	BD	DU	HASL 300
	Uranium-235	pCi/g	−0.0661	± 0.134	0.157	0.0767	U	BD	DU	HASL 300
	Uranium-238	pCi/g	0.747	± 1.35	1.29	0.628	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.703	± 0.512	0.377	0.184		J	DU	HASL 300
	Uranium-238	pCi/g	1.31	± 1.86	1.51	0.735	U	BD	DU	HASL 300
S-34	Actinium-228	pCi/g	1.23	± 0.212	0.112	0.0524		None	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-34	Americium-241	pCi/g	−0.0079	± 0.0617	0.106	0.0515	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.053	± 0.0296	0.0281	0.0132		J	SA	HASL 300
	Tritium	pCi/L	114	± 131	219	106	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.134	± 0.126	0.153	0.0743	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.03	± 1.24	0.895	0.434	X	R	SA	HASL 300
S-45	Actinium-228	pCi/g	0.874	± 0.182	0.1	0.0477		None	SA	HASL 300
	Americium-241	pCi/g	−0.0212	± 0.0973	0.16	0.0778	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0187	± 0.0183	0.0299	0.0144	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.172	± 0.192	0.178	0.0869	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.878	± 1.65	1.29	0.626	U	BD	SA	HASL 300
S-46	Actinium-228	pCi/g	1.04	± 0.178	0.103	0.0477		None	SA	HASL 300
	Americium-241	pCi/g	0.014	± 0.0211	0.0364	0.0177	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.126	± 0.0308	0.0283	0.0133		None	SA	HASL 300
	Tritium	pCi/L	193	± 133	203	91.3	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0187	± 0.0764	0.131	0.0631	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.18	± 0.528	0.353	0.172		None	SA	HASL 300
S-49	Actinium-228	pCi/g	0.967	± 0.149	0.0734	0.0344		None	SA	HASL 300
	Americium-241	pCi/g	−0.0008	± 0.0164	0.0293	0.0143	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.161	± 0.0272	0.02	0.00948		None	SA	HASL 300
	Uranium-235	pCi/g	0.0747	± 0.107	0.0972	0.0473	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.02	± 0.491	0.287	0.14		None	SA	HASL 300
S-51	Actinium-228	pCi/g	0.766	± 0.148	0.0856	0.0405		None	SA	HASL 300
	Americium-241	pCi/g	−0.0046	± 0.0406	0.0642	0.0314	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0708	± 0.0306	0.0245	0.0117		J	SA	HASL 300
	Tritium	pCi/L	219	± 107	157	73.6		J	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0322	± 0.0816	0.129	0.0628	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.944	± 0.769	0.577	0.282	X	R	SA	HASL 300
S-53	Actinium-228	pCi/g	0.905	± 0.16	0.0848	0.0406		None	SA	HASL 300
	Actinium-228	pCi/g	0.828	± 0.191	0.112	0.0522		None	DU	HASL 300
	Actinium-228	pCi/g	0.873	± 0.193	0.112	0.0517		None	DU	HASL 300
	Americium-241	pCi/g	−0.0543	± 0.0821	0.136	0.0661	U	BD	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-53	Americium-241	pCi/g	0.00066	± 0.0703	0.124	0.0596	U	BD	DU	HASL 300
	Americium-241	pCi/g	−0.0266	± 0.0652	0.11	0.0528	U	BD	DU	HASL 300
	Cesium-137	pCi/g	0.0274	± 0.019	0.0274	0.0128	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0143	± 0.0184	0.0321	0.0152	U	BD	DU	HASL 300
	Cesium-137	pCi/g	0.00789	± 0.0168	0.0307	0.0144	U	BD	DU	HASL 300
	Uranium-235	pCi/g	−0.0033	± 0.0922	0.149	0.0728	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.00146	± 0.0916	0.154	0.0743	U	BD	DU	HASL 300
	Uranium-235	pCi/g	0.109	± 0.146	0.164	0.0795	U	BD	DU	HASL 300
	Uranium-238	pCi/g	−0.411	± 0.819	1.28	0.625	U	BD	SA	HASL 300
	Uranium-238	pCi/g	2.08	± 1.54	0.975	0.47	X	R	DU	HASL 300
	Uranium-238	pCi/g	1.09	± 1.3	0.954	0.461	X	R	DU	HASL 300
S-55	Actinium-228	pCi/g	1.05	± 0.153	0.0716	0.0334		None	SA	HASL 300
	Americium-241	pCi/g	0.0388	± 0.0397	0.0276	0.0134	X	R	SA	HASL 300
	Cesium-137	pCi/g	0.171	± 0.0322	0.0223	0.0106		None	SA	HASL 300
	Uranium-235	pCi/g	0.064	± 0.118	0.101	0.0489	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.825	± 0.418	0.282	0.138		J	SA	HASL 300
S-57	Actinium-228	pCi/g	0.922	± 0.185	0.0956	0.0446		None	SA	HASL 300
	Americium-241	pCi/g	0.0114	± 0.0647	0.113	0.0547	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.00832	± 0.0163	0.0285	0.0135	U	BD	SA	HASL 300
	Tritium	pCi/L	166	± 131	206	92.8	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0131	± 0.0886	0.146	0.0708	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.32	± 1.19	0.96	0.466		J	SA	HASL 300
S-76	Actinium-228	pCi/g	0.906	± 0.139	0.0741	0.035		None	SA	HASL 300
	Americium-241	pCi/g	0.00341	± 0.0151	0.0268	0.0131	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0636	± 0.021	0.02	0.00952		None	SA	HASL 300
	Uranium-235	pCi/g	−0.0147	± 0.0602	0.0954	0.0465	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.845	± 0.428	0.264	0.129		None	SA	HASL 300
S-77	Actinium-228	pCi/g	1.03	± 0.165	0.0846	0.0398		None	SA	HASL 300
	Americium-241	pCi/g	0.00881	± 0.0443	0.0782	0.0381	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.296	± 0.044	0.0241	0.0115		None	SA	HASL 300
	Uranium-235	pCi/g	0.0419	± 0.12	0.12	0.0582	U	BD	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-77	Uranium-238	pCi/g	1.29	± 1	0.685	0.334		J	SA	HASL 300
S-86	Actinium-228	pCi/g	1.03	± 0.164	0.0901	0.0427		None	SA	HASL 300
	Americium-241	pCi/g	0.0237	± 0.0449	0.0705	0.0345	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0516	± 0.0314	0.0266	0.0128		J	SA	HASL 300
	Uranium-235	pCi/g	0.111	± 0.137	0.133	0.0647	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.612	± 0.945	0.637	0.312	U	BD	SA	HASL 300
S-90	Actinium-228	pCi/g	0.653	± 0.14	0.0848	0.0397		None	SA	HASL 300
	Americium-241	pCi/g	0.0187	± 0.053	0.0933	0.0453	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.226	± 0.0407	0.0212	0.01		None	SA	HASL 300
	Tritium	pCi/L	251	± 102	133	59.7		J	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0938	± 0.124	0.107	0.0519	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.729	± 0.809	0.744	0.362	U	BD	SA	HASL 300
S-92	Actinium-228	pCi/g	0.887	± 0.141	0.0719	0.0337		None	SA	HASL 300
	Americium-241	pCi/g	−0.0013	± 0.0511	0.0921	0.0448	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.141	± 0.0283	0.0229	0.0109		None	SA	HASL 300
	Tritium	pCi/L	227	± 96.8	128	57.6		J	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0101	± 0.0695	0.116	0.0565	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.801	± 1.12	0.793	0.387	X	R	SA	HASL 300

[a] Blank cells indicate that the lab did not qualify the data.

DU = duplicate sample
SA = sample

Laboratory Data Qualifier
U = The analyte was absent or below the method detection limit.
X = The data was rejected due to the peak not meeting identification criteria.

Data Validation Qualifier
BD = The associated value was below the detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J = The associated numerical value was an estimated quantity.
None = There was no data validation for corrected gross alpha activity.
R = The data are unusable and rejected (compound may or may not be present).

Table B-2. Radiological results in sediment, 2021

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
C-8	Actinium-228	pCi/g	0.861	± 0.17	0.0951	0.045		None	SA	HASL 300
	Americium-241	pCi/g	0.00437	± 0.0124	0.0238	0.0116	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0545	± 0.0233	0.0222	0.0105		J	SA	HASL 300
	Tritium	pCi/L	38.1	± 115	207	93	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	−0.0189	± 0.0529	0.0848	0.0414	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.813	± 0.389	0.242	0.118		None	SA	HASL 300
C-68	Actinium-228	pCi/g	0.616	± 0.148	0.0885	0.0415		None	SA	HASL 300
	Americium-241	pCi/g	0.00864	± 0.0427	0.0662	0.0323	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0546	± 0.0305	0.0239	0.0113	X	R	SA	HASL 300
	Tritium	pCi/L	96.8	± 123	207	93.3	U	BD	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0604	± 0.139	0.131	0.0637	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.543	± 0.701	0.611	0.298	U	BD	SA	HASL 300
P-60	Actinium-228	pCi/g	0.711	± 0.146	0.0913	0.0425		None	SA	HASL 300
	Americium-241	pCi/g	0.0412	± 0.0496	0.0869	0.042	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.00477	± 0.0137	0.0233	0.0109	U	BD	SA	HASL 300
	Tritium	pCi/L	522	± 159	179	81.6		J	SA	GL-RAD-A-002
	Uranium-235	pCi/g	0.0895	± 0.13	0.117	0.0563	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.916	± 0.966	0.711	0.344	X	R	SA	HASL 300
P-73	Actinium-228	pCi/g	1.4	± 0.233	0.0972	0.0453		None	SA	HASL 300
	Americium-241	pCi/g	0.0227	± 0.0564	0.112	0.0541	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0141	± 0.0172	0.0282	0.0134	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.261	± 0.231	0.142	0.0687	X	R	SA	HASL 300
	Uranium-238	pCi/g	0.354	± 1.07	0.966	0.47	U	BD	SA	HASL 300
S-72	Actinium-228	pCi/g	0.859	± 0.168	0.111	0.0519		None	SA	HASL 300
	Americium-241	pCi/g	−0.00081	± 0.0231	0.0388	0.019	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0308	± 0.0319	0.0323	0.0154	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.0214	± 0.138	0.129	0.0625	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.621	± 0.598	0.384	0.188		J	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-74	Actinium-228	pCi/g	1.03	± 0.188	0.0958	0.0447		None	SA	HASL 300
	Actinium-228	pCi/g	1.01	± 0.21	0.0915	0.0437		None	DU	HASL 300
	Actinium-228	pCi/g	1.22	± 0.201	0.0772	0.0365		None	DU	HASL 300
	Americium-241	pCi/g	−0.0517	± 0.0682	0.114	0.0551	U	BD	SA	HASL 300
	Americium-241	pCi/g	0.0258	± 0.0412	0.0597	0.0293	U	BD	DU	HASL 300
	Americium-241	pCi/g	−0.034	± 0.0457	0.0671	0.0328	U	BD	DU	HASL 300
	Cesium-137	pCi/g	0.0114	± 0.0175	0.0282	0.0134	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.00701	± 0.0204	0.0261	0.0126	U	BD	DU	HASL 300
	Cesium-137	pCi/g	0.00763	± 0.0133	0.0209	0.01	U	BD	DU	HASL 300
	Uranium-235	pCi/g	0.106	± 0.181	0.136	0.066	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.193	± 0.108	0.115	0.0562		J	DU	HASL 300
	Uranium-235	pCi/g	0.0414	± 0.0582	0.0995	0.0486	U	BD	DU	HASL 300
	Uranium-238	pCi/g	1.34	± 1.32	0.975	0.473		J	SA	HASL 300
	Uranium-238	pCi/g	0.784	± 0.762	0.532	0.261		J	DU	HASL 300
	Uranium-238	pCi/g	0.728	± 0.648	0.571	0.279		J	DU	HASL 300
S-75	Actinium-228	pCi/g	0.6	± 0.181	0.107	0.0506		None	SA	HASL 300
	Americium-241	pCi/g	0.0549	± 0.0761	0.119	0.0583	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.0658	± 0.0325	0.0286	0.0137		J	SA	HASL 300
	Uranium-235	pCi/g	−0.0444	± 0.11	0.14	0.0686	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.07	± 1.24	0.979	0.479	X	R	SA	HASL 300
S-85	Actinium-228	pCi/g	0.716	± 0.138	0.0984	0.045		None	SA	HASL 300
	Americium-241	pCi/g	0.00157	± 0.0137	0.028	0.0136	U	BD	SA	HASL 300
	Cesium-137	pCi/g	−0.014	± 0.0187	0.0287	0.0134	U	BD	SA	HASL 300
	Uranium-235	pCi/g	0.03	± 0.108	0.1	0.0484	U	BD	SA	HASL 300
	Uranium-238	pCi/g	0.753	± 0.462	0.275	0.133		J	SA	HASL 300

Location	Analyte	Units	Activity	Total Propagated Uncertainty	Minimum Detectable Activity	Critical Level	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-91	Actinium-228	pCi/g	1.22	± 0.215	0.0946	0.0439		None	SA	HASL 300
	Americium-241	pCi/g	0.0204	± 0.119	0.224	0.109	U	BD	SA	HASL 300
	Cesium-137	pCi/g	0.178	± 0.041	0.028	0.0132		None	SA	HASL 300
	Uranium-235	pCi/g	0.0235	± 0.178	0.166	0.0809	U	BD	SA	HASL 300
	Uranium-238	pCi/g	1.1	± 2.01	1.67	0.812	U	BD	SA	HASL 300

[a] Blank cells indicate that the lab did not qualify the data.

DU = duplicate sample
SA = sample

Laboratory Data Qualifier
U = The analyte was absent or below the method detection limit.
X = The data was rejected due to the peak not meeting identification criteria.

Data Validation Qualifier
BD = The associated value was below the detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J = The associated numerical value was an estimated quantity.
None = There was no data validation for corrected gross alpha activity.
R = The data are unusable and rejected (compound may or may not be present).

Table B-3. Dosimeter measurements, 2021

Location Number	1st Quarter (91 Days)		2nd Quarter (99 Days)		3rd Quarter (82 Days)		4th Quarter (92 Days)	
	Gross Exposure (ambient dose mrem)	Net Exposure (ambient dose mrem)	Gross Exposure (ambient dose mrem)	Net Exposure (ambient dose mrem)	Gross Exposure (ambient dose mrem)	Net Exposure (ambient dose mrem)	Gross Exposure (ambient dose mrem)	Net Exposure (ambient dose mrem)
C-10	43.2	19.3	45	21	37.9	17.2	44.8	18.9
C-21	40.9	17	44	20.1	37.5	16.8	42.5	16.5
C-22	40.4	16.5	40.4	16.4	32.8	12.1	40.5	14.5
C-23	34.4	10.5	38.1	14.1	28.6	7.9	36.1	10.2
C-25	35.4	11.5	37.8	13.9	32.3	11.6	36	10.1
C-26	40.4	16.5	42.9	18.9	35.8	15.1	41.1	15.1
C-30	42.4	18.5	41	17.1	36.5	15.8	44.8	18.8
S-1	44.9	21.1	43.3	19.3	38	17.3	40	14
S-6	36.3	12.4	41.9	18	30.8	10.1	39.5	13.5
S-7	36.6	12.7	40.5	16.6	31.7	11	39.2	13.2
S-20	42.8	18.9	42	18	31.7	10.9	46.7	20.7
S-45	40.5	16.6	46	22	33	12.3	40.1	14.2
S-46	42.7	18.8	41.3	17.4	34.4	13.7	43.2	17.2
S-48	42	18.1	45.7	21.7	37.6	16.9	42.9	16.9
P-4	40	16.1	40.8	16.9	33.5	12.8	43.5	17.5
P-5	37.2	13.3	39.7	15.8	32.6	11.9	38.9	12.9
P-16	43	19.1	46.2	22.3	37.9	17.2	46.5	20.5
P-19	39	15.1	43.3	19.4	35.7	15	43.3	17.3
P-39	39	15.2	41.3	17.4	32.5	11.8	41.9	16
P-40	37.8	13.9	40.6	16.7	34.5	13.8	40.2	14.2
P-81	39.7	15.8	41	17.1	36.1	15.4	39.5	13.5

Table B-4. Nonradiological results in soil, 2021

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
C-9	Aluminum	14,100	43.2	94.9		J	SA	SW846 3050B/6020B
	Antimony	0.849	0.328	1.99	J	1.99U	SA	SW846 3050B/6010D
	Arsenic	3.95	0.321	0.949		None	SA	SW846 3050B/6020B
	Beryllium	0.538	0.019	0.0949		None	SA	SW846 3050B/6020B
	Cadmium	0.205	0.019	0.19		None	SA	SW846 3050B/6020B
	Chromium	13	0.19	0.569		None	SA	SW846 3050B/6020B
	Copper	10.3	0.0626	0.38	N	J-	SA	SW846 3050B/6020B
	Iron	13,000	62.6	190		J	SA	SW846 3050B/6020B
	Lead	14.4	0.0949	0.38	N	J	SA	SW846 3050B/6020B
	Magnesium	3,830	1.9	5.69		None	SA	SW846 3050B/6020B
	Nickel	10.8	0.0949	0.38	N	J-	SA	SW846 3050B/6020B
	Selenium	0.696	0.342	0.949	J	None	SA	SW846 3050B/6020B
	Silver	0.0994	0.0994	0.497	U	None	SA	SW846 3050B/6010D
	Thallium	0.133	0.133	0.38	U	None	SA	SW846 3050B/6020B
	Uranium	0.443	0.0125	0.038		None	SA	SW846 3050B/6020B
	Zinc	39.1	0.759	3.8		J	SA	SW846 3050B/6020B
P-4	Aluminum	6,930	4.41	9.69		J	SA	SW846 3050B/6020B
	Antimony	0.472	0.319	1.93	J	1.93U	SA	SW846 3050B/6010D
	Arsenic	2.07	0.328	0.969		None	SA	SW846 3050B/6020B
	Beryllium	0.297	0.0194	0.0969		None	SA	SW846 3050B/6020B
	Cadmium	0.16	0.0194	0.194	J	None	SA	SW846 3050B/6020B
	Chromium	6.6	0.194	0.581		None	SA	SW846 3050B/6020B
	Copper	4.94	0.064	0.388	N	J-	SA	SW846 3050B/6020B
	Iron	6,930	6.4	19.4		J	SA	SW846 3050B/6020B
	Lead	7.59	0.0969	0.388	N	J	SA	SW846 3050B/6020B
	Magnesium	2,420	1.94	5.81		None	SA	SW846 3050B/6020B
	Nickel	5.75	0.0969	0.388	N	J-	SA	SW846 3050B/6020B
	Selenium	0.532	0.349	0.969	J	None	SA	SW846 3050B/6020B
	Silver	0.0965	0.0965	0.483	U	None	SA	SW846 3050B/6010D
	Thallium	0.136	0.136	0.388	U	None	SA	SW846 3050B/6020B

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
P-4	Uranium	0.302	0.0128	0.0388		None	SA	SW846 3050B/6020B
	Zinc	21.6	0.775	3.88		J	SA	SW846 3050B/6020B
P-5	Aluminum	5,290	4.12	9.06		J	SA	SW846 3050B/6020B
	Antimony	0.32	0.32	1.94	U	None	SA	SW846 3050B/6010D
	Arsenic	1.41	0.306	0.906		None	SA	SW846 3050B/6020B
	Beryllium	0.243	0.0181	0.0906		None	SA	SW846 3050B/6020B
	Cadmium	0.104	0.0181	0.181	J	None	SA	SW846 3050B/6020B
	Chromium	4.72	0.181	0.543		None	SA	SW846 3050B/6020B
	Copper	3.99	0.0598	0.362	N	J-	SA	SW846 3050B/6020B
	Iron	5,230	5.98	18.1		J	SA	SW846 3050B/6020B
	Lead	6.47	0.0906	0.362	N	J	SA	SW846 3050B/6020B
	Magnesium	1,420	1.81	5.43		None	SA	SW846 3050B/6020B
	Nickel	4.02	0.0906	0.362	N	J-	SA	SW846 3050B/6020B
	Selenium	0.376	0.326	0.906	J	None	SA	SW846 3050B/6020B
	Silver	0.0971	0.0971	0.485	U	None	SA	SW846 3050B/6010D
	Thallium	0.127	0.127	0.362	U	None	SA	SW846 3050B/6020B
	Uranium	0.228	0.012	0.0362		None	SA	SW846 3050B/6020B
	Zinc	17.9	0.725	3.62		J	SA	SW846 3050B/6020B
P-16	Aluminum	12,200	21.8	47.9		J	SA	SW846 3050B/6020B
	Antimony	0.648	0.307	1.86	J	None	SA	SW846 3050B/6010D
	Arsenic	2.57	0.324	0.958		None	SA	SW846 3050B/6020B
	Beryllium	0.582	0.0192	0.0958		None	SA	SW846 3050B/6020B
	Cadmium	0.125	0.0192	0.192	J	None	SA	SW846 3050B/6020B
	Chromium	8.08	0.192	0.575		None	SA	SW846 3050B/6020B
	Copper	13.8	0.0632	0.383	N	J	SA	SW846 3050B/6020B
	Iron	15,000	31.6	95.8		J	SA	SW846 3050B/6020B
	Lead	10.6	0.0958	0.383		None	SA	SW846 3050B/6020B
	Magnesium	4,670	1.92	5.75		J	SA	SW846 3050B/6020B
	Nickel	8.65	0.0958	0.383		J	SA	SW846 3050B/6020B
	Selenium	1.9	0.345	0.958		None	SA	SW846 3050B/6020B
	Silver	0.929	0.929	4.65	U	None	SA	SW846 3050B/6010D

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
P-16	Thallium	0.169	0.134	0.383	J	None	SA	SW846 3050B/6020B
	Uranium	0.714	0.0126	0.0383		None	SA	SW846 3050B/6020B
	Zinc	43.9	0.766	3.83		J	SA	SW846 3050B/6020B
P-19	Aluminum	11,300	22.3	48.9		J	SA	SW846 3050B/6020B
	Antimony	0.308	0.308	1.87	U	1.87UJ	SA	SW846 3050B/6010D
	Arsenic	3.16	0.331	0.978		None	SA	SW846 3050B/6020B
	Beryllium	0.495	0.0196	0.0978		None	SA	SW846 3050B/6020B
	Cadmium	0.178	0.0196	0.196	J	None	SA	SW846 3050B/6020B
	Chromium	15.5	0.196	0.587	N	J	SA	SW846 3050B/6020B
	Copper	12.5	0.0646	0.391		J	SA	SW846 3050B/6020B
	Iron	12,200	32.3	97.8		J	SA	SW846 3050B/6020B
	Lead	46.3	0.0978	0.391		None	SA	SW846 3050B/6020B
	Magnesium	4,550	1.96	5.87		J	SA	SW846 3050B/6020B
	Nickel	14.8	0.0978	0.391		None	SA	SW846 3050B/6020B
	Selenium	1.43	0.352	0.978	N	J	SA	SW846 3050B/6020B
	Silver	0.0935	0.0935	0.467	U	None	SA	SW846 3050B/6010D
	Thallium	0.149	0.137	0.391	J	None	SA	SW846 3050B/6020B
	Uranium	1.12	0.0129	0.0391		None	SA	SW846 3050B/6020B
	Zinc	41.9	0.783	3.91		J	SA	SW846 3050B/6020B
P-58	Aluminum	9,270	4.47	9.82		J	SA	SW846 3050B/6020B
	Antimony	0.352	0.302	1.83	J	1.83U	SA	SW846 3050B/6010D
	Arsenic	3.37	0.332	0.982		None	SA	SW846 3050B/6020B
	Beryllium	0.393	0.0196	0.0982		None	SA	SW846 3050B/6020B
	Cadmium	0.295	0.0196	0.196		None	SA	SW846 3050B/6020B
	Chromium	8.79	0.196	0.589		None	SA	SW846 3050B/6020B
	Copper	8.83	0.0648	0.393	N	J-	SA	SW846 3050B/6020B
	Iron	10,500	64.8	196		J	SA	SW846 3050B/6020B
	Lead	12.6	0.0982	0.393	N	J	SA	SW846 3050B/6020B
	Magnesium	4,450	1.96	5.89		None	SA	SW846 3050B/6020B
	Nickel	7.96	0.0982	0.393	N	J-	SA	SW846 3050B/6020B
	Selenium	0.632	0.354	0.982	J	None	SA	SW846 3050B/6020B

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
P-58	Silver	0.0914	0.0914	0.457	U	None	SA	SW846 3050B/6010D
	Thallium	0.138	0.138	0.393	U	None	SA	SW846 3050B/6020B
	Uranium	0.684	0.013	0.0393		None	SA	SW846 3050B/6020B
	Zinc	40.9	0.786	3.93		J	SA	SW846 3050B/6020B
P-61	Aluminum	6,390	4.4	9.67		J	SA	SW846 3050B/6020B
	Antimony	1.48	0.328	1.99	J	1.99U	SA	SW846 3050B/6010D
	Arsenic	3.07	0.327	0.967		None	SA	SW846 3050B/6020B
	Beryllium	0.239	0.0193	0.0967		None	SA	SW846 3050B/6020B
	Cadmium	0.172	0.0193	0.193	J	None	SA	SW846 3050B/6020B
	Chromium	4.8	0.193	0.58		None	SA	SW846 3050B/6020B
	Copper	5.58	0.0638	0.387	N	J-	SA	SW846 3050B/6020B
	Iron	5,710	6.38	19.3		J	SA	SW846 3050B/6020B
	Lead	6.07	0.0967	0.387	N	J	SA	SW846 3050B/6020B
	Magnesium	2,640	1.93	5.8		None	SA	SW846 3050B/6020B
	Nickel	4.78	0.0967	0.387	N	J-	SA	SW846 3050B/6020B
	Selenium	0.391	0.348	0.967	J	None	SA	SW846 3050B/6020B
	Silver	0.0994	0.0994	0.497	U	None	SA	SW846 3050B/6010D
	Thallium	0.135	0.135	0.387	U	None	SA	SW846 3050B/6020B
	Uranium	0.421	0.0128	0.0387		None	SA	SW846 3050B/6020B
	Zinc	23.7	0.774	3.87		J	SA	SW846 3050B/6020B
P-63	Aluminum	11,900	21.4	47.1		J	SA	SW846 3050B/6020B
	Antimony	0.308	0.308	1.87	U	1.87UJ	SA	SW846 3050B/6010D
	Arsenic	2.99	0.318	0.942		None	SA	SW846 3050B/6020B
	Beryllium	0.533	0.0188	0.0942		None	SA	SW846 3050B/6020B
	Cadmium	0.21	0.0188	0.188		None	SA	SW846 3050B/6020B
	Chromium	11.5	0.188	0.565	N	J	SA	SW846 3050B/6020B
	Copper	8.21	0.0621	0.377		J	SA	SW846 3050B/6020B
	Iron	12,300	31.1	94.2		J	SA	SW846 3050B/6020B
	Lead	11	0.0942	0.377		None	SA	SW846 3050B/6020B
	Magnesium	3,610	1.88	5.65		J	SA	SW846 3050B/6020B
	Nickel	10.1	0.0942	0.377		None	SA	SW846 3050B/6020B

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
P-63	Selenium	1.31	0.339	0.942	N	J	SA	SW846 3050B/6020B
	Silver	0.0935	0.0935	0.467	U	0.467UJ	SA	SW846 3050B/6010D
	Thallium	0.132	0.132	0.377	U	None	SA	SW846 3050B/6020B
	Uranium	0.569	0.0124	0.0377		None	SA	SW846 3050B/6020B
	Zinc	31.2	0.753	3.77		J	SA	SW846 3050B/6020B
P-64	Aluminum	9,440	4.39	9.65	*	None	SA	SW846 3050B/6020B
	Aluminum	12,100	21.5	47.3	*	None	DU	SW846 3050B/6020B
	Aluminum	15,100	21.3	46.9	*	None	DU	SW846 3050B/6020B
	Antimony	0.299	0.299	1.81	U	None	SA	SW846 3050B/6010D
	Antimony	0.328	0.328	1.99	U	None	DU	SW846 3050B/6010D
	Antimony	0.619	0.318	1.93	J	None	DU	SW846 3050B/6010D
	Arsenic	2.93	0.326	0.965		None	SA	SW846 3050B/6020B
	Arsenic	2.62	0.32	0.947		None	DU	SW846 3050B/6020B
	Arsenic	3.11	0.317	0.938		None	DU	SW846 3050B/6020B
	Beryllium	0.425	0.0193	0.0965		None	SA	SW846 3050B/6020B
	Beryllium	0.472	0.0189	0.0947		None	DU	SW846 3050B/6020B
	Beryllium	0.565	0.0188	0.0938		None	DU	SW846 3050B/6020B
	Cadmium	0.192	0.0193	0.193	J	None	SA	SW846 3050B/6020B
	Cadmium	0.155	0.0189	0.189	J	None	DU	SW846 3050B/6020B
	Cadmium	0.206	0.0188	0.188		None	DU	SW846 3050B/6020B
	Chromium	6.4	0.193	0.579		None	SA	SW846 3050B/6020B
	Chromium	6.86	0.189	0.568		None	DU	SW846 3050B/6020B
	Chromium	7.99	0.188	0.563		None	DU	SW846 3050B/6020B
	Copper	10.5	0.0637	0.386	*B	J	SA	SW846 3050B/6020B
	Copper	12	0.0625	0.379	*B	J	DU	SW846 3050B/6020B
	Copper	14.8	0.0619	0.375	*B	J	DU	SW846 3050B/6020B
	Iron	18,300	31.9	96.5	*	J	SA	SW846 3050B/6020B
	Iron	20,000	31.3	94.7	*	J	DU	SW846 3050B/6020B
	Iron	28,100	31	93.8	*	J	DU	SW846 3050B/6020B
	Lead	8.05	0.0965	0.386		None	SA	SW846 3050B/6020B
	Lead	9.82	0.0947	0.379		None	DU	SW846 3050B/6020B

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
P-64	Lead	11.2	0.0938	0.375		None	DU	SW846 3050B/6020B
	Magnesium	6,130	1.93	5.79		None	SA	SW846 3050B/6020B
	Magnesium	7,150	1.89	5.68		None	DU	SW846 3050B/6020B
	Magnesium	10,600	9.38	28.1		None	DU	SW846 3050B/6020B
	Nickel	8.92	0.0965	0.386	*	None	SA	SW846 3050B/6020B
	Nickel	8.15	0.0947	0.379	*	None	DU	SW846 3050B/6020B
	Nickel	10.4	0.0938	0.375	*	None	DU	SW846 3050B/6020B
	Selenium	1.91	0.347	0.965		None	SA	SW846 3050B/6020B
	Selenium	1.75	0.341	0.947		None	DU	SW846 3050B/6020B
	Selenium	1.65	0.338	0.938		None	DU	SW846 3050B/6020B
	Silver	0.906	0.906	4.53	U	None	SA	SW846 3050B/6010D
	Silver	0.994	0.994	4.97	U	None	DU	SW846 3050B/6010D
	Silver	0.963	0.963	4.82	U	None	DU	SW846 3050B/6010D
	Thallium	0.135	0.135	0.386	U	None	SA	SW846 3050B/6020B
	Thallium	0.133	0.133	0.379	U	None	DU	SW846 3050B/6020B
	Thallium	0.131	0.131	0.375	U	None	DU	SW846 3050B/6020B
	Uranium	0.794	0.0127	0.0386	*	None	SA	SW846 3050B/6020B
	Uranium	0.7	0.0125	0.0379	*	None	DU	SW846 3050B/6020B
	Uranium	0.908	0.0124	0.0375	*	None	DU	SW846 3050B/6020B
	Zinc	56	0.772	3.86	N	J-	SA	SW846 3050B/6020B
	Zinc	64.9	0.758	3.79	N	J-	DU	SW846 3050B/6020B
	Zinc	85.9	0.75	3.75	N	J-	DU	SW846 3050B/6020B
P-81	Aluminum	9,800	42.8	94.2		J	SA	SW846 3050B/6020B
	Antimony	0.303	0.303	1.83	U	None	SA	SW846 3050B/6010D
	Arsenic	2.26	0.318	0.942		None	SA	SW846 3050B/6020B
	Beryllium	0.494	0.0188	0.0942		J-	SA	SW846 3050B/6020B
	Cadmium	0.119	0.0188	0.188	J	None	SA	SW846 3050B/6020B
	Chromium	8.5	0.188	0.565		J-	SA	SW846 3050B/6020B
	Copper	7.83	0.0621	0.377	N	J-	SA	SW846 3050B/6020B
	Iron	9,760	62.1	188		J	SA	SW846 3050B/6020B
	Lead	9.23	0.0942	0.377	N	J	SA	SW846 3050B/6020B

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
P-81	Magnesium	2,560	1.88	5.65		None	SA	SW846 3050B/6020B
	Nickel	7.86	0.0942	0.377	N	J-	SA	SW846 3050B/6020B
	Selenium	0.574	0.339	0.942	J	None	SA	SW846 3050B/6020B
	Silver	0.0917	0.0917	0.459	U	None	SA	SW846 3050B/6010D
	Thallium	0.132	0.132	0.377	U	None	SA	SW846 3050B/6020B
	Uranium	0.379	0.0124	0.0377		None	SA	SW846 3050B/6020B
	Zinc	26.6	0.753	3.77		J	SA	SW846 3050B/6020B
P-82	Aluminum	8,330	4.49	9.86		J	SA	SW846 3050B/6020B
	Antimony	1.25	0.315	1.91	J	1.91UJ	SA	SW846 3050B/6010D
	Arsenic	4.51	0.333	0.986		None	SA	SW846 3050B/6020B
	Beryllium	0.38	0.0197	0.0986		None	SA	SW846 3050B/6020B
	Cadmium	0.334	0.0197	0.197		None	SA	SW846 3050B/6020B
	Chromium	7.79	0.197	0.592		None	SA	SW846 3050B/6020B
	Copper	11.2	0.0651	0.394	N	J-	SA	SW846 3050B/6020B
	Iron	9,020	6.51	19.7		J	SA	SW846 3050B/6020B
	Lead	51.2	0.0986	0.394	N	J	SA	SW846 3050B/6020B
	Magnesium	3,980	1.97	5.92		None	SA	SW846 3050B/6020B
	Nickel	7.52	0.0986	0.394	N	J-	SA	SW846 3050B/6020B
	Selenium	0.699	0.355	0.986	J	None	SA	SW846 3050B/6020B
	Silver	0.648	0.478	2.39	J	None	SA	SW846 3050B/6010D
	Thallium	0.138	0.138	0.394	U	None	SA	SW846 3050B/6020B
	Uranium	0.905	0.013	0.0394		None	SA	SW846 3050B/6020B
	Zinc	47.5	0.789	3.94		J	SA	SW846 3050B/6020B
P-95	Aluminum	7,780	4.37	9.6		J	SA	SW846 3050B/6020B
	Antimony	0.745	0.325	1.97	J	1.97U	SA	SW846 3050B/6010D
	Arsenic	1.84	0.324	0.96		None	SA	SW846 3050B/6020B
	Beryllium	0.344	0.0192	0.096		None	SA	SW846 3050B/6020B
	Cadmium	0.161	0.0192	0.192	J	None	SA	SW846 3050B/6020B
	Chromium	7.31	0.192	0.576		None	SA	SW846 3050B/6020B
	Copper	5.95	0.0633	0.384	N	J-	SA	SW846 3050B/6020B
	Iron	7,460	6.33	19.2		J	SA	SW846 3050B/6020B

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
P-95	Lead	9.57	0.096	0.384	N	J	SA	SW846 3050B/6020B
	Magnesium	2,540	1.92	5.76		None	SA	SW846 3050B/6020B
	Nickel	6.18	0.096	0.384	N	J-	SA	SW846 3050B/6020B
	Selenium	0.439	0.345	0.96	J	None	SA	SW846 3050B/6020B
	Silver	0.0986	0.0986	0.493	U	None	SA	SW846 3050B/6010D
	Thallium	0.134	0.134	0.384	U	None	SA	SW846 3050B/6020B
	Uranium	0.292	0.0127	0.0384		None	SA	SW846 3050B/6020B
	Zinc	25	0.768	3.84		J	SA	SW846 3050B/6020B
S-1	Aluminum	8,950	4.31	9.47		J	SA	SW846 3050B/6020B
	Antimony	1.09	0.315	1.91	J	1.91U	SA	SW846 3050B/6010D
	Arsenic	2.42	0.32	0.947		None	SA	SW846 3050B/6020B
	Beryllium	0.412	0.0189	0.0947		None	SA	SW846 3050B/6020B
	Cadmium	0.193	0.0189	0.189		None	SA	SW846 3050B/6020B
	Chromium	8.76	0.189	0.568		None	SA	SW846 3050B/6020B
	Copper	9.32	0.0625	0.379	N	J-	SA	SW846 3050B/6020B
	Iron	12,300	62.5	189		J	SA	SW846 3050B/6020B
	Lead	10.7	0.0947	0.379	N	J	SA	SW846 3050B/6020B
	Magnesium	4,250	1.89	5.68		None	SA	SW846 3050B/6020B
	Nickel	8.68	0.0947	0.379	N	J-	SA	SW846 3050B/6020B
	Selenium	0.775	0.341	0.947	J	None	SA	SW846 3050B/6020B
	Silver	0.478	0.478	2.39	U	None	SA	SW846 3050B/6010D
	Thallium	0.15	0.133	0.379	J	None	SA	SW846 3050B/6020B
	Uranium	0.669	0.0125	0.0379		None	SA	SW846 3050B/6020B
	Zinc	41.8	0.758	3.79		J	SA	SW846 3050B/6020B
S-6	Aluminum	6,310	4.43	9.73		J	SA	SW846 3050B/6020B
	Antimony	0.764	0.31	1.88	J	None	SA	SW846 3050B/6010D
	Arsenic	2.12	0.329	0.973		None	SA	SW846 3050B/6020B
	Beryllium	0.273	0.0195	0.0973		None	SA	SW846 3050B/6020B
	Cadmium	0.131	0.0195	0.195	J	None	SA	SW846 3050B/6020B
	Chromium	5.58	0.195	0.584		None	SA	SW846 3050B/6020B
	Copper	13.8	0.0642	0.389	N	J	SA	SW846 3050B/6020B

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-6	Iron	6,120	6.42	19.5		J	SA	SW846 3050B/6020B
	Lead	5.42	0.0973	0.389		None	SA	SW846 3050B/6020B
	Magnesium	2,010	1.95	5.84		J	SA	SW846 3050B/6020B
	Nickel	8.33	0.0973	0.389		J	SA	SW846 3050B/6020B
	Selenium	0.669	0.35	0.973	J	None	SA	SW846 3050B/6020B
	Silver	0.52	0.094	0.47		None	SA	SW846 3050B/6010D
	Thallium	0.136	0.136	0.389	U	None	SA	SW846 3050B/6020B
	Uranium	0.336	0.0128	0.0389		None	SA	SW846 3050B/6020B
	Zinc	28.5	0.778	3.89		J	SA	SW846 3050B/6020B
S-33	Aluminum	11,100	20.5	45	*	None	SA	SW846 3050B/6020B
	Aluminum	11,700	21.5	47.3	*	None	DU	SW846 3050B/6020B
	Aluminum	7,900	4.18	9.19	*	None	DU	SW846 3050B/6020B
	Antimony	2.14	1.53	9.26	J	None	SA	SW846 3050B/6010D
	Antimony	1.65	1.6	9.71	J	None	DU	SW846 3050B/6010D
	Antimony	3.53	1.51	9.17	J	None	DU	SW846 3050B/6010D
	Arsenic	4.61	0.305	0.901		None	SA	SW846 3050B/6020B
	Arsenic	4.56	0.319	0.945		None	DU	SW846 3050B/6020B
	Arsenic	4.32	0.311	0.919		None	DU	SW846 3050B/6020B
	Beryllium	0.693	0.018	0.0901		None	SA	SW846 3050B/6020B
	Beryllium	0.76	0.0189	0.0945		None	DU	SW846 3050B/6020B
	Beryllium	0.72	0.0184	0.0919		None	DU	SW846 3050B/6020B
	Cadmium	0.314	0.018	0.18		None	SA	SW846 3050B/6020B
	Cadmium	0.375	0.0189	0.189		None	DU	SW846 3050B/6020B
	Cadmium	0.233	0.0184	0.184		None	DU	SW846 3050B/6020B
	Chromium	11.1	0.18	0.541		None	SA	SW846 3050B/6020B
	Chromium	12	0.189	0.567		None	DU	SW846 3050B/6020B
	Chromium	8.87	0.184	0.551		None	DU	SW846 3050B/6020B
	Copper	11.2	0.0595	0.36	*B	J	SA	SW846 3050B/6020B
	Copper	11.8	0.0624	0.378	*B	J	DU	SW846 3050B/6020B
	Copper	9.05	0.0607	0.368	*B	J	DU	SW846 3050B/6020B
	Iron	11,100	29.7	90.1	*	J	SA	SW846 3050B/6020B

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-33	Iron	11,400	31.2	94.5	*	J	DU	SW846 3050B/6020B
	Iron	8,420	6.07	18.4	*	J	DU	SW846 3050B/6020B
	Lead	14	0.0901	0.36		None	SA	SW846 3050B/6020B
	Lead	13.7	0.0945	0.378		None	DU	SW846 3050B/6020B
	Lead	11.1	0.0919	0.368		None	DU	SW846 3050B/6020B
	Magnesium	4,430	1.8	5.41		None	SA	SW846 3050B/6020B
	Magnesium	4,560	1.89	5.67		None	DU	SW846 3050B/6020B
	Magnesium	3,520	1.84	5.51		None	DU	SW846 3050B/6020B
	Nickel	11.1	0.0901	0.36	*	None	SA	SW846 3050B/6020B
	Nickel	11.5	0.0945	0.378	*	None	DU	SW846 3050B/6020B
	Nickel	8.95	0.0919	0.368	*	None	DU	SW846 3050B/6020B
	Selenium	0.791	0.324	0.901	J	None	SA	SW846 3050B/6020B
	Selenium	0.893	0.34	0.945	J	None	DU	SW846 3050B/6020B
	Selenium	0.592	0.331	0.919	J	None	DU	SW846 3050B/6020B
	Silver	0.938	0.463	2.31	J	None	SA	SW846 3050B/6010D
	Silver	1.31	0.485	2.43	J	None	DU	SW846 3050B/6010D
	Silver	1.06	0.459	2.29	J	None	DU	SW846 3050B/6010D
	Thallium	0.154	0.126	0.36	J	None	SA	SW846 3050B/6020B
	Thallium	0.157	0.132	0.378	J	None	DU	SW846 3050B/6020B
	Thallium	0.129	0.129	0.368	U	None	DU	SW846 3050B/6020B
	Uranium	0.78	0.0119	0.036	*	None	SA	SW846 3050B/6020B
	Uranium	0.779	0.0125	0.0378	*	None	DU	SW846 3050B/6020B
	Uranium	0.651	0.0121	0.0368	*	None	DU	SW846 3050B/6020B
	Zinc	53.3	0.721	3.6	N	J-	SA	SW846 3050B/6020B
	Zinc	48	0.756	3.78	N	J-	DU	SW846 3050B/6020B
	Zinc	36.3	0.735	3.68	N	J-	DU	SW846 3050B/6020B
S-34	Aluminum	14,000	22.2	48.8		J	SA	SW846 3050B/6020B
	Antimony	0.833	0.328	1.99	J	None	SA	SW846 3050B/6010D
	Arsenic	5.41	0.33	0.977		None	SA	SW846 3050B/6020B
	Beryllium	0.668	0.0195	0.0977		None	SA	SW846 3050B/6020B
	Cadmium	0.2	0.0195	0.195		None	SA	SW846 3050B/6020B

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-34	Chromium	15.7	0.195	0.586		None	SA	SW846 3050B/6020B
	Copper	9.83	0.0645	0.391	N	J	SA	SW846 3050B/6020B
	Iron	15,500	32.2	97.7		J	SA	SW846 3050B/6020B
	Lead	12.1	0.0977	0.391		None	SA	SW846 3050B/6020B
	Magnesium	3,600	1.95	5.86		J	SA	SW846 3050B/6020B
	Nickel	14.2	0.0977	0.391		J	SA	SW846 3050B/6020B
	Selenium	1.41	0.352	0.977		None	SA	SW846 3050B/6020B
	Silver	0.994	0.994	4.97	U	None	SA	SW846 3050B/6010D
	Thallium	0.155	0.137	0.391	J	None	SA	SW846 3050B/6020B
	Uranium	0.635	0.0129	0.0391		None	SA	SW846 3050B/6020B
	Zinc	42.7	0.781	3.91		J	SA	SW846 3050B/6020B
S-45	Aluminum	7,740	4.42	9.71		J	SA	SW846 3050B/6020B
	Antimony	0.356	0.304	1.85	J	None	SA	SW846 3050B/6010D
	Arsenic	2.54	0.328	0.971		None	SA	SW846 3050B/6020B
	Beryllium	0.378	0.0194	0.0971		None	SA	SW846 3050B/6020B
	Cadmium	0.114	0.0194	0.194	J	None	SA	SW846 3050B/6020B
	Chromium	7.11	0.194	0.583		None	SA	SW846 3050B/6020B
	Copper	6.41	0.0641	0.388	N	J	SA	SW846 3050B/6020B
	Iron	7,300	6.41	19.4		J	SA	SW846 3050B/6020B
	Lead	7	0.0971	0.388		None	SA	SW846 3050B/6020B
	Magnesium	2,770	1.94	5.83		J	SA	SW846 3050B/6020B
	Nickel	6.45	0.0971	0.388		J	SA	SW846 3050B/6020B
	Selenium	0.798	0.35	0.971	J	None	SA	SW846 3050B/6020B
	Silver	0.0923	0.0923	0.461	U	None	SA	SW846 3050B/6010D
	Thallium	0.136	0.136	0.388	U	None	SA	SW846 3050B/6020B
	Uranium	0.347	0.0128	0.0388		None	SA	SW846 3050B/6020B
	Zinc	25.5	0.777	3.88		J	SA	SW846 3050B/6020B
S-51	Aluminum	7,400	4.31	9.47		J	SA	SW846 3050B/6020B
	Antimony	0.296	0.296	1.8	U	1.80UJ	SA	SW846 3050B/6010D
	Arsenic	2.06	0.32	0.947		None	SA	SW846 3050B/6020B
	Beryllium	0.419	0.0189	0.0947		None	SA	SW846 3050B/6020B

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-51	Cadmium	0.112	0.0189	0.189	J	None	SA	SW846 3050B/6020B
	Chromium	45	0.189	0.568	N	J	SA	SW846 3050B/6020B
	Copper	8.12	0.0625	0.379		J	SA	SW846 3050B/6020B
	Iron	7,190	6.25	18.9		J	SA	SW846 3050B/6020B
	Lead	10.2	0.0947	0.379		None	SA	SW846 3050B/6020B
	Magnesium	2,540	1.89	5.68		J	SA	SW846 3050B/6020B
	Nickel	6.17	0.0947	0.379		None	SA	SW846 3050B/6020B
	Selenium	1.01	0.341	0.947	N	J	SA	SW846 3050B/6020B
	Silver	0.0898	0.0898	0.449	U	None	SA	SW846 3050B/6010D
	Thallium	0.133	0.133	0.379	U	None	SA	SW846 3050B/6020B
	Uranium	0.32	0.0125	0.0379		None	SA	SW846 3050B/6020B
	Zinc	69.8	0.758	3.79		J	SA	SW846 3050B/6020B
S-53	Aluminum	18,400	22.5	49.4	*	None	SA	SW846 3050B/6020B
	Aluminum	14,800	21.6	47.5	*	None	DU	SW846 3050B/6020B
	Aluminum	16,900	21.8	48	*	None	DU	SW846 3050B/6020B
	Antimony	0.304	0.304	1.85	U	None	SA	SW846 3050B/6010D
	Antimony	0.876	0.296	1.8	J	None	DU	SW846 3050B/6010D
	Antimony	0.325	0.325	1.97	U	None	DU	SW846 3050B/6010D
	Arsenic	3.71	0.334	0.988		None	SA	SW846 3050B/6020B
	Arsenic	3.3	0.321	0.951		None	DU	SW846 3050B/6020B
	Arsenic	3.73	0.324	0.96		None	DU	SW846 3050B/6020B
	Beryllium	0.695	0.0198	0.0988		None	SA	SW846 3050B/6020B
	Beryllium	0.569	0.019	0.0951		None	DU	SW846 3050B/6020B
	Beryllium	0.639	0.0192	0.096		None	DU	SW846 3050B/6020B
	Cadmium	0.0939	0.0198	0.198	J	None	SA	SW846 3050B/6020B
	Cadmium	0.0888	0.019	0.19	J	None	DU	SW846 3050B/6020B
	Cadmium	0.13	0.0192	0.192	J	None	DU	SW846 3050B/6020B
	Chromium	11.6	0.198	0.593		None	SA	SW846 3050B/6020B
	Chromium	9.65	0.19	0.57		None	DU	SW846 3050B/6020B
	Chromium	11.2	0.192	0.576		None	DU	SW846 3050B/6020B
	Copper	9.03	0.0652	0.395	*B	J	SA	SW846 3050B/6020B

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-53	Copper	7.59	0.0627	0.38	*B	J	DU	SW846 3050B/6020B
	Copper	8.86	0.0633	0.384	*B	J	DU	SW846 3050B/6020B
	Iron	13,100	32.6	98.8	*	J	SA	SW846 3050B/6020B
	Iron	10,900	31.4	95.1	*	J	DU	SW846 3050B/6020B
	Iron	12,600	31.7	96	*	J	DU	SW846 3050B/6020B
	Lead	8.23	0.0988	0.395		None	SA	SW846 3050B/6020B
	Lead	7.33	0.0951	0.38		None	DU	SW846 3050B/6020B
	Lead	8.13	0.096	0.384		None	DU	SW846 3050B/6020B
	Magnesium	3,590	1.98	5.93		None	SA	SW846 3050B/6020B
	Magnesium	3,110	1.9	5.7		None	DU	SW846 3050B/6020B
	Magnesium	3,500	1.92	5.76		None	DU	SW846 3050B/6020B
	Nickel	9.23	0.0988	0.395	*	None	SA	SW846 3050B/6020B
	Nickel	7.58	0.0951	0.38	*	None	DU	SW846 3050B/6020B
	Nickel	8.61	0.096	0.384	*	None	DU	SW846 3050B/6020B
	Selenium	0.701	0.356	0.988	J	None	SA	SW846 3050B/6020B
	Selenium	0.573	0.342	0.951	J	None	DU	SW846 3050B/6020B
	Selenium	0.647	0.345	0.96	J	None	DU	SW846 3050B/6020B
	Silver	0.0923	0.0923	0.461	U	None	SA	SW846 3050B/6010D
	Silver	0.0898	0.0898	0.449	U	None	DU	SW846 3050B/6010D
	Silver	0.0986	0.0986	0.493	U	None	DU	SW846 3050B/6010D
	Thallium	0.149	0.138	0.395	J	None	SA	SW846 3050B/6020B
	Thallium	0.133	0.133	0.38	U	None	DU	SW846 3050B/6020B
	Thallium	0.137	0.134	0.384	J	None	DU	SW846 3050B/6020B
	Uranium	0.419	0.013	0.0395	*	None	SA	SW846 3050B/6020B
	Uranium	0.347	0.0125	0.038	*	None	DU	SW846 3050B/6020B
	Uranium	0.382	0.0127	0.0384	*	None	DU	SW846 3050B/6020B
	Zinc	31.1	0.791	3.95	N	J-	SA	SW846 3050B/6020B
	Zinc	26.1	0.76	3.8	N	J-	DU	SW846 3050B/6020B
	Zinc	29.4	0.768	3.84	N	J-	DU	SW846 3050B/6020B

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-55	Aluminum	9,350	4.4	9.67		J	SA	SW846 3050B/6020B
	Antimony	1.01	0.328	1.99	J	1.99U	SA	SW846 3050B/6010D
	Arsenic	2.61	0.327	0.967		None	SA	SW846 3050B/6020B
	Beryllium	0.368	0.0193	0.0967		None	SA	SW846 3050B/6020B
	Cadmium	0.16	0.0193	0.193	J	None	SA	SW846 3050B/6020B
	Chromium	6.98	0.193	0.58		None	SA	SW846 3050B/6020B
	Copper	6.11	0.0638	0.387	N	J-	SA	SW846 3050B/6020B
	Iron	8,100	6.38	19.3		J	SA	SW846 3050B/6020B
	Lead	9.06	0.0967	0.387	N	J	SA	SW846 3050B/6020B
	Magnesium	2,800	1.93	5.8		None	SA	SW846 3050B/6020B
	Nickel	6.18	0.0967	0.387	N	J-	SA	SW846 3050B/6020B
	Selenium	0.584	0.348	0.967	J	None	SA	SW846 3050B/6020B
	Silver	0.0994	0.0994	0.497	U	None	SA	SW846 3050B/6010D
	Thallium	0.135	0.135	0.387	U	None	SA	SW846 3050B/6020B
	Uranium	0.415	0.0128	0.0387		None	SA	SW846 3050B/6020B
	Zinc	27.7	0.774	3.87		J	SA	SW846 3050B/6020B
S-57	Aluminum	8,580	4.45	9.78		J	SA	SW846 3050B/6020B
	Antimony	1.01	0.324	1.96	J	1.96UJ	SA	SW846 3050B/6010D
	Arsenic	4	0.331	0.978		None	SA	SW846 3050B/6020B
	Beryllium	0.313	0.0196	0.0978		None	SA	SW846 3050B/6020B
	Cadmium	0.144	0.0196	0.196	J	None	SA	SW846 3050B/6020B
	Chromium	6.51	0.196	0.587		None	SA	SW846 3050B/6020B
	Copper	6.25	0.0646	0.391	N	J-	SA	SW846 3050B/6020B
	Iron	9,070	6.46	19.6		J	SA	SW846 3050B/6020B
	Lead	6.74	0.0978	0.391	N	J	SA	SW846 3050B/6020B
	Magnesium	4,680	1.96	5.87		None	SA	SW846 3050B/6020B
	Nickel	6.82	0.0978	0.391	N	J-	SA	SW846 3050B/6020B
	Selenium	0.575	0.352	0.978	J	None	SA	SW846 3050B/6020B
	Silver	0.49	0.49	2.45	U	None	SA	SW846 3050B/6010D
	Thallium	0.137	0.137	0.391	U	None	SA	SW846 3050B/6020B
	Uranium	1.17	0.0129	0.0391		None	SA	SW846 3050B/6020B

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-57	Zinc	45.7	0.783	3.91		J	SA	SW846 3050B/6020B
S-90	Aluminum	4,740	4.28	9.4		J	SA	SW846 3050B/6020B
S-90	Antimony	0.313	0.313	1.89	U	1.89UJ	SA	SW846 3050B/6010D
	Arsenic	1.41	0.318	0.94		None	SA	SW846 3050B/6020B
	Beryllium	0.245	0.0188	0.094		None	SA	SW846 3050B/6020B
	Cadmium	0.108	0.0188	0.188	J	None	SA	SW846 3050B/6020B
	Chromium	4.89	0.188	0.564	N	J	SA	SW846 3050B/6020B
	Copper	4.07	0.062	0.376		J	SA	SW846 3050B/6020B
	Iron	5,460	6.2	18.8		J	SA	SW846 3050B/6020B
	Lead	7.07	0.094	0.376		None	SA	SW846 3050B/6020B
	Magnesium	1,380	1.88	5.64		J	SA	SW846 3050B/6020B
	Nickel	3.98	0.094	0.376		None	SA	SW846 3050B/6020B
	Selenium	0.797	0.338	0.94	JN	J	SA	SW846 3050B/6020B
	Silver	0.0947	0.0947	0.473	U	None	SA	SW846 3050B/6010D
	Thallium	0.132	0.132	0.376	U	None	SA	SW846 3050B/6020B
	Uranium	0.237	0.0124	0.0376		None	SA	SW846 3050B/6020B
	Zinc	18.3	0.752	3.76		J	SA	SW846 3050B/6020B
S-92	Aluminum	8,350	4.16	9.14		J	SA	SW846 3050B/6020B
	Antimony	0.313	0.313	1.89	U	1.89UJ	SA	SW846 3050B/6010D
	Arsenic	2.03	0.309	0.914		None	SA	SW846 3050B/6020B
	Beryllium	0.435	0.0183	0.0914		None	SA	SW846 3050B/6020B
	Cadmium	0.134	0.0183	0.183	J	None	SA	SW846 3050B/6020B
	Chromium	7.76	0.183	0.548	N	J	SA	SW846 3050B/6020B
	Copper	7.14	0.0603	0.366		J	SA	SW846 3050B/6020B
	Iron	8,460	6.03	18.3		J	SA	SW846 3050B/6020B
	Lead	8.68	0.0914	0.366		None	SA	SW846 3050B/6020B
	Magnesium	2,190	1.83	5.48		J	SA	SW846 3050B/6020B
	Nickel	7.19	0.0914	0.366		None	SA	SW846 3050B/6020B
	Selenium	1.18	0.329	0.914	N	J	SA	SW846 3050B/6020B
	Silver	0.22	0.0947	0.473	J	None	SA	SW846 3050B/6010D
	Thallium	0.128	0.128	0.366	U	None	SA	SW846 3050B/6020B

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-92	Uranium	0.37	0.0121	0.0366		None	SA	SW846 3050B/6020B
	Zinc	23.5	0.731	3.66		J	SA	SW846 3050B/6020B

[a] Blank cells indicate that the lab did not qualify the data.

DU = duplicate sample
SA = sample

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 negative base.
None = There was no data validation for corrected gross alpha activity.
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.

Table B-5. Nonradiological results in sediment, 2021

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
C-68	Aluminum	6,620	4.38	9.63		J	SA	SW846 3050B/6020B
	Antimony	1.44	0.306	1.85	J	1.85UJ	SA	SW846 3050B/6010D
	Arsenic	4.29	1.63	4.82	J	None	SA	SW846 3050B/6020B
	Beryllium	0.293	0.0193	0.0963		None	SA	SW846 3050B/6020B
	Cadmium	0.211	0.0193	0.193		None	SA	SW846 3050B/6020B
	Chromium	6.66	0.193	0.578		None	SA	SW846 3050B/6020B
	Copper	5.21	0.0636	0.385	N	J-	SA	SW846 3050B/6020B
	Iron	6,140	6.36	19.3		J	SA	SW846 3050B/6020B
	Lead	7.61	0.0963	0.385	N	J	SA	SW846 3050B/6020B
	Magnesium	2,670	1.93	5.78		None	SA	SW846 3050B/6020B
	Nickel	6.89	0.0963	0.385	N	J-	SA	SW846 3050B/6020B
	Selenium	1.73	1.73	4.82	U	None	SA	SW846 3050B/6020B
	Silver	0.463	0.463	2.31	U	None	SA	SW846 3050B/6010D
	Thallium	0.135	0.135	0.385	U	None	SA	SW846 3050B/6020B
	Uranium	1.71	0.0127	0.0385		None	SA	SW846 3050B/6020B
	Zinc	23.4	3.85	19.3		J	SA	SW846 3050B/6020B
P-60	Aluminum	5,500	4.54	9.98		J	SA	SW846 3050B/6020B
	Antimony	1.15	0.322	1.95	J	1.95U	SA	SW846 3050B/6010D
	Arsenic	1.71	0.337	0.998		None	SA	SW846 3050B/6020B
	Beryllium	0.27	0.02	0.0998		None	SA	SW846 3050B/6020B
	Cadmium	0.107	0.02	0.2	J	None	SA	SW846 3050B/6020B
	Chromium	4.56	0.2	0.599		None	SA	SW846 3050B/6020B
	Copper	4.85	0.0659	0.399	N	J-	SA	SW846 3050B/6020B
	Iron	7,230	6.59	20		J	SA	SW846 3050B/6020B
	Lead	5.02	0.0998	0.399	N	J	SA	SW846 3050B/6020B
	Magnesium	2,320	2	5.99		None	SA	SW846 3050B/6020B
	Nickel	6	0.0998	0.399	N	J-	SA	SW846 3050B/6020B
	Selenium	0.453	0.359	0.998	J	None	SA	SW846 3050B/6020B
	Silver	0.0975	0.0975	0.487	U	None	SA	SW846 3050B/6010D
	Thallium	0.14	0.14	0.399	U	None	SA	SW846 3050B/6020B

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
P-60	Uranium	0.516	0.0132	0.0399		None	SA	SW846 3050B/6020B
	Zinc	22.5	0.798	3.99		J	SA	SW846 3050B/6020B
P-73	Aluminum	4,240	4.43	9.75		J	SA	SW846 3050B/6020B
	Antimony	0.62	0.307	1.86	J	None	SA	SW846 3050B/6010D
	Arsenic	1.77	0.329	0.975		None	SA	SW846 3050B/6020B
	Beryllium	0.268	0.0195	0.0975		None	SA	SW846 3050B/6020B
	Cadmium	0.161	0.0195	0.195	J	None	SA	SW846 3050B/6020B
	Chromium	5	0.195	0.585		None	SA	SW846 3050B/6020B
	Copper	7.43	0.0643	0.39	N	J	SA	SW846 3050B/6020B
	Iron	11,300	32.2	97.5		J	SA	SW846 3050B/6020B
	Lead	5.19	0.0975	0.39		None	SA	SW846 3050B/6020B
	Magnesium	2,260	1.95	5.85		J	SA	SW846 3050B/6020B
	Nickel	4.81	0.0975	0.39		J	SA	SW846 3050B/6020B
	Selenium	1.16	0.351	0.975		None	SA	SW846 3050B/6020B
	Silver	0.929	0.929	4.65	U	None	SA	SW846 3050B/6010D
	Thallium	0.136	0.136	0.39	U	None	SA	SW846 3050B/6020B
	Uranium	0.751	0.0129	0.039		None	SA	SW846 3050B/6020B
	Zinc	19.2	0.78	3.9		J	SA	SW846 3050B/6020B
S-72	Aluminum	8,760	4.43	9.73		J	SA	SW846 3050B/6020B
	Antimony	0.768	0.301	1.82	J	None	SA	SW846 3050B/6010D
	Arsenic	3.07	0.329	0.973		None	SA	SW846 3050B/6020B
	Beryllium	0.425	0.0195	0.0973		None	SA	SW846 3050B/6020B
	Cadmium	0.143	0.0195	0.195	J	None	SA	SW846 3050B/6020B
	Chromium	10.3	0.195	0.584		None	SA	SW846 3050B/6020B
	Copper	9.03	0.0642	0.389	N	J	SA	SW846 3050B/6020B
	Iron	10,500	32.1	97.3		J	SA	SW846 3050B/6020B
	Lead	12	0.0973	0.389		None	SA	SW846 3050B/6020B
	Magnesium	3,820	1.95	5.84		J	SA	SW846 3050B/6020B
	Nickel	9.2	0.0973	0.389		J	SA	SW846 3050B/6020B
	Selenium	1.07	0.35	0.973		None	SA	SW846 3050B/6020B
	Silver	0.229	0.0912	0.456	J	None	SA	SW846 3050B/6010D

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-72	Thallium	0.136	0.136	0.389	U	None	SA	SW846 3050B/6020B
	Uranium	0.639	0.0128	0.0389		None	SA	SW846 3050B/6020B
	Zinc	26.4	0.778	3.89		J	SA	SW846 3050B/6020B
S-74	Aluminum	2,680	4.46	9.8	*	None	SA	SW846 3050B/6020B
	Aluminum	3,030	4.11	9.04	*	None	DU	SW846 3050B/6020B
	Aluminum	1,640	4.21	9.26	*	None	DU	SW846 3050B/6020B
	Antimony	0.324	0.324	1.96	U	None	SA	SW846 3050B/6010D
	Antimony	0.573	0.301	1.82	J	None	DU	SW846 3050B/6010D
	Antimony	0.345	0.311	1.88	J	None	DU	SW846 3050B/6010D
	Arsenic	1.01	0.331	0.98		None	SA	SW846 3050B/6020B
	Arsenic	0.916	0.306	0.904		None	DU	SW846 3050B/6020B
	Arsenic	0.55	0.313	0.926	J	None	DU	SW846 3050B/6020B
	Beryllium	0.194	0.0196	0.098		None	SA	SW846 3050B/6020B
	Beryllium	0.226	0.0181	0.0904		None	DU	SW846 3050B/6020B
	Beryllium	0.162	0.0185	0.0926		None	DU	SW846 3050B/6020B
	Cadmium	0.112	0.0196	0.196	J	None	SA	SW846 3050B/6020B
	Cadmium	0.111	0.0181	0.181	J	None	DU	SW846 3050B/6020B
	Cadmium	0.0533	0.0185	0.185	J	None	DU	SW846 3050B/6020B
	Chromium	1.93	0.196	0.588		None	SA	SW846 3050B/6020B
	Chromium	3.77	0.181	0.542		None	DU	SW846 3050B/6020B
	Chromium	1.27	0.185	0.556		None	DU	SW846 3050B/6020B
	Copper	3.67	0.0647	0.392	*B	J	SA	SW846 3050B/6020B
	Copper	4.47	0.0597	0.362	*B	J	DU	SW846 3050B/6020B
	Copper	3.75	0.0611	0.37	*B	J	DU	SW846 3050B/6020B
	Iron	4,640	6.47	19.6	*	J	SA	SW846 3050B/6020B
	Iron	6,250	5.97	18.1	*	J	DU	SW846 3050B/6020B
	Iron	3,260	6.11	18.5	*	J	DU	SW846 3050B/6020B
	Lead	3.24	0.098	0.392		None	SA	SW846 3050B/6020B
	Lead	4.1	0.0904	0.362		None	DU	SW846 3050B/6020B
	Lead	1.95	0.0926	0.37		None	DU	SW846 3050B/6020B
	Magnesium	1,730	1.96	5.88		None	SA	SW846 3050B/6020B

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-74	Magnesium	1,910	1.81	5.42		None	DU	SW846 3050B/6020B
	Magnesium	913	1.85	5.56		None	DU	SW846 3050B/6020B
	Nickel	2.54	0.098	0.392	*	None	SA	SW846 3050B/6020B
	Nickel	5.92	0.0904	0.362	*	None	DU	SW846 3050B/6020B
	Nickel	1.93	0.0926	0.37	*	None	DU	SW846 3050B/6020B
	Selenium	0.503	0.353	0.98	J	None	SA	SW846 3050B/6020B
	Selenium	0.571	0.325	0.904	J	None	DU	SW846 3050B/6020B
	Selenium	0.391	0.333	0.926	J	None	DU	SW846 3050B/6020B
	Silver	0.338	0.0982	0.491	J	None	SA	SW846 3050B/6010D
	Silver	0.912	0.912	4.56	U	None	DU	SW846 3050B/6010D
	Silver	0.276	0.0942	0.471	J	None	DU	SW846 3050B/6010D
	Thallium	0.137	0.137	0.392	U	None	SA	SW846 3050B/6020B
	Thallium	0.127	0.127	0.362	U	None	DU	SW846 3050B/6020B
	Thallium	0.13	0.13	0.37	U	None	DU	SW846 3050B/6020B
	Uranium	0.863	0.0129	0.0392	*	None	SA	SW846 3050B/6020B
	Uranium	0.646	0.0119	0.0362	*	None	DU	SW846 3050B/6020B
	Uranium	0.611	0.0122	0.037	*	None	DU	SW846 3050B/6020B
	Zinc	16.3	0.784	3.92	N	J-	SA	SW846 3050B/6020B
	Zinc	17.3	0.723	3.62	N	J-	DU	SW846 3050B/6020B
	Zinc	8.48	0.741	3.7	N	J-	DU	SW846 3050B/6020B
S-75	Aluminum	6,410	4.4	9.67		J	SA	SW846 3050B/6020B
	Antimony	0.501	0.297	1.8	J	None	SA	SW846 3050B/6010D
	Arsenic	1.87	0.327	0.967		None	SA	SW846 3050B/6020B
	Beryllium	0.406	0.0193	0.0967		None	SA	SW846 3050B/6020B
	Cadmium	0.151	0.0193	0.193	J	None	SA	SW846 3050B/6020B
	Chromium	7.57	0.193	0.58		None	SA	SW846 3050B/6020B
	Copper	8.13	0.0638	0.387	N	J	SA	SW846 3050B/6020B
	Iron	7,360	6.38	19.3		J	SA	SW846 3050B/6020B
	Lead	6.17	0.0967	0.387		None	SA	SW846 3050B/6020B
	Magnesium	3,040	1.93	5.8		J	SA	SW846 3050B/6020B
	Nickel	7.67	0.0967	0.387		J	SA	SW846 3050B/6020B

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-75	Selenium	0.825	0.348	0.967	J	None	SA	SW846 3050B/6020B
	Silver	0.219	0.0899	0.45	J	None	SA	SW846 3050B/6010D
	Thallium	0.135	0.135	0.387	U	None	SA	SW846 3050B/6020B
	Uranium	0.535	0.0128	0.0387		None	SA	SW846 3050B/6020B
	Zinc	20	0.774	3.87		J	SA	SW846 3050B/6020B
S-85	Aluminum	4,510	4.46	9.8		J	SA	SW846 3050B/6020B
	Antimony	0.53	0.311	1.89	J	None	SA	SW846 3050B/6010D
	Arsenic	2.03	0.331	0.98		None	SA	SW846 3050B/6020B
	Beryllium	0.227	0.0196	0.098		None	SA	SW846 3050B/6020B
	Cadmium	0.106	0.0196	0.196	J	None	SA	SW846 3050B/6020B
	Chromium	5.55	0.196	0.588		None	SA	SW846 3050B/6020B
	Copper	4.43	0.0647	0.392	N	J	SA	SW846 3050B/6020B
	Iron	6,100	6.47	19.6		J	SA	SW846 3050B/6020B
	Lead	4.89	0.098	0.392		None	SA	SW846 3050B/6020B
	Magnesium	1,800	1.96	5.88		J	SA	SW846 3050B/6020B
	Nickel	5.16	0.098	0.392		J	SA	SW846 3050B/6020B
	Selenium	0.712	0.353	0.98	J	None	SA	SW846 3050B/6020B
	Silver	0.201	0.0943	0.472	J	None	SA	SW846 3050B/6010D
	Thallium	0.137	0.137	0.392	U	None	SA	SW846 3050B/6020B
	Uranium	0.512	0.0129	0.0392		None	SA	SW846 3050B/6020B
	Zinc	15.7	0.784	3.92		J	SA	SW846 3050B/6020B
S-91	Aluminum	8,760	4.39	9.65		J	SA	SW846 3050B/6020B
	Antimony	1.04	0.328	1.99	J	None	SA	SW846 3050B/6010D
	Arsenic	4.79	0.326	0.965		None	SA	SW846 3050B/6020B
	Beryllium	0.548	0.0193	0.0965		None	SA	SW846 3050B/6020B
	Cadmium	0.195	0.0193	0.193		None	SA	SW846 3050B/6020B
	Chromium	10.2	0.193	0.579		None	SA	SW846 3050B/6020B
	Copper	9	0.0637	0.386	N	J	SA	SW846 3050B/6020B
	Iron	12,400	31.9	96.5		J	SA	SW846 3050B/6020B
	Lead	10.5	0.0965	0.386		None	SA	SW846 3050B/6020B
	Magnesium	3,590	1.93	5.79		J	SA	SW846 3050B/6020B

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-91	Nickel	10.9	0.0965	0.386		J	SA	SW846 3050B/6020B
	Selenium	1.58	0.347	0.965		None	SA	SW846 3050B/6020B
	Silver	0.0994	0.0994	0.497	U	None	SA	SW846 3050B/6010D
	Thallium	0.172	0.135	0.386	J	None	SA	SW846 3050B/6020B
	Uranium	0.621	0.0127	0.0386		None	SA	SW846 3050B/6020B
	Zinc	32.5	0.772	3.86		J	SA	SW846 3050B/6020B

[a] Blank cells indicate that the lab did not qualify the data.

DU = duplicate sample
SA = sample

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 negative base.
None = There was no data validation for corrected gross alpha activity.
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.

Table B-6. Perchlorate results in soil, 2021

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-53	Perchlorate	0.0911	0.0387	0.116	J	None	SA	EPA 314.0 DOE-AL
	Perchlorate	0.00586	0.039	0.117	J	None	DU	EPA 314.0 DOE-AL
	Perchlorate	0.137	0.0392	0.118		None	DU	EPA 314.0 DOE-AL

[a] Blank cells indicate that the lab did not qualify the data.

DU = duplicate sample
SA = sample

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

Data Validation Qualifier
None = There was no data validation for corrected gross alpha activity.

Table B-7. High explosive compound results in soil, 2021

Location	Analyte	Result (µg/kg)	Method Detection Limit (µg/kg)	Practical Quantitation Limit (µg/kg)	Laboratory Data Qualifier	Data Validation Qualifier	Sample Type	Analytical Method
S-90	Amino-2,6-dinitrotoluene, 4-	48.5	48.5	146	U	None	SA	SW846 8330A
	Amino-4,6-dinitrotoluene, 2-	48.5	48.5	146	U	None	SA	SW846 8330A
	Dinitrobenzene, 1,3-	48.5	48.5	146	U	None	SA	SW846 8330A
	Dinitrotoluene, 2,4-	48.5	48.5	146	U	None	SA	SW846 8330A
	Dinitrotoluene, 2,6-	48.5	48.5	146	U	None	SA	SW846 8330A
	HMX	48.5	48.5	146	U	None	SA	SW846 8330A
	Nitro-benzene	48.5	48.5	146	U	None	SA	SW846 8330A
	Nitrotoluene, 2-	48.5	48.5	146	U	None	SA	SW846 8330A
	Nitrotoluene, 3-	48.5	48.5	146	U	None	SA	SW846 8330A
	Nitrotoluene, 4-	48.5	48.5	146	U	None	SA	SW846 8330A
	Pentaerythritol tetranitrate	80.1	80.1	485	U	None	SA	SW846 8330A
	Cyclotrimethylenetrinitramine	48.5	48.5	146	U	None	SA	SW846 8330A
	Tetryl	48.5	48.5	146	U	None	SA	SW846 8330A
	Trinitrobenzene, 1,3,5-	48.5	48.5	146	U	None	SA	SW846 8330A
	Trinitrotoluene, 2,4,6-	48.5	48.5	146	U	None	SA	SW846 8330A
S-93	Amino-2,6-dinitrotoluene, 4-	46.5	46.5	140	U	None	SA	SW846 8330A
	Amino-4,6-dinitrotoluene, 2-	46.5	46.5	140	U	None	SA	SW846 8330A
	Dinitrobenzene, 1,3-	46.5	46.5	140	U	None	SA	SW846 8330A
	Dinitrotoluene, 2,4-	46.5	46.5	140	U	None	SA	SW846 8330A
	Dinitrotoluene, 2,6-	46.5	46.5	140	U	None	SA	SW846 8330A
	HMX	46.5	46.5	140	U	None	SA	SW846 8330A
	Nitro-benzene	46.5	46.5	140	U	None	SA	SW846 8330A
	Nitrotoluene, 2-	46.5	46.5	140	U	None	SA	SW846 8330A
	Nitrotoluene, 3-	46.5	46.5	140	U	None	SA	SW846 8330A
	Nitrotoluene, 4-	46.5	46.5	140	U	None	SA	SW846 8330A
	Pentaerythritol tetranitrate	76.7	76.7	465	U	None	SA	SW846 8330A
	Cyclotrimethylenetrinitramine	46.5	46.5	140	U	None	SA	SW846 8330A
	Tetryl	46.5	46.5	140	U	None	SA	SW846 8330A
	Trinitrobenzene, 1,3,5-	46.5	46.5	140	U	None	SA	SW846 8330A
	Trinitrotoluene, 2,4,6-	46.5	46.5	140	U	None	SA	SW846 8330A

Location	Analyte	Result (µg/kg)	Method Detection Limit (µg/kg)	Practical Quantitation Limit (µg/kg)	Laboratory Data Qualifier	Data Validation Qualifier	Sample Type	Analytical Method
S-94	Amino-2,6-dinitrotoluene, 4-	45.7	45.7	137	U	None	SA	SW846 8330A
	Amino-4,6-dinitrotoluene, 2-	45.7	45.7	137	U	None	SA	SW846 8330A
	Dinitrobenzene, 1,3-	45.7	45.7	137	U	None	SA	SW846 8330A
	Dinitrotoluene, 2,4-	45.7	45.7	137	U	None	SA	SW846 8330A
	Dinitrotoluene, 2,6-	45.7	45.7	137	U	None	SA	SW846 8330A
	HMX	45.7	45.7	137	U	None	SA	SW846 8330A
	Nitro-benzene	45.7	45.7	137	U	None	SA	SW846 8330A
	Nitrotoluene, 2-	45.7	45.7	137	U	None	SA	SW846 8330A
	Nitrotoluene, 3-	45.7	45.7	137	U	None	SA	SW846 8330A
	Nitrotoluene, 4-	45.7	45.7	137	U	None	SA	SW846 8330A
	Pentaerythritol tetranitrate	75.3	75.3	457	U	None	SA	SW846 8330A
	Cyclotrimethylenetrinitramine	45.7	45.7	137	U	None	SA	SW846 8330A
	Tetryl	45.7	45.7	137	U	None	SA	SW846 8330A
	Trinitrobenzene, 1,3,5-	45.7	45.7	137	U	None	SA	SW846 8330A
	Trinitrotoluene, 2,4,6-	45.7	45.7	137	U	None	SA	SW846 8330A

HMX = high melting explosive
SA = sample

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

Data Validation Qualifier
None = There was no data validation for corrected gross alpha activity.

Table B-8. Equipment blank detections, 2021

Sample Identification	Analyte	Result (mg/L)	Method Detection Limit (mg/L)	Practical Quantitation Limit (mg/L)	Laboratory Data Qualifier[a]	Data Validation Qualifier	Sample Type	Analytical Method
S-EB-DAY1	Aluminum	0.0224	0.0193	0.05	J	None	EB	SW846 3005A/6020B
	Cadmium	0.0192	0.0003	0.001		None	EB	SW846 3005A/6020B
	Magnesium	0.0194	0.01	0.03	J	None	EB	SW846 3005A/6020B
S-EB-DAY2	Cadmium	0.0544	0.0003	0.001		None	EB	SW846 3005A/6020B
	Magnesium	0.0101	0.01	0.03	J	None	EB	SW846 3005A/6020B
S-EB-DAY3	Aluminum	0.0206	0.0193	0.05	J	None	EB	SW846 3005A/6020B
	Cadmium	0.0505	0.0003	0.001		None	EB	SW846 3005A/6020B
	Magnesium	0.0149	0.01	0.03	J	None	EB	SW846 3005A/6020B
S-EB-DAY4	Cadmium	0.0214	0.0003	0.001		None	EB	SW846 3005A/6020B

[a] Blank cells indicate that the lab did not qualify the data.

EB = equipment blank

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

Data Validation Qualifier
None = There was no data validation for corrected gross alpha activity.

Table B-9. Coefficient of variance results, 2021

Location	Analyte	Calculation[a]	Result (mg/kg)	Laboratory Data Qualifier	Data Validation Qualifier	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Sample Type
S-74	Chromium	N/A	1.93		None	0.196	0.588	SA
	Chromium	N/A	3.77		None	0.181	0.542	DU
	Chromium	N/A	1.27		None	0.185	0.556	DU

[a]Coefficient of variance reported for duplicate sets that exceeded 35 percent.
DU = duplicate sample
SA = sample

Average	2.32
Standard deviation	1.30
Coefficient of variance (%)	55.76

Appendix C. Ambient Air Surveillance Results in Fiscal Year 2021

Western kingbird (*Tyrannus verticalis*)

Table C-1. Ambient air metals analysis, fiscal year 2021

Sample Location	Sample Date	Analyte	Result (mg/sa)	MDL (mg/sa)	PQL (mg/sa)	Laboratory Data Qualifier[a]
Area 3 PM 10	9-Dec-2020	Aluminum	0.156	0.08	0.0272	
		Antimony	<0.00132	0.008	0.00132	U
		Arsenic	<0.002	0.012	0.002	U
		Barium	0.00559	0.002	0.0004	
		Beryllium	<0.0004	0.002	0.0004	U
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	0.959	0.1	0.032	
		Chromium	0.00388	0.004	0.0006	J
		Cobalt	0.000784	0.002	0.0006	J
		Copper	0.211	0.008	0.0012	
		Iron	0.17	0.1	0.032	
		Lead	0.00524	0.008	0.00132	J
		Magnesium	0.108	0.12	0.034	J
		Manganese	0.00402	0.004	0.0008	
		Nickel	0.00109	0.002	0.0006	J
		Potassium	0.122	0.1	0.0256	
		Selenium	0.00238	0.012	0.002	J
		Silver	0.00265	0.002	0.0004	
		Sodium	0.846	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	<0.0000264	0.00008	0.0000264	U
		Vanadium	<0.0004	0.002	0.0004	U
		Zinc	0.0294	0.008	0.0016	
Area 3 PM 10	3-Mar-2021	Aluminum	0.104	0.08	0.0272	
		Antimony	0.00245	0.008	0.00132	J
		Arsenic	<0.002	0.012	0.002	U
		Barium	0.0024	0.002	0.0004	
		Beryllium	<0.0004	0.002	0.0004	U
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	0.669	0.1	0.032	
		Chromium	0.0149	0.004	0.0006	

Sample Location	Sample Date	Analyte	Result (mg/sa)	MDL (mg/sa)	PQL (mg/sa)	Laboratory Data Qualifier[a]
Area 3 PM 10	3-Mar-2021	Cobalt	0.00138	0.002	0.0006	J
		Copper	0.0171	0.008	0.0012	
		Iron	0.123	0.1	0.032	
		Lead	0.00167	0.008	0.00132	J
		Magnesium	0.121	0.12	0.034	
		Manganese	0.00255	0.004	0.0008	J
		Nickel	0.00124	0.002	0.0006	J
		Potassium	0.0836	0.1	0.0256	J
		Selenium	<0.002	0.012	0.002	U
		Silver	<0.0004	0.002	0.0004	U
		Sodium	0.887	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	<0.0000264	0.00008	0.0000264	U
		Vanadium	<0.0004	0.002	0.0004	U
		Zinc	0.0267	0.008	0.0016	
Area 3 PM 10	25-Jun-2021	Aluminum	0.264	0.08	0.0272	
		Antimony	<0.00132	0.008	0.00132	U
		Arsenic	<0.002	0.012	0.002	U
		Barium	0.00653	0.002	0.0004	
		Beryllium	<0.0004	0.002	0.0004	U
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	1.18	0.1	0.032	
		Chromium	0.00291	0.004	0.0006	J
		Cobalt	0.000807	0.002	0.0006	J
		Copper	0.0563	0.008	0.0012	
		Iron	0.316	0.1	0.032	
		Lead	<0.00132	0.008	0.00132	U
		Magnesium	0.192	0.12	0.034	
		Manganese	0.0101	0.004	0.0008	
		Nickel	0.00114	0.002	0.0006	J
		Potassium	0.225	0.1	0.0256	
		Selenium	<0.002	0.012	0.002	U

Sample Location	Sample Date	Analyte	Result (mg/sa)	MDL (mg/sa)	PQL (mg/sa)	Laboratory Data Qualifier[a]
Area 3 PM 10	25-Jun-2021	Silver	<0.0004	0.002	0.0004	U
		Sodium	0.716	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	0.0000468	0.00008	0.0000264	J
		Vanadium	0.000605	0.002	0.0004	J
		Zinc	0.0228	0.008	0.0016	
Area 3 PM 10	11-Aug-2021	Aluminum	0.138	0.08	0.0272	
		Antimony	<0.00132	0.008	0.00132	U
		Arsenic	<0.002	0.012	0.002	U
		Barium	0.00358	0.002	0.0004	
		Beryllium	<0.0004	0.002	0.0004	U
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	0.65	0.1	0.032	
		Chromium	0.00353	0.004	0.0006	J
		Cobalt	<0.0006	0.002	0.0006	U
		Copper	0.0234	0.008	0.0012	
		Iron	0.185	0.1	0.032	
		Lead	0.00303	0.008	0.00132	J
		Magnesium	0.135	0.12	0.034	
		Manganese	0.00853	0.004	0.0008	
		Nickel	<0.0006	0.002	0.0006	U
		Potassium	0.206	0.1	0.0256	
		Selenium	<0.002	0.012	0.002	U
		Silver	<0.0004	0.002	0.0004	U
		Sodium	0.947	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	<0.0000264	0.00008	0.0000264	U
		Vanadium	0.000579	0.002	0.0004	J
		Zinc	0.0137	0.008	0.0016	
BKPM 10	9-Dec-2020	Aluminum	<0.0272	0.08	0.0272	U
		Antimony	<0.00132	0.008	0.00132	U
		Arsenic	<0.002	0.012	0.002	U

Sample Location	Sample Date	Analyte	Result (mg/sa)	MDL (mg/sa)	PQL (mg/sa)	Laboratory Data Qualifier[a]
BKPM 10	9-Dec-2020	Barium	0.000602	0.002	0.0004	J
		Beryllium	0.000411	0.002	0.0004	J
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	0.433	0.1	0.032	
		Chromium	0.00339	0.004	0.0006	J
		Cobalt	<0.0006	0.002	0.0006	U
		Copper	<0.0012	0.008	0.0012	U
		Iron	<0.032	0.1	0.032	U
		Lead	0.00317	0.008	0.00132	J
		Magnesium	0.0613	0.12	0.034	J
		Manganese	<0.0008	0.004	0.0008	U
		Nickel	0.00061	0.002	0.0006	J
		Potassium	0.0423	0.1	0.0256	J
		Selenium	<0.002	0.012	0.002	U
		Silver	<0.0004	0.002	0.0004	U
		Sodium	0.825	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	<0.0000264	0.00008	0.0000264	U
		Vanadium	<0.0004	0.002	0.0004	U
		Zinc	0.024	0.008	0.0016	
BKPM 10	3-Mar-2021	Aluminum	<0.0272	0.08	0.0272	U
		Antimony	<0.00132	0.008	0.00132	U
		Arsenic	<0.002	0.012	0.002	U
		Barium	0.000952	0.002	0.0004	J
		Beryllium	<0.0004	0.002	0.0004	U
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	0.452	0.1	0.032	
		Chromium	0.00295	0.004	0.0006	J
		Cobalt	0.0013	0.002	0.0006	J
		Copper	0.00129	0.008	0.0012	J
		Iron	0.034	0.1	0.032	J
		Lead	<0.00132	0.008	0.00132	U

Sample Location	Sample Date	Analyte	Result (mg/sa)	MDL (mg/sa)	PQL (mg/sa)	Laboratory Data Qualifier[a]
BKPM 10	3-Mar-2021	Magnesium	0.0834	0.12	0.034	J
		Manganese	<0.0008	0.004	0.0008	U
		Nickel	0.000933	0.002	0.0006	J
		Potassium	0.109	0.1	0.0256	
		Selenium	<0.002	0.012	0.002	U
		Silver	<0.0004	0.002	0.0004	U
		Sodium	0.843	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	<0.0000264	0.00008	0.0000264	U
		Vanadium	<0.0004	0.002	0.0004	U
		Zinc	0.0309	0.008	0.0016	
BKPM 10	25-Jun-2021	Aluminum	<0.0272	0.08	0.0272	U
		Antimony	<0.00132	0.008	0.00132	U
		Arsenic	<0.002	0.012	0.002	U
		Barium	<0.0004	0.002	0.0004	U
		Beryllium	<0.0004	0.002	0.0004	U
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	0.274	0.1	0.032	
		Chromium	0.00238	0.004	0.0006	J
		Cobalt	0.000643	0.002	0.0006	J
		Copper	0.00176	0.008	0.0012	J
		Iron	<0.032	0.1	0.032	U
		Lead	<0.00132	0.008	0.00132	U
		Magnesium	0.0465	0.12	0.034	J
		Manganese	<0.0008	0.004	0.0008	U
		Nickel	<0.0006	0.002	0.0006	U
		Potassium	0.0491	0.1	0.0256	J
		Selenium	<0.002	0.012	0.002	U
		Silver	<0.0004	0.002	0.0004	U
		Sodium	0.634	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	<0.0000264	0.00008	0.0000264	U

Sample Location	Sample Date	Analyte	Result (mg/sa)	MDL (mg/sa)	PQL (mg/sa)	Laboratory Data Qualifier[a]
BKPM 10	25-Jun-2021	Vanadium	<0.0004	0.002	0.0004	U
		Zinc	0.0169	0.008	0.0016	
BKPM 10	11-Aug-2021	Aluminum	<0.0272	0.08	0.0272	U
		Antimony	<0.00132	0.008	0.00132	U
		Arsenic	<0.002	0.012	0.002	U
		Barium	<0.0004	0.002	0.0004	U
		Beryllium	<0.0004	0.002	0.0004	U
		Cadmium	<0.0004	0.002	0.0004	U
		Calcium	0.264	0.1	0.032	
		Chromium	0.00213	0.004	0.0006	J
		Cobalt	<0.0006	0.002	0.0006	U
		Copper	<0.0012	0.008	0.0012	U
		Iron	<0.032	0.1	0.032	U
		Lead	<0.00132	0.008	0.00132	U
		Magnesium	0.0399	0.12	0.034	J
		Manganese	<0.0008	0.004	0.0008	U
		Nickel	<0.0006	0.002	0.0006	U
		Potassium	0.0292	0.1	0.0256	J
		Selenium	<0.002	0.012	0.002	U
		Silver	<0.0004	0.002	0.0004	U
		Sodium	0.566	0.1	0.028	
		Thallium	<0.002	0.008	0.002	U
		Uranium	<0.0000264	0.00008	0.0000264	U
		Vanadium	<0.0004	0.002	0.0004	U
		Zinc	0.00863	0.008	0.0016	

[a] Blank cells indicate that the lab did not qualify the data.

MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99 percent confidence that the analyte is greater than zero; analyte is matrix-specific
PQL = practical quantitation limit; the lowest concentration of analytes in a sample that can be determined reliably within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions

Laboratory Data Qualifier
J = An estimated value, the analyte concentration was above the effective MDL and below the effective PQL.
U = The analyte was absent or below the method detection limit.

Table C-2. Ambient air radiological analysis, fiscal year 2021

Sample Location	Sample Date	Analyte	Result (pCi/sa)	Error (pCi/sa)	Lc (pCi/sa)	MDA (pCi/sa)	Laboratory Data Qualifiers[a]
Area 3 PM 10	9-Dec-2020	Actinium-228	−41.5	36.1	30.2	14.4	U
		Alpha, gross	8.7	1.83	2.08	0.946	
		Americium-241	4.73	14	24.1	11.7	U
		Beryllium-7	385	84.9	56	26.9	
		Beta, gross	67.9	3.37	2.49	1.2	
		Bismuth-212	93.4	138	84.6	40.3	X
		Bismuth-214	−3.3	19.5	15.8	7.63	U
		Cesium-137	1.16	3.73	6.61	3.16	U
		Cobalt-60	1	9.36	6.81	3.18	U
		Lead-212	−3.34	12	12.8	6.25	U
		Lead-214	−10	18.1	14.8	7.18	U
		Neptunium-237	2.3	6.65	12	5.81	U
		Potassium-40	120	122	57.6	26.5	X
		Radium-223	44.7	69.8	123	59.5	U
		Radium-224	−98.6	85.7	113	55	U
		Radium-226	−169	173	168	82.6	U
		Radium-228	−41.5	36.1	30.2	14.4	U
		Sodium-22	0.712	3.23	6.11	2.84	U
		Thorium-227	−29.6	32	45.1	21.9	U
		Thorium-231	−26	86.7	77	37.7	U
		Thorium-234	−152	291	265	130	U
		Uranium-235	−13.5	36.6	38.4	18.7	U
		Uranium-238	−152	291	265	130	U
Area 3 PM 10	3-Mar-2021	Actinium-228	−11.6	30.6	34.5	16.3	U
		Alpha, gross	3.66	1.34	1.44	0.602	
		Americium-241	4.45	4.58	7.82	3.77	U
		Beryllium-7	324	82.5	56.8	26.8	
		Beta, gross	23	2.9	3.87	1.89	
		Bismuth-212	4.7	72.2	105	49.2	U
		Bismuth-214	0.283	19.4	15.1	7.16	U
		Cesium-137	2.6	3.94	7.08	3.32	U

Sample Location	Sample Date	Analyte	Result (pCi/sa)	Error (pCi/sa)	Lc (pCi/sa)	MDA (pCi/sa)	Laboratory Data Qualifiers[a]
Area 3 PM 10	3-Mar-2021	Cobalt-60	−1.61	5.17	7.92	3.62	U
		Lead-212	6.19	13.6	12.7	6.15	U
		Lead-214	−2.18	15.3	15.5	7.44	U
		Neptunium-237	−6.24	10.5	11.9	5.69	U
		Potassium-40	−105	96.3	102	47.7	U
		Radium-223	−65.8	73.9	106	50.3	U
		Radium-224	−17.1	69.2	106	51	U
		Radium-226	−80.1	136	150	72.8	U
		Radium-228	−11.6	30.6	34.5	16.3	U
		Sodium-22	10.5	5.96	6.59	2.97	X
		Thorium-227	7.99	27.6	46.9	22.6	U
		Thorium-231	16.5	59.7	43.4	20.9	U
		Thorium-234	−88.9	99	118	57.4	U
		Uranium-235	−14	30.9	32.4	15.6	U
		Uranium-238	−88.9	99	118	57.4	U
Area 3 PM 10	25-Jun-2021	Actinium-228	11.4	34.2	20.6	9.87	U
		Alpha, gross	4.37	1.54	1.79	0.759	
		Americium-241	−2.97	20.9	36.1	17.6	U
		Beryllium-7	481	79.5	55.1	26.7	
		Beta, gross	41.1	2.78	2.72	1.31	
		Bismuth-212	107	87.7	75.6	36.4	X
		Bismuth-214	1.43	19.3	15.8	7.69	U
		Cesium-137	2.08	3.72	6.35	3.07	U
		Cobalt-60	0.289	3.48	6.07	2.88	U
		Lead-212	9.54	14.8	12.6	6.17	U
		Lead-214	1.6	12.9	14.7	7.18	U
		Neptunium-237	0.687	6.29	10.8	5.24	U
		Potassium-40	10.9	102	63.1	30	U
		Radium-223	53.6	67.4	110	53.5	U
		Radium-224	27.4	65.6	102	49.8	U
		Radium-226	−126	151	143	70.3	U
		Radium-228	11.4	34.2	20.6	9.87	U

Sample Location	Sample Date	Analyte	Result (pCi/sa)	Error (pCi/sa)	Lc (pCi/sa)	MDA (pCi/sa)	Laboratory Data Qualifiers[a]
Area 3 PM 10	25-Jun-2021	Sodium-22	0.339	3.44	6.02	2.86	U
		Thorium-227	−0.174	23.7	41.1	20	U
		Thorium-231	43.4	50.2	79.7	39	U
		Thorium-234	169	332	330	162	U
		Uranium-235	−11.2	33.4	33.3	16.3	U
		Uranium-238	169	332	330	162	U
Area 3 PM 10	11-Aug-2021	Actinium-228	19.7	33	21.9	10.5	U
		Alpha, gross	3.93	2.22	3.24	1.45	
		Americium-241	−0.224	22.7	36.5	17.8	U
		Beryllium-7	272	65.3	51.9	25.2	
		Beta, gross	24.3	2.34	2.63	1.27	
		Bismuth-212	44.4	73.7	79	38.1	U
		Bismuth-214	7.38	16.9	12.8	6.22	U
		Cesium-137	6.12	4.7	6.28	3.04	U
		Cobalt-60	−2.25	3.85	6.17	2.93	U
		Lead-212	4.95	11.6	8.8	4.29	U
		Lead-214	2.11	16.8	14.8	7.21	U
		Neptunium-237	−1.42	6.42	10.8	5.26	U
		Potassium-40	23.7	98.6	55.3	26.1	U
		Radium-223	2.26	64.8	110	53.7	U
		Radium-224	13.2	63.1	98.9	48.2	U
		Radium-226	38.1	182	99.4	48.5	U
		Radium-228	19.7	33	21.9	10.5	U
		Sodium-22	2.06	5.76	6.06	2.88	U
		Thorium-227	16	25.4	42.9	20.9	U
		Thorium-231	−37.5	78.6	75.8	37	U
		Thorium-234	262	384	279	136	U
		Uranium-235	−10.9	34.4	34.6	16.9	U
		Uranium-238	262	384	279	136	U
BKPM 10	9-Dec-2020	Actinium-228	41.4	34.4	65.7	29.2	U
		Alpha, gross	2.41	1.44	2.23	1.02	
		Americium-241	5.1	8.86	16.7	7.78	U

Sample Location	Sample Date	Analyte	Result (pCi/sa)	Error (pCi/sa)	Lc (pCi/sa)	MDA (pCi/sa)	Laboratory Data Qualifiers[a]
BKPM 10	9-Dec-2020	Beryllium-7	15.9	58.4	116	51.7	U
		Beta, gross	2.04	1.59	2.61	1.26	U
		Bismuth-212	−78.8	160	249	113	U
		Bismuth-214	2.75	31.2	34.7	15.9	U
		Cesium-137	0.146	7.46	14.2	6.29	U
		Cobalt-60	3.81	7.42	16.4	6.89	U
		Lead-212	12.2	21.5	37	17.8	U
		Lead-214	8.4	32.1	33.3	15.5	U
		Neptunium-237	20.8	22.5	27	12.5	U
		Potassium-40	−86.7	139	241	107	U
		Radium-223	−13.2	132	226	103	U
		Radium-224	102	242	174	79.2	U
		Radium-226	310	249	197	90.6	X
		Radium-228	41.4	34.4	65.7	29.2	U
		Sodium-22	−0.0625	5.89	12.6	5.03	U
		Thorium-227	31	49.5	89.3	41.1	U
		Thorium-231	−23	63.6	103	48.3	U
		Thorium-234	110	177	136	62.4	U
		Uranium-235	4.44	45	70.2	32.9	U
		Uranium-238	110	177	136	62.4	U
BKPM 10	3-Mar-2021	Actinium-228	2.98	35.1	34.5	16.4	U
		Alpha, gross	1.82	1.32	2.05	0.907	U
		Americium-241	5.06	17.9	33.2	16	U
		Beryllium-7	−7.7	38.9	67.6	32.3	U
		Beta, gross	2.77	1.68	2.73	1.32	
		Bismuth-212	10.1	62.3	107	50.8	U
		Bismuth-214	15	22.7	17.3	8.3	U
		Cesium-137	0.699	4.59	7.94	3.77	U
		Cobalt-60	0.803	4.89	7.75	3.56	U
		Lead-212	−2.18	14.1	13	6.33	U
		Lead-214	8.43	16.2	16.2	7.83	U
		Neptunium-237	−3.26	7.69	12.1	5.8	U

Sample Location	Sample Date	Analyte	Result (pCi/sa)	Error (pCi/sa)	Lc (pCi/sa)	MDA (pCi/sa)	Laboratory Data Qualifiers[a]
BKPM 10	3-Mar-2021	Potassium-40	−50.3	85	103	48.5	U
		Radium-223	26	70.5	128	61.5	U
		Radium-224	−62	76.3	114	54.9	U
		Radium-226	−97.1	162	163	79.5	U
		Radium-228	2.98	35.1	34.5	16.4	U
		Sodium-22	−2.85	4.82	7.73	3.56	U
		Thorium-227	40.3	38.1	49.4	23.8	U
		Thorium-231	50.2	80.8	72.8	35.2	U
		Thorium-234	−197	315	320	156	U
		Uranium-235	−19.7	38.6	35.2	17.1	U
		Uranium-238	−197	315	320	156	U
BKPM 10	25-Jun-2021	Actinium-228	4.77	40.5	21.7	10.2	U
		Alpha, gross	−0.0991	1.19	2.18	0.992	U
		Americium-241	−2.48	14	24.6	11.9	U
		Beryllium-7	16.3	33	58.5	28	U
		Beta, gross	1.9	2.01	3.36	1.63	U
		Bismuth-212	109	90.6	83.7	39.7	X
		Bismuth-214	−5.7	17.6	14.5	6.98	U
		Cesium-137	−0.0463	3.51	6.13	2.91	U
		Cobalt-60	−5.01	6.58	6.19	2.86	U
		Lead-212	2.66	15.1	9.74	4.72	U
		Lead-214	−1.59	13.6	13.6	6.58	U
		Neptunium-237	−1.36	6.28	11.2	5.4	U
		Potassium-40	32	108	60.6	28	U
		Radium-223	−57.1	73.8	107	51.6	U
		Radium-224	−3.52	71.6	108	52.5	U
		Radium-226	28.7	197	103	49.9	U
		Radium-228	4.77	40.5	21.7	10.2	U
		Sodium-22	−0.0465	3.44	6.28	2.91	U
		Thorium-227	−28.7	30.2	42.1	20.3	U
		Thorium-231	−28.5	75.4	69	33.5	U
		Thorium-234	−36.7	245	281	137	U

Sample Location	Sample Date	Analyte	Result (pCi/sa)	Error (pCi/sa)	Lc (pCi/sa)	MDA (pCi/sa)	Laboratory Data Qualifiers[a]
BKPM 10	25-Jun-2021	Uranium-235	−1.52	38.7	35.5	17.3	U
		Uranium-238	−36.7	245	281	137	U
BKPM 10	11-Aug-2021	Actinium-228	−18.5	69.8	54.1	25.9	U
		Alpha, gross	0.425	2.2	3.96	1.82	U
		Americium-241	4.69	12.5	19.7	9.71	U
		Beryllium-7	−9.75	44.9	76.4	36.3	U
		Beta, gross	0.865	2.27	3.85	1.88	U
		Bismuth-212	82.8	116	133	62.8	U
		Bismuth-214	−21.5	28.5	25.8	12.4	U
		Cesium-137	1.23	6.14	10.5	4.99	U
		Cobalt-60	5.2	16.1	10.2	4.7	U
		Lead-212	−10.9	19.6	18.9	9.21	U
		Lead-214	13.8	30.3	22.6	10.9	U
		Neptunium-237	3.4	9.04	16.1	7.72	U
		Potassium-40	6.58	187	85.4	38.6	U
		Radium-223	−26.5	93.3	161	77.5	U
		Radium-224	−166	116	147	70.9	U
		Radium-226	−303	276	221	108	U
		Radium-228	−18.5	69.8	54.1	25.9	U
		Sodium-22	2.89	5.58	10.4	4.81	U
		Thorium-227	−6.82	32.5	57.5	27.6	U
		Thorium-231	−101	118	86.8	42.5	U
		Thorium-234	235	264	181	89.1	X
		Uranium-235	−11.8	45.4	47.6	23.2	U
		Uranium-238	235	264	181	89.1	X

[a] Blank cells indicate that the lab did not qualify the data.

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

Laboratory Data Qualifier
U = The analyte was absent or below the method detection limit.
X = The data was rejected due to the peak not meeting identification criteria.

Appendix D. Stormwater Sampling Requirements and Results in 2021

Monarch butterfly (*Danaus plexippus*)

Table D-1. MSGP stormwater sampling results, calendar year 2021

Sampling Point	Sample Date	Analyte	Result (mg/L)	MDL (mg/L)	PQL (mg/L)	Sample Preparation
SWSP-05	12-Jul-21	Chemical oxygen demand	61.1	8.95	20	Unfiltered
SWSP-05	12-Jul-21	Solids, total dissolved	85.7	3.4	14.3	Unfiltered
SWSP-05	7-Sep-21	Chemical oxygen demand	49.7	8.95	20	Unfiltered
SWSP-05	7-Sep-21	Solids, total suspended	72	11.4	50	Unfiltered
SWSP-17	7-Sep-21	Ammonia	0.265	0.017	0.05	Unfiltered
SWSP-17	7-Sep-21	Arsenic	0.00215	0.002	0.005	Unfiltered
SWSP-17	7-Sep-21	Cadmium	0.000618	0.0003	0.001	Unfiltered
SWSP-17	7-Sep-21	Cadmium	0.000838	0.000577	0.0019	Unfiltered
SWSP-17	7-Sep-21	Chemical oxygen demand	49.7	8.95	20	Unfiltered
SWSP-17	7-Sep-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-17	7-Sep-21	Lead	0.19	0.0005	0.002	Unfiltered
SWSP-17	7-Sep-21	Lead	0.414	0.000962	0.0039	Unfiltered
SWSP-17	7-Sep-21	Magnesium	1.85	0.01	0.03	Unfiltered
SWSP-17	7-Sep-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-17	7-Sep-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-17	7-Sep-21	Selenium	0.00403	0.00288	0.0096	Unfiltered
SWSP-17	7-Sep-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-17	7-Sep-21	Silver	<0.000577	0.000577	0.0019	Unfiltered
SWSP-17	7-Sep-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	12-Jul-21	Ammonia	0.255	0.017	0.05	Unfiltered

Sampling Point	Sample Date	Analyte	Result (mg/L)	MDL (mg/L)	PQL (mg/L)	Sample Preparation
SWSP-40	12-Jul-21	Arsenic	<0.002	0.002	0.005	Filtered
SWSP-40	12-Jul-21	Cadmium	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	12-Jul-21	Chemical oxygen demand	86.1	8.95	20	Unfiltered
SWSP-40	12-Jul-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-40	12-Jul-21	Lead	<0.0005	0.0005	0.002	Unfiltered
SWSP-40	12-Jul-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-40	12-Jul-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-40	12-Jul-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	31-Aug-21	Ammonia	0.254	0.017	0.05	Unfiltered
SWSP-40	31-Aug-21	Arsenic	<0.002	0.002	0.005	Filtered
SWSP-40	31-Aug-21	Cadmium	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	31-Aug-21	Chemical oxygen demand	112	8.95	20	Unfiltered
SWSP-40	31-Aug-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-40	31-Aug-21	Lead	0.000924	0.0005	0.002	Unfiltered
SWSP-40	31-Aug-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-40	31-Aug-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-40	31-Aug-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	9-Sep-21	Ammonia	0.181	0.017	0.05	Unfiltered
SWSP-40	9-Sep-21	Arsenic	<0.002	0.002	0.005	Filtered
SWSP-40	9-Sep-21	Cadmium	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	9-Sep-21	Chemical oxygen demand	86.8	8.95	20	Unfiltered
SWSP-40	9-Sep-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-40	9-Sep-21	Lead	0.00059	0.0005	0.002	Unfiltered
SWSP-40	9-Sep-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-40	9-Sep-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-40	9-Sep-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	4-Oct-21	Ammonia	0.609	0.017	0.05	Unfiltered
SWSP-40	4-Oct-21	Arsenic	<0.002	0.002	0.005	Filtered
SWSP-40	4-Oct-21	Cadmium	<0.0003	0.0003	0.001	Unfiltered
SWSP-40	4-Oct-21	Chemical oxygen demand	50.3	8.95	20	Unfiltered
SWSP-40	4-Oct-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-40	4-Oct-21	Lead	0.000622	0.0005	0.002	Unfiltered
SWSP-40	4-Oct-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-40	4-Oct-21	Selenium	<0.0015	0.0015	0.005	Unfiltered
SWSP-40	4-Oct-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-42	7-Sep-21	Chemical oxygen demand	35.9	8.95	20	Unfiltered
SWSP-42	7-Sep-21	Solids, total suspended	450	57	250	Unfiltered
SWSP-47	15-Jul-21	Ammonia	0.918	0.017	0.05	Unfiltered
SWSP-47	15-Jul-21	Arsenic	<0.002	0.002	0.005	Filtered
SWSP-47	15-Jul-21	Cadmium	0.00196	0.0003	0.001	Unfiltered
SWSP-47	15-Jul-21	Cadmium	0.00177	0.0003	0.001	Unfiltered
SWSP-47	15-Jul-21	Chemical oxygen demand	48.6	8.95	20	Unfiltered
SWSP-47	15-Jul-21	Cyanide, total	0.0046	0.00167	0.005	Unfiltered
SWSP-47	15-Jul-21	Lead	0.0667	0.0005	0.002	Unfiltered
SWSP-47	15-Jul-21	Lead	0.0595	0.0005	0.002	Unfiltered
SWSP-47	15-Jul-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered

Sampling Point	Sample Date	Analyte	Result (mg/L)	MDL (mg/L)	PQL (mg/L)	Sample Preparation
SWSP-47	15-Jul-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-47	15-Jul-21	Selenium	0.00427	0.0015	0.005	Unfiltered
SWSP-47	15-Jul-21	Silver	0.000682	0.0003	0.001	Unfiltered
SWSP-47	15-Jul-21	Silver	0.00089	0.0003	0.001	Unfiltered
SWSP-47	2-Sep-21	Arsenic	<0.002	0.002	0.005	Filtered
SWSP-47	2-Sep-21	Cadmium	0.00344	0.0003	0.001	Unfiltered
SWSP-47	2-Sep-21	Lead	0.0152	0.0005	0.002	Unfiltered
SWSP-47	2-Sep-21	Mercury	0.000073	0.000067	0.0002	Unfiltered
SWSP-47	2-Sep-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-47	2-Sep-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-47	7-Sep-21	Ammonia	0.816	0.017	0.05	Unfiltered
SWSP-47	7-Sep-21	Chemical oxygen demand	42.8	8.95	20	Unfiltered
SWSP-47	7-Sep-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-48	2-Sep-21	Arsenic	<0.002	0.002	0.005	Filtered
SWSP-48	2-Sep-21	Cadmium	<0.0003	0.0003	0.001	Unfiltered
SWSP-48	2-Sep-21	Lead	0.000502	0.0005	0.002	Unfiltered
SWSP-48	2-Sep-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-48	2-Sep-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-48	2-Sep-21	Silver	0.00308	0.0003	0.001	Unfiltered
SWSP-48	7-Sep-21	Ammonia	0.469	0.017	0.05	Unfiltered
SWSP-48	7-Sep-21	Chemical oxygen demand	53.1	8.95	20	Unfiltered
SWSP-48	7-Sep-21	Cyanide, total	0.00262	0.00167	0.005	Unfiltered
SWSP-49	28-Jul-21	Ammonia	0.209	0.017	0.05	Unfiltered
SWSP-49	28-Jul-21	Arsenic	0.00207	0.002	0.005	Filtered
SWSP-49	28-Jul-21	Cadmium	<0.0003	0.0003	0.001	Unfiltered
SWSP-49	28-Jul-21	Chemical oxygen demand	135	8.95	20	Unfiltered
SWSP-49	28-Jul-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-49	28-Jul-21	Lead	<0.0005	0.0005	0.002	Unfiltered
SWSP-49	28-Jul-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-49	28-Jul-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-49	28-Jul-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-49	31-Aug-21	Ammonia	0.226	0.017	0.05	Unfiltered
SWSP-49	31-Aug-21	Arsenic	0.00231	0.002	0.005	Filtered
SWSP-49	31-Aug-21	Cadmium	<0.0003	0.0003	0.001	Unfiltered
SWSP-49	31-Aug-21	Chemical oxygen demand	105	8.95	20	Unfiltered
SWSP-49	31-Aug-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-49	31-Aug-21	Lead	<0.0005	0.0005	0.002	Unfiltered
SWSP-49	31-Aug-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-49	31-Aug-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-49	31-Aug-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-50	15-Jul-21	Chemical oxygen demand	37.2	8.95	20	Unfiltered
SWSP-50	15-Jul-21	Solids, total suspended	91	5.7	25	Unfiltered
SWSP-50	2-Sep-21	Chemical oxygen demand	87.6	8.95	20	Unfiltered
SWSP-50	2-Sep-21	Solids, total suspended	3.27	0.582	2.55	Unfiltered
SWSP-52	15-Jul-21	Ammonia	0.841	0.017	0.05	Unfiltered
SWSP-52	15-Jul-21	Arsenic	<0.002	0.002	0.005	Filtered

Sampling Point	Sample Date	Analyte	Result (mg/L)	MDL (mg/L)	PQL (mg/L)	Sample Preparation
SWSP-52	15-Jul-21	Cadmium	0.000463	0.0003	0.001	Unfiltered
SWSP-52	15-Jul-21	Chemical oxygen demand	36.1	8.95	20	Unfiltered
SWSP-52	15-Jul-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-52	15-Jul-21	Lead	0.0121	0.0005	0.002	Unfiltered
SWSP-52	15-Jul-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-52	15-Jul-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-52	15-Jul-21	Silver	<0.0003	0.0003	0.001	Unfiltered
SWSP-52	2-Sep-21	Ammonia	0.33	0.017	0.05	Unfiltered
SWSP-52	2-Sep-21	Arsenic	<0.002	0.002	0.005	FILTEREED
SWSP-52	2-Sep-21	Cadmium	0.000937	0.0003	0.001	Unfiltered
SWSP-52	2-Sep-21	Chemical oxygen demand	63.4	8.95	20	Unfiltered
SWSP-52	2-Sep-21	Cyanide, total	<0.00167	0.00167	0.005	Unfiltered
SWSP-52	2-Sep-21	Lead	0.00945	0.0005	0.002	Unfiltered
SWSP-52	2-Sep-21	Mercury	<0.000067	0.000067	0.0002	Unfiltered
SWSP-52	2-Sep-21	Selenium	<0.002	0.002	0.005	Unfiltered
SWSP-52	2-Sep-21	Silver	<0.0003	0.0003	0.001	Unfiltered

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

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

Table D-2. Polyfluoroalkyl substances screening results for NMED, calendar year 2021

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-17	Aqueous	7-Sep-21	Fluorotelomer sulfonate 4:2	1.35	1.35	3.85	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Fluorotelomer sulfonate 4:2	<2.67	2.67	6.27	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Fluorotelomer sulfonate 6:2	1.35	1.35	3.89	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Fluorotelomer sulfonate 6:2	<2.6	2.6	6.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Fluorotelomer sulfonate 8:2	1.35	1.35	3.93	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Fluorotelomer sulfonate 8:2	<2.57	2.57	6.4	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.35	1.35	4.09	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.83	1.83	6.67	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	N-methylperfluoro-1-octanesulfonamide	<1.35	1.35	4.09	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	N-methylperfluoro-1-octanesulfonamide	<2.9	2.9	6.67	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<1.35	1.35	4.09	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<2.2	2.2	6.67	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorobutanesulfonate	<0.675	0.675	1.82	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorobutanesulfonate	<1.1	1.1	2.97	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorobutyric acid	2.93	0.819	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorobutyric acid	<1.33	1.33	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorodecanesulfonate	<0.675	0.675	1.99	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorodecanesulfonate	<1.1	1.1	3.23	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorodecanoic acid	1.78	0.798	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorodecanoic acid	<2.47	2.47	6.67	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorododecanoic acid	<0.675	0.675	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorododecanoic acid	<1.1	1.1	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluoroheptanesulfonate	<0.675	0.675	1.94	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluoroheptanesulfonate	<1.23	1.23	3.17	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluoroheptanoic acid	<0.675	0.675	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluoroheptanoic acid	<1.1	1.1	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorohexanesulfonate	<0.675	0.675	1.86	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorohexanesulfonate	<1.1	1.1	3.03	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorohexanoic acid	<0.819	0.819	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorohexanoic acid	<1.33	1.33	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorononanesulfonate	<0.716	0.716	1.96	Unfiltered	ng/L

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-17	Solid	7-Sep-21	Perfluorononanesulfonate	<1.1	1.1	3.2	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorononanoic acid	2.24	0.675	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorononanoic acid	<1.1	1.1	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorooctanesulfonamide	<0.675	0.675	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorooctanesulfonamide	<1.1	1.1	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorooctanesulfonate	14.1	0.819	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorooctanesulfonate	<1.33	1.33	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorooctanoic acid	1.82	0.819	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorooctanoic acid	<1.33	1.33	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluoropentanesulfonate	<0.675	0.675	1.92	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluoropentanesulfonate	<1.1	1.1	3.13	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluoropentanoic acid	<0.675	0.675	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluoropentanoic acid	<1.1	1.1	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorotetradecanoic acid	<0.819	0.819	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorotetradecanoic acid	<1.33	1.33	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluorotridecanoic acid	<0.675	0.675	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluorotridecanoic acid	<1.1	1.1	3.33	Unfiltered	ng/g
SWSP-17	Aqueous	7-Sep-21	Perfluoroundecanoic acid	<0.675	0.675	2.05	Unfiltered	ng/L
SWSP-17	Solid	7-Sep-21	Perfluoroundecanoic acid	<1.1	1.1	3.33	Unfiltered	ng/g
SWSP-40	Aqueous	12-Jul-21	Fluorotelomer sulfonate 4:2	<1.23	1.23	3.5	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Fluorotelomer sulfonate 6:2	<154	154	443	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Fluorotelomer sulfonate 8:2	<30.8	30.8	89.5	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.23	1.23	3.73	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	N-methylperfluoro-1-octanesulfonamide	<1.23	1.23	3.73	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	N-methylperfluoro-1-octanesulfonamidoace	<1.23	1.23	3.73	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorobutanesulfonate	<0.615	0.615	1.66	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorobutyric acid	21.7	18.6	46.6	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorodecanesulfonate	<0.615	0.615	1.81	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorodecanoic acid	2.37	0.727	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorododecanoic acid	<0.615	0.615	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluoroheptanesulfonate	<0.615	0.615	1.77	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluoroheptanoic acid	3.53	0.615	1.86	Unfiltered	ng/L

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-40	Aqueous	12-Jul-21	Perfluorohexanesulfonate	<0.615	0.615	1.7	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorohexanoic acid	11.4	0.746	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorononanesulfonate	<0.652	0.652	1.79	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorononanoic acid	2.33	0.615	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorooctanesulfonamide	<0.615	0.615	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorooctanesulfonate	7.35	0.746	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorooctanoic acid	6.73	0.746	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluoropentanesulfonate	<0.615	0.615	1.75	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluoropentanoic acid	6.17	3.08	9.32	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorotetradecanoic acid	<3.73	3.73	9.32	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluorotridecanoic acid	<3.08	3.08	9.32	Unfiltered	ng/L
SWSP-40	Aqueous	12-Jul-21	Perfluoroundecanoic acid	0.995	0.615	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Fluorotelomer sulfonate 4:2	<1.26	1.26	3.58	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Fluorotelomer sulfonate 6:2	1.62	1.26	3.61	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Fluorotelomer sulfonate 8:2	<1.26	1.26	3.65	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.26	1.26	3.8	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	N-methylperfluoro-1-octanesulfonamide	<1.26	1.26	3.8	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<1.26	1.26	3.8	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorobutanesulfonate	1.24	0.628	1.69	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorobutyric acid	14	0.761	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorodecanesulfonate	<0.628	0.628	1.84	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorodecanoic acid	1.86	0.742	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorododecanoic acid	<0.628	0.628	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluoroheptanesulfonate	<0.628	0.628	1.81	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluoroheptanoic acid	1.56	0.628	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorohexanesulfonate	<0.628	0.628	1.73	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorohexanoic acid	4.28	0.761	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorononanesulfonate	<0.666	0.666	1.83	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorononanoic acid	1.43	0.628	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorooctanesulfonamide	<0.628	0.628	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorooctanesulfonate	5.93	0.761	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorooctanoic acid	2.52	0.761	1.9	Unfiltered	ng/L

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-40	Aqueous	9-Sep-21	Perfluoropentanesulfonate	<0.628	0.628	1.79	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluoropentanoic acid	1.44	0.628	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorotetradecanoic acid	<0.761	0.761	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluorotridecanoic acid	<0.628	0.628	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	9-Sep-21	Perfluoroundecanoic acid	<0.628	0.628	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Fluorotelomer sulfonate 4:2	<1.29	1.29	3.68	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Fluorotelomer sulfonate 6:2	1.4	1.29	3.72	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Fluorotelomer sulfonate 8:2	<1.29	1.29	3.76	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	N-ethylperfluoro-1-octanesulfonamidoacet	<6.46	6.46	19.6	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	N-methylperfluoro-1-octanesulfonamide	<1.29	1.29	3.92	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	N-methylperfluoro-1-octanesulfonamidoace	<1.29	1.29	3.92	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorobutanesulfonate	<0.646	0.646	1.74	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorobutyric acid	66.6	0.784	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorodecanesulfonate	<0.646	0.646	1.9	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorodecanoic acid	1.18	0.764	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorododecanoic acid	<0.646	0.646	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluoroheptanesulfonate	<0.646	0.646	1.86	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluoroheptanoic acid	2.26	0.646	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorohexanesulfonate	<0.646	0.646	1.78	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorohexanoic acid	6.98	0.784	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorononanesulfonate	<0.686	0.686	1.88	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorononanoic acid	1.38	0.646	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorooctanesulfonamide	<0.646	0.646	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorooctanesulfonate	1.78	0.784	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorooctanoic acid	1.96	0.784	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluoropentanesulfonate	<0.646	0.646	1.84	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluoropentanoic acid	<0.646	0.646	1.96	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorotetradecanoic acid	<03.92	3.92	9.8	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluorotridecanoic acid	<3.23	3.23	9.8	Unfiltered	ng/L
SWSP-40	Aqueous	4-Oct-21	Perfluoroundecanoic acid	<0.646	0.646	1.96	Unfiltered	ng/L
SWSP-47	Aqueous	15-Jul-21	Fluorotelomer sulfonate 4:2	<6.18	6.18	17.6	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Fluorotelomer sulfonate 4:2	<1.04	1.04	2.44	Unfiltered	ng/g

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-47	Aqueous	15-Jul-21	Fluorotelomer sulfonate 6:2	<1.24	1.24	3.56	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Fluorotelomer sulfonate 6:2	<1.01	1.01	2.47	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Fluorotelomer sulfonate 8:2	<1.24	1.24	3.6	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Fluorotelomer sulfonate 8:2	<1	1	2.49	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.24	1.24	3.75	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	N-ethylperfluoro-1-octanesulfonamidoacet	<0.714	0.714	2.6	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	N-methylperfluoro-1-octanesulfonamide	<1.24	1.24	3.75	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	N-methylperfluoro-1-octanesulfonamide	<1.13	1.13	2.6	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	N-methylperfluoro-1-octanesulfonamidoace	<1.24	1.24	3.75	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	N-methylperfluoro-1-octanesulfonamidoace	<0.857	0.857	2.6	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorobutanesulfonate	<0.618	0.618	1.67	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorobutanesulfonate	<0.429	0.429	1.16	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorobutyric acid	9.57	3.75	9.37	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorobutyric acid	<0.519	0.519	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorodecanesulfonate	<0.618	0.618	1.82	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorodecanesulfonate	<0.429	0.429	1.26	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorodecanoic acid	17.7	0.731	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorodecanoic acid	<0.961	0.961	2.6	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorododecanoic acid	1.17	0.618	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorododecanoic acid	1.03	0.429	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluoroheptanesulfonate	7.32	0.618	1.78	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluoroheptanesulfonate	<0.481	0.481	1.23	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluoroheptanoic acid	0.782	0.618	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluoroheptanoic acid	<0.429	0.429	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorohexanesulfonate	1.47	0.618	1.7	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorohexanesulfonate	<0.429	0.429	1.18	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorohexanoic acid	<0.749	0.749	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorohexanoic acid	<0.519	0.519	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorononanesulfonate	<0.656	0.656	1.8	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorononanesulfonate	<0.429	0.429	1.25	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorononanoic acid	27	0.618	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorononanoic acid	<0.429	0.429	1.3	Unfiltered	ng/g

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-47	Aqueous	15-Jul-21	Perfluorooctanesulfonamide	<0.618	0.618	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorooctanesulfonamide	<0.429	0.429	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorooctanesulfonate	758	3.75	9.37	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorooctanesulfonate	15.9	0.519	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorooctanoic acid	5.78	0.749	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorooctanoic acid	<0.519	0.519	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluoropentanesulfonate	<0.618	0.618	1.76	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluoropentanesulfonate	<0.429	0.429	1.22	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluoropentanoic acid	<0.618	0.618	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluoropentanoic acid	<0.429	0.429	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorotetradecanoic acid	<0.749	0.749	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorotetradecanoic acid	<0.519	0.519	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluorotridecanoic acid	<0.618	0.618	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluorotridecanoic acid	0.662	0.429	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	15-Jul-21	Perfluoroundecanoic acid	8.59	0.618	1.87	Unfiltered	ng/L
SWSP-47	Solid	15-Jul-21	Perfluoroundecanoic acid	1.69	0.429	1.3	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Fluorotelomer sulfonate 4:2	<1.3	1.3	3.69	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Fluorotelomer sulfonate 4:2	<6.67	6.67	15.7	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Fluorotelomer sulfonate 6:2	<1.3	1.3	3.73	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Fluorotelomer sulfonate 6:2	<6.5	6.5	15.8	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Fluorotelomer sulfonate 8:2	<1.3	1.3	3.77	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Fluorotelomer sulfonate 8:2	<6.42	6.42	16	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.3	1.3	3.93	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<4.58	4.58	16.7	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	N-methylperfluoro-1-octanesulfonamide	<1.3	1.3	3.93	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	N-methylperfluoro-1-octanesulfonamide	<7.25	7.25	16.7	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<1.3	1.3	3.93	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<5.5	5.5	16.7	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorobutanesulfonate	<0.648	0.648	1.75	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorobutanesulfonate	<2.75	2.75	7.42	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorobutyric acid	3.23	0.786	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorobutyric acid	<3.33	3.33	8.33	Unfiltered	ng/g

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-47	Aqueous	7-Sep-21	Perfluorodecanesulfonate	<0.648	0.648	1.91	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorodecanesulfonate	<2.75	2.75	8.08	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorodecanoic acid	9.81	0.766	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorodecanoic acid	<6.17	6.17	16.7	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorododecanoic acid	<0.648	0.648	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorododecanoic acid	<2.75	2.75	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluoroheptanesulfonate	2.99	0.648	1.87	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluoroheptanesulfonate	<3.08	3.08	7.92	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluoroheptanoic acid	<0.648	0.648	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluoroheptanoic acid	<2.75	2.75	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorohexanesulfonate	<0.648	0.648	1.79	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorohexanesulfonate	<2.75	2.75	7.58	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorohexanoic acid	<0.786	0.786	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorohexanoic acid	<3.33	3.33	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorononanesulfonate	<0.688	0.688	1.89	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorononanesulfonate	<2.75	2.75	8	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorononanoic acid	14.1	0.648	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorononanoic acid	<2.75	2.75	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorooctanesulfonamide	<0.648	0.648	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorooctanesulfonamide	<2.75	2.75	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorooctanesulfonate	384	3.93	9.82	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorooctanesulfonate	108	3.33	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorooctanoic acid	2.69	0.786	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorooctanoic acid	<3.33	3.33	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluoropentanesulfonate	<0.648	0.648	1.85	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluoropentanesulfonate	<2.75	2.75	7.83	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluoropentanoic acid	<0.648	0.648	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluoropentanoic acid	<2.75	2.75	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorotetradecanoic acid	<3.93	3.93	9.82	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorotetradecanoic acid	<3.33	3.33	8.33	Unfiltered	ng/g
SWSP-47	Aqueous	7-Sep-21	Perfluorotridecanoic acid	<3.24	3.24	9.82	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluorotridecanoic acid	<2.75	2.75	8.33	Unfiltered	ng/g

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-47	Aqueous	7-Sep-21	Perfluoroundecanoic acid	3.67	0.648	1.96	Unfiltered	ng/L
SWSP-47	Solid	7-Sep-21	Perfluoroundecanoic acid	7.12	2.75	8.33	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Fluorotelomer sulfonate 4:2	1.39	1.39	3.96	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Fluorotelomer sulfonate 4:2	<40	40	94	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Fluorotelomer sulfonate 6:2	<1.39	1.39	4.01	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Fluorotelomer sulfonate 6:2	<39	39	95	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Fluorotelomer sulfonate 8:2	<1.39	1.39	4.05	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Fluorotelomer sulfonate 8:2	<38.5	38.5	96	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<6.96	6.96	21.1	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<27.5	27.5	100	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	N-methylperfluoro-1-octanesulfonamide	<6.96	6.96	21.1	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	N-methylperfluoro-1-octanesulfonamide	<43.5	43.5	100	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<1.39	1.39	4.22	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<33	33	100	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorobutanesulfonate	<0.696	0.696	1.88	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorobutanesulfonate	<16.5	16.5	44.5	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorobutyric acid	12.3	0.844	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorobutyric acid	<20	20	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorodecanesulfonate	<0.696	0.696	2.05	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorodecanesulfonate	<16.5	16.5	48.5	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorodecanoic acid	1.99	0.822	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorodecanoic acid	<37	37	100	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorododecanoic acid	0.803	0.696	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorododecanoic acid	<16.5	16.5	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluoroheptanesulfonate	<0.696	0.696	2	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluoroheptanesulfonate	<18.5	18.5	47.5	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluoroheptanoic acid	1.15	0.696	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluoroheptanoic acid	<16.5	16.5	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorohexanesulfonate	<0.696	0.696	1.92	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorohexanesulfonate	<16.5	16.5	45.5	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorohexanoic acid	1.93	0.844	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorohexanoic acid	<20	20	50	Unfiltered	ng/g

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-48	Aqueous	7-Sep-21	Perfluorononanesulfonate	<0.738	0.738	2.02	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorononanesulfonate	<16.5	16.5	48	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorononanoic acid	1.61	0.696	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorononanoic acid	<16.5	16.5	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorooctanesulfonamide	<0.696	0.696	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorooctanesulfonamide	<16.5	16.5	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorooctanesulfonate	3.4	0.844	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorooctanesulfonate	<20	20	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorooctanoic acid	1.57	0.844	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorooctanoic acid	<20	20	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluoropentanesulfonate	<0.696	0.696	1.98	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluoropentanesulfonate	<16.5	16.5	47	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluoropentanoic acid	<0.696	0.696	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluoropentanoic acid	<16.5	16.5	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorotetradecanoic acid	<4.22	4.22	10.5	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorotetradecanoic acid	<20	20	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluorotridecanoic acid	3.48	3.48	10.5	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluorotridecanoic acid	<16.5	16.5	50	Unfiltered	ng/g
SWSP-48	Aqueous	7-Sep-21	Perfluoroundecanoic acid	0.823	0.696	2.11	Unfiltered	ng/L
SWSP-48	Solid	7-Sep-21	Perfluoroundecanoic acid	<16.5	16.5	50	Unfiltered	ng/g
SWSP-49	Aqueous	28-Jul-21	Fluorotelomer sulfonate 4:2	<1.37	1.37	3.92	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Fluorotelomer sulfonate 6:2	34	1.37	3.96	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Fluorotelomer sulfonate 8:2	<1.37	1.37	4	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.37	1.37	4.17	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	N-methylperfluoro-1-octanesulfonamide	<1.37	1.37	4.17	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	N-methylperfluoro-1-octanesulfonamidoace	<1.37	1.37	4.17	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorobutanesulfonate	1.3	0.687	1.85	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorobutyric acid	82.3	0.833	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorodecanesulfonate	<0.687	0.687	2.02	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorodecanoic acid	2.8	0.812	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorododecanoic acid	<0.687	0.687	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluoroheptanesulfonate	<0.687	0.687	1.98	Unfiltered	ng/L

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-49	Aqueous	28-Jul-21	Perfluoroheptanoic acid	4.95	0.687	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorohexanesulfonate	<0.687	0.687	1.9	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorohexanoic acid	7.56	0.833	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorononanesulfonate	<0.729	0.729	2	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorononanoic acid	6.08	0.687	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorooctanesulfonamide	<0.687	0.687	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorooctanesulfonate	4.23	0.833	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorooctanoic acid	5.14	0.833	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluoropentanesulfonate	<0.687	0.687	1.96	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluoropentanoic acid	6.27	0.687	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorotetradecanoic acid	<0.833	0.833	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluorotridecanoic acid	<0.687	0.687	2.08	Unfiltered	ng/L
SWSP-49	Aqueous	28-Jul-21	Perfluoroundecanoic acid	2.23	0.687	2.08	Unfiltered	ng/L
SWSP-52	Aqueous	15-Jul-21	Fluorotelomer sulfonate 4:2	<29.3	29.3	83.6	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Fluorotelomer sulfonate 4:2	<1.78	1.78	4.18	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Fluorotelomer sulfonate 6:2	<29.3	29.3	84.5	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Fluorotelomer sulfonate 6:2	<1.73	1.73	4.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Fluorotelomer sulfonate 8:2	16.3	5.87	17.1	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Fluorotelomer sulfonate 8:2	<1.71	1.71	4.27	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.17	1.17	3.56	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.22	1.22	4.44	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	N-methylperfluoro-1-octanesulfonamide	<1.17	1.17	3.56	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	N-methylperfluoro-1-octanesulfonamide	<1.93	1.93	4.44	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	N-methylperfluoro-1-octanesulfonamidoace	<1.17	1.17	3.56	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	N-methylperfluoro-1-octanesulfonamidoace	<1.47	1.47	4.44	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorobutanesulfonate	4.02	0.587	1.58	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorobutanesulfonate	<0.733	0.733	1.98	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorobutyric acid	21.1	3.56	8.89	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorobutyric acid	<0.889	0.889	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorodecanesulfonate	12.2	0.587	1.73	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorodecanesulfonate	2.12	0.733	2.16	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorodecanoic acid	101	0.694	1.78	Unfiltered	ng/L

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-52	Solid	15-Jul-21	Perfluorodecanoic acid	2.24	1.64	4.44	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorododecanoic acid	18.7	0.587	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorododecanoic acid	6.21	0.733	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluoroheptanesulfonate	14	0.587	1.69	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluoroheptanesulfonate	<0.822	0.822	2.11	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluoroheptanoic acid	3.31	0.587	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluoroheptanoic acid	<0.733	0.733	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorohexanesulfonate	20.1	0.587	1.62	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorohexanesulfonate	<0.733	0.733	2.02	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorohexanoic acid	6.57	0.711	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorohexanoic acid	<0.889	0.889	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorononanesulfonate	4.02	0.623	1.71	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorononanesulfonate	<0.733	0.733	2.13	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorononanoic acid	21.1	0.587	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorononanoic acid	<0.733	0.733	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorooctanesulfonamide	2.55	0.587	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorooctanesulfonamide	<0.733	0.733	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorooctanesulfonate	2770	17.8	44.5	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorooctanesulfonate	20.4	0.889	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorooctanoic acid	19.7	0.711	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorooctanoic acid	<0.889	0.889	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluoropentanesulfonate	1.39	0.587	1.67	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluoropentanesulfonate	<0.733	0.733	2.09	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluoropentanoic acid	1.06	0.587	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluoropentanoic acid	<0.733	0.733	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorotetradecanoic acid	1.87	0.711	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorotetradecanoic acid	1.51	0.889	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluorotridecanoic acid	3.86	0.587	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluorotridecanoic acid	2.5	0.733	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	15-Jul-21	Perfluoroundecanoic acid	38.4	0.587	1.78	Unfiltered	ng/L
SWSP-52	Solid	15-Jul-21	Perfluoroundecanoic acid	4.65	0.733	2.22	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Fluorotelomer sulfonate 4:2	<1.22	1.22	3.47	Unfiltered	ng/L

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-52	Solid	2-Sep-21	Fluorotelomer sulfonate 4:2	<2.58	2.58	6.06	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Fluorotelomer sulfonate 6:2	<1.22	1.22	3.51	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Fluorotelomer sulfonate 6:2	<2.52	2.52	6.13	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Fluorotelomer sulfonate 8:2	5.13	1.22	3.55	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Fluorotelomer sulfonate 8:2	<2.48	2.48	6.19	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.22	1.22	3.7	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	N-ethylperfluoro-1-octanesulfonamidoacet	<1.77	1.77	6.45	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	N-methylperfluoro-1-octanesulfonamide	<1.22	1.22	3.7	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	N-methylperfluoro-1-octanesulfonamide	<2.81	2.81	6.45	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	1.33	1.22	3.7	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	N-methylperfluoro-1-octanesulfonamidoace	<2.13	2.13	6.45	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorobutanesulfonate	1.23	0.61	1.64	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorobutanesulfonate	<1.06	1.06	2.87	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorobutyric acid	7.79	0.739	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorobutyric acid	<1.29	1.29	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorodecanesulfonate	2.74	0.61	1.79	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorodecanesulfonate	1.92	1.06	3.13	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorodecanoic acid	25.5	0.721	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorodecanoic acid	<2.39	2.39	6.45	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorododecanoic acid	5.47	0.61	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorododecanoic acid	5.32	1.06	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluoroheptanesulfonate	11.7	0.61	1.76	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluoroheptanesulfonate	<1.19	1.19	3.06	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluoroheptanoic acid	1.09	0.61	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluoroheptanoic acid	<1.06	1.06	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorohexanesulfonate	22.9	0.61	1.68	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorohexanesulfonate	<1.06	1.06	2.94	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorohexanoic acid	1.67	0.739	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorohexanoic acid	<1.29	1.29	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorononanesulfonate	4.97	0.647	1.77	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorononanesulfonate	<1.06	1.06	3.1	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorononanoic acid	11	0.61	1.85	Unfiltered	ng/L

Sampling Point	Matrix	Sample Date	Analyte	Result	MDL	PQL	Sample Preparation	Units
SWSP-52	Solid	2-Sep-21	Perfluorononanoic acid	<1.06	1.06	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorooctanesulfonamide	1.39	0.61	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorooctanesulfonamide	<1.06	1.06	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorooctanesulfonate	896	3.7	9.24	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorooctanesulfonate	14.3	1.29	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorooctanoic acid	18.9	0.739	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorooctanoic acid	<1.29	1.29	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluoropentanesulfonate	0.616	0.61	1.74	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluoropentanesulfonate	<1.06	1.06	3.03	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluoropentanoic acid	<0.61	0.61	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluoropentanoic acid	<1.06	1.06	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorotetradecanoic acid	<0.739	0.739	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorotetradecanoic acid	1.69	1.29	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluorotridecanoic acid	0.979	0.61	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluorotridecanoic acid	2.36	1.06	3.23	Unfiltered	ng/g
SWSP-52	Aqueous	2-Sep-21	Perfluoroundecanoic acid	13.4	0.61	1.85	Unfiltered	ng/L
SWSP-52	Solid	2-Sep-21	Perfluoroundecanoic acid	3.12	1.06	3.23	Unfiltered	ng/g

MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99 percent confidence that the analyte is greater than zero; analyte is matrix-specific
PQL = practical quantitation limit; the lowest concentration of analytes in a sample that can be determined reliably within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions

Table D-3. MS4 Permit sampling results, July 1, 2020, through June 30, 2021

Sampling Point	Sample Date	Analyte	Result	MDL[a]	PQL	Sample Preparation	Units
SWSP-02	13-Jul-2020	Solids, total dissolved	7.14	3.4	14.3	Unfiltered	mg/L
SWSP-02	13-Jul-2020	Solids, total suspended	5.4	0.57	2.5	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Alpha, gross	5.73	0.327	0.772	Unfiltered	pCi/L
SWSP-02	1-Jun-2021	Beta, gross	11.7	0.779	1.6	Unfiltered	pCi/L
SWSP-02	1-Jun-2021	Biochemical oxygen demand	8.5		2	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Chemical oxygen demand	115	8.95	20	Unfiltered	mg/L
SWSP-02	1-Jun-2021	E. coli	3,130		10	Unfiltered	MPN/100 mL
SWSP-02	1-Jun-2021	Nitrate plus nitrite as N	0.73	0.085	0.25	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Nitrogen, kjeldahl	2.41	0.033	0.1	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Oil and grease	1.45	1.27	4.55	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Phosphorus, total as P	0.163	0.02	0.05	Filtered	mg/L
SWSP-02	1-Jun-2021	Phosphorus, total as P	0.423	0.02	0.05	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Solids, total dissolved	72.9	3.4	14.3	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Solids, total suspended	170	57	250	Unfiltered	mg/L
SWSP-02	1-Jun-2021	Total PCB congeners	25,700		112	Unfiltered	pg/L
SWSP-05	13-Jul-2020	Solids, total dissolved	7.14	3.4	14.3	Unfiltered	mg/L
SWSP-05	13-Jul-2020	Solids, total suspended	5.67	0.588	2.58	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Alpha, gross	3.52	0.453	1.02	Unfiltered	pCi/L
SWSP-05	1-Jun-2021	Beta, gross	7.84	0.42	0.879	Unfiltered	pCi/L
SWSP-05	1-Jun-2021	Biochemical oxygen demand	5.9		2	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Chemical oxygen demand	97.9	8.95	20	Unfiltered	mg/L
SWSP-05	1-Jun-2021	E. coli	581		10	Unfiltered	MPN/100 mL
SWSP-05	1-Jun-2021	Nitrate plus nitrite as N	0.675	0.085	0.25	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Nitrogen, kjeldahl	1.38	0.033	0.1	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Oil and grease	1.28	1.28	4.59	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Phosphorus, total as P	0.283	0.02	0.05	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Phosphorus, total as P	0.107	0.02	0.05	Filtered	mg/L
SWSP-05	1-Jun-2021	Solids, total dissolved	101	3.4	14.3	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Solids, total suspended	120	57	250	Unfiltered	mg/L
SWSP-05	1-Jun-2021	Total PCB congeners	6,360		114	Unfiltered	pg/L
SWSP-36	1-Jun-2021	Alpha, gross	1.93	0.392	0.869	Unfiltered	pCi/L
SWSP-36	1-Jun-2021	Beta, gross	4.22	0.677	1.39	Unfiltered	pCi/L

Sampling Point	Sample Date	Analyte	Result	MDL[a]	PQL	Sample Preparation	Units
SWSP-36	1-Jun-2021	Biochemical oxygen demand	3.1		2	Unfiltered	mg/L
SWSP-36	1-Jun-2021	Chemical oxygen demand	122	8.95	20	Unfiltered	mg/L
SWSP-36	1-Jun-2021	E. coli	101.9		1	Unfiltered	MPN/100 mL
SWSP-36	1-Jun-2021	Nitrate plus nitrite as N	1	0.085	0.25	Unfiltered	mg/L
SWSP-36	1-Jun-2021	Nitrogen, kjeldahl	1.3	0.033	0.1	Unfiltered	mg/L
SWSP-36	1-Jun-2021	Oil and grease	1.21	1.21	4.31	Unfiltered	mg/L
SWSP-36	1-Jun-2021	Phosphorus, total as P	0.0767	0.02	0.05	Filtered	mg/L
SWSP-36	1-Jun-2021	Phosphorus, total as P	0.158	0.02	0.05	Unfiltered	mg/L
SWSP-36	1-Jun-2021	Solids, total dissolved	60	3.4	14.3	Unfiltered	mg/L
SWSP-36	1-Jun-2021	Solids, total suspended	23.4	1.63	7.14	Unfiltered	mg/L
SWSP-36	1-Jun-2021	Total PCB congeners	4150		104	Unfiltered	pg/L

[a] Blank cells indicate that an MDL was reported by the lab.
MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99 percent confidence that the analyte is greater than zero; analyte is matrix-specific
MPN = most probable number
N = nitrogen
P = phosphorus
PQL = practical quantitation limit; the lowest concentration of analytes in a sample that can be determined reliably within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions

Appendix E. Sanitary Outfalls Monitoring Results in 2021

Lady beetle (*Coccinellidae*)

Table E-1. Inorganic results for permitted sanitary outfalls, second quarter of calendar year 2021

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	12-Apr-2021	Cyanide, total		0.00167	NU	EPA 335.4
			Cyanide, total		0.00167	NU	EPA 335.4
			Cyanide, total		0.00167	NU	EPA 335.4
			Cyanide, total		0.00167	U	EPA 335.4
			Cyanide, total		0.00167	U	EPA 335.4
CINT	2238A	13-Apr-2021	Aluminum	0.0212	0.0193	J	EPA 200.8
			Ammonia	0.15	0.017		EPA 350.1
			Arsenic	0.00396	0.002	J	EPA 200.8
			Boron	0.0446	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.00488	0.0003	B	EPA 200.8
			Cyanide, total		0.00167	NU	EPA 335.4
			Cyanide, total		0.00167	U	EPA 335.4
			Cyanide, total		0.00167	U	EPA 335.4
			Fluoride	2.32	0.033		EPA 300.0
			Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00463	0.0002		EPA 200.8
			Nickel		0.0006	U	EPA 200.8
			Selenium	0.00263	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
CINT	2238A	13-Apr-2021	Zinc	0.00925	0.0033	J	EPA 200.8
			Aluminum		0.0193	U	EPA 200.8
			Ammonia	0.248	0.017		EPA 350.1
			Arsenic	0.00341	0.002	J	EPA 200.8
			Boron	0.0366	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.00383	0.0003	B	EPA 200.8
			Fluoride	1.03	0.033		EPA 300.0

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	14-Apr-2021	Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00348	0.0002		EPA 200.8
			Nickel		0.0006	U	EPA 200.8
			Selenium	0.00262	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc		0.0033	U	EPA 200.8
CINT	2238A	15-Apr-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia		0.017	*U	EPA 350.1
			Arsenic	0.00264	0.002	J	EPA 200.8
			Boron	0.0313	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0106	0.0003		EPA 200.8
			Fluoride	0.713	0.033		EPA 300.0
			Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00379	0.0002		EPA 200.8
			Nickel		0.0006	U	EPA 200.8
			Selenium	0.00253	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.00759	0.0033	J	EPA 200.8
CINT	2238A	16-Apr-2021	Aluminum	0.0296	0.0193	J	EPA 200.8
			Ammonia	0.203	0.017	*	EPA 350.1
			Arsenic	0.00392	0.002	J	EPA 200.8
			Boron	0.0509	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00313	0.003	J	EPA 200.8
			Copper	0.00114	0.0003	J	EPA 200.8
			Fluoride	1.91	0.033		EPA 300.0
			Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	16-Apr-2021	Molybdenum	0.00465	0.0002		EPA 200.8
			Nickel		0.0006	U	EPA 200.8
			Selenium	0.00272	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW001	2069A	13-Apr-2021	Aluminum	0.0439	0.0193	J	EPA 200.8
			Ammonia	9.05	0.085		EPA 350.1
			Arsenic	0.00279	0.002	J	EPA 200.8
			Boron	0.0575	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00347	0.003	J	EPA 200.8
			Copper	0.0379	0.0003	B	EPA 200.8
			Fluoride	3.77	0.033		EPA 300.0
			Lead	0.0066	0.0005		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00895	0.0002		EPA 200.8
			Nickel	0.0022	0.0006		EPA 200.8
			Selenium	0.0025	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.029	0.0033		EPA 200.8
WW001	2069A	14-Apr-2021	Aluminum	0.0288	0.0193	J	EPA 200.8
			Ammonia	9.58	0.17		EPA 350.1
			Arsenic	0.00262	0.002	J	EPA 200.8
			Boron	0.0592	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00342	0.003	J	EPA 200.8
			Copper	0.0221	0.0003	B	EPA 200.8
			Fluoride	3.1	0.33		EPA 300.0
			Lead	0.00944	0.0005		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0127	0.0002		EPA 200.8
			Nickel	0.00186	0.0006	J	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	14-Apr-2021	Selenium	0.00288	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.0254	0.0033		EPA 200.8
WW001	2069A	15-Apr-2021	Aluminum	0.0617	0.0193	*	EPA 200.8
			Ammonia	10	0.425	*	EPA 350.1
			Arsenic	0.00266	0.002	J	EPA 200.8
			Boron	0.0556	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00391	0.003	J	EPA 200.8
			Copper	0.0212	0.0003		EPA 200.8
			Fluoride	4.38	0.033		EPA 300.0
			Lead	0.0148	0.0005		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00988	0.0002		EPA 200.8
			Nickel	0.00169	0.0006	J	EPA 200.8
			Selenium	0.00272	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.0293	0.0033	B	EPA 200.8
WW001	2069A	16-Apr-2021	Aluminum	0.0649	0.0193		EPA 200.8
			Ammonia	9.1	0.085	*	EPA 350.1
			Arsenic	0.00261	0.002	J	EPA 200.8
			Boron	0.0537	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00356	0.003	J	EPA 200.8
			Copper	0.0241	0.0003		EPA 200.8
			Fluoride	4.59	0.066		EPA 300.0
			Lead	0.0448	0.0005		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0175	0.0002		EPA 200.8
			Nickel	0.00189	0.0006	J	EPA 200.8
			Selenium	0.00274	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	16-Apr-2021	Zinc	0.0408	0.0033		EPA 200.8
WW006	2069F	13-Apr-2021	Aluminum	0.191	0.0193		EPA 200.8
			Ammonia	34.8	0.85		EPA 350.1
			Arsenic	0.00304	0.002	J	EPA 200.8
			Boron	0.0913	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0399	0.0003	B	EPA 200.8
			Cyanide, total	0.00349	0.00167	JN	EPA 335.4
			Cyanide, total	0.00219	0.00167	JN	EPA 335.4
			Cyanide, total	0.00182	0.00167	JN	EPA 335.4
			Fluoride	1.08	0.033		EPA 300.0
			Lead	0.00577	0.0005		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00473	0.0002		EPA 200.8
			Nickel	0.00221	0.0006		EPA 200.8
			Selenium	0.00273	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.108	0.0033		EPA 200.8
WW006	2069F	14-Apr-2021	Aluminum	0.134	0.0193		EPA 200.8
			Ammonia	66.5	0.85		EPA 350.1
			Arsenic	0.00284	0.002	J	EPA 200.8
			Boron	0.139	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0367	0.0003	B	EPA 200.8
			Cyanide, total	0.00256	0.00167	JN	EPA 335.4
			Cyanide, total	0.00196	0.00167	J	EPA 335.4
			Cyanide, total		0.00167	U	EPA 335.4
			Cyanide, total	0.00263	0.00167	J	EPA 335.4
			Fluoride	0.861	0.066		EPA 300.0
			Lead	0.00524	0.0005		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	14-Apr-2021	Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00456	0.0002		EPA 200.8
			Nickel	0.00227	0.0006		EPA 200.8
			Selenium	0.00292	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.0903	0.0033		EPA 200.8
WW006	2069F	15-Apr-2021	Aluminum	0.0853	0.0193	*	EPA 200.8
			Ammonia	42.2	0.85	*	EPA 350.1
			Arsenic	0.00224	0.002	J	EPA 200.8
			Boron	0.123	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0263	0.0003		EPA 200.8
			Cyanide, total	0.00404	0.00167	J	EPA 335.4
			Fluoride	0.858	0.033		EPA 300.0
			Lead	0.00198	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00455	0.0002		EPA 200.8
			Nickel	0.00187	0.0006	J	EPA 200.8
			Selenium	0.00244	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.0857	0.0033	B	EPA 200.8
WW006	2069F	16-Apr-2021	Aluminum	0.113	0.0193		EPA 200.8
			Ammonia	39	0.425	*	EPA 350.1
			Arsenic	0.00244	0.002	J	EPA 200.8
			Boron	0.159	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0258	0.0003		EPA 200.8
			Fluoride	1.1	0.033		EPA 300.0
			Lead	0.000981	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	16-Apr-2021	Molybdenum	0.00443	0.0002		EPA 200.8
			Nickel	0.00179	0.0006	J	EPA 200.8
			Selenium	0.0023	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.169	0.0033		EPA 200.8
WW007	2069G	12-Apr-2021	Cyanide, total		0.00167	NU	EPA 335.4
			Cyanide, total	0.00207	0.00167	JN	EPA 335.4
			Cyanide, total		0.00167	NU	EPA 335.4
WW007	2069G	13-Apr-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	2.22	0.085		EPA 350.1
			Arsenic		0.002	U	EPA 200.8
			Boron	0.0139	0.0052	J	EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.00184	0.0003	JB	EPA 200.8
			Cyanide, total		0.00167	U	EPA 335.4
			Cyanide, total		0.00167	U	EPA 335.4
			Cyanide, total		0.00167	NU	EPA 335.4
			Cyanide, total		0.00167	U	EPA 335.4
			Fluoride	5.09	0.066		EPA 300.0
			Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0147	0.0002		EPA 200.8
			Nickel	0.00302	0.0006		EPA 200.8
			Selenium		0.002	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW007	2069G	14-Apr-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	3.72	0.085		EPA 350.1
			Arsenic		0.002	U	EPA 200.8
			Boron	0.0147	0.0052	J	EPA 200.8
			Cadmium		0.0003	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	14-Apr-2021	Chromium		0.003	U	EPA 200.8
			Copper	0.00169	0.0003	JB	EPA 200.8
			Cyanide, total		0.00167	U	EPA 335.4
			Fluoride	4.76	0.066		EPA 300.0
			Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0137	0.0002		EPA 200.8
			Nickel	0.00154	0.0006	J	EPA 200.8
			Selenium		0.002	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW007	2069G	15-Apr-2021	Aluminum	0.0381	0.0193	J	EPA 200.8
			Ammonia	5.6	0.085	*	EPA 350.1
			Arsenic		0.002	U	EPA 200.8
			Boron	0.015	0.0052	J	EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.00186	0.0003	J	EPA 200.8
			Fluoride	4.59	0.066		EPA 300.0
			Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0193	0.0002		EPA 200.8
			Nickel	0.00157	0.0006	J	EPA 200.8
			Selenium		0.002	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.00488	0.0033	J	EPA 200.8
WW007	2069G	16-Apr-2021	Aluminum	0.0365	0.0193	J	EPA 200.8
			Ammonia	3.78	0.085	*	EPA 350.1
			Arsenic		0.002	U	EPA 200.8
			Boron	0.0155	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	16-Apr-2021	Copper	0.00158	0.0003	J	EPA 200.8
			Fluoride	6.62	0.066		EPA 300.0
			Lead		0.0005	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0154	0.0002		EPA 200.8
			Nickel	0.00102	0.0006	J	EPA 200.8
			Selenium		0.002	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.00559	0.0033	J	EPA 200.8
WW008	2069I	13-Apr-2021	Aluminum	0.215	0.0193		EPA 200.8
			Ammonia	77.5	0.85		EPA 350.1
			Arsenic	0.00353	0.002	J	EPA 200.8
			Boron	0.143	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0679	0.0003	B	EPA 200.8
			Fluoride	0.959	0.033		EPA 300.0
			Lead	0.00109	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00822	0.0002		EPA 200.8
			Nickel	0.0109	0.0006		EPA 200.8
			Selenium	0.00314	0.002	J	EPA 200.8
			Silver	0.000487	0.0003	J	EPA 200.8
			Zinc	0.0935	0.0033		EPA 200.8
WW008	2069I	14-Apr-2021	Aluminum	0.222	0.0193		EPA 200.8
			Ammonia	86	0.85		EPA 350.1
			Arsenic	0.004	0.002	J	EPA 200.8
			Boron	0.521	0.026		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0611	0.0003	B	EPA 200.8
			Fluoride	0.941	0.066		EPA 300.0

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	14-Apr-2021	Lead	0.000827	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0087	0.0002		EPA 200.8
			Nickel	0.00857	0.0006		EPA 200.8
			Selenium	0.00379	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.0906	0.0033		EPA 200.8
WW008	2069I	15-Apr-2021	Aluminum	0.196	0.0193	*	EPA 200.8
			Ammonia	47	0.85	*	EPA 350.1
			Arsenic	0.00325	0.002	J	EPA 200.8
			Boron	0.175	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0507	0.0003		EPA 200.8
			Fluoride	1.06	0.033		EPA 300.0
			Lead	0.00265	0.0005		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00832	0.0002		EPA 200.8
			Nickel	0.00572	0.0006		EPA 200.8
			Selenium	0.00312	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.102	0.0033	B	EPA 200.8
WW008	2069I	16-Apr-2021	Aluminum	0.0753	0.0193		EPA 200.8
			Ammonia	65	0.85	*	EPA 350.1
			Arsenic	0.00363	0.002	J	EPA 200.8
			Boron	0.111	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Copper	0.0908	0.0003		EPA 200.8
			Fluoride	1.18	0.033		EPA 300.0
			Lead	0.0014	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	16-Apr-2021	Molybdenum	0.00736	0.0002		EPA 200.8
			Nickel	0.00377	0.0006		EPA 200.8
			Selenium	0.00385	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.0535	0.0033		EPA 200.8
WW011	2069K	13-Apr-2021	Aluminum	0.147	0.0193		EPA 200.8
			Ammonia	17	0.425		EPA 350.1
			Arsenic	0.00269	0.002	J	EPA 200.8
			Boron	0.0674	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00561	0.003	J	EPA 200.8
			Copper	0.0479	0.0003	B	EPA 200.8
			Fluoride	0.565	0.165		EPA 300.0
			Lead	0.000946	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0694	0.0002		EPA 200.8
			Nickel	0.0023	0.0006		EPA 200.8
			Selenium	0.00252	0.002	J	EPA 200.8
			Silver	0.000301	0.0003	J	EPA 200.8
			Zinc	0.114	0.0033		EPA 200.8
WW011	2069K	14-Apr-2021	Aluminum	0.0906	0.0193		EPA 200.8
			Ammonia	25.5	0.425		EPA 350.1
			Arsenic		0.002	U	EPA 200.8
			Boron	0.0729	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00337	0.003	J	EPA 200.8
			Copper	0.0241	0.0003	B	EPA 200.8
			Fluoride	0.632	0.066		EPA 300.0
			Lead	0.000846	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0533	0.0002		EPA 200.8
			Nickel	0.0025	0.0006		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	14-Apr-2021	Selenium		0.002	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.162	0.0033		EPA 200.8
WW011	2069K	15-Apr-2021	Aluminum	0.174	0.0193	*	EPA 200.8
			Ammonia	19.5	0.425	*	EPA 350.1
			Arsenic	0.00213	0.002	J	EPA 200.8
			Boron	0.065	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00512	0.003	J	EPA 200.8
			Copper	0.0518	0.0003		EPA 200.8
			Fluoride	0.789	0.033		EPA 300.0
			Lead	0.00144	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0815	0.0002		EPA 200.8
			Nickel	0.00261	0.0006		EPA 200.8
			Selenium	0.00212	0.002	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Zinc	0.132	0.0033	B	EPA 200.8
WW011	2069K	16-Apr-2021	Aluminum	0.0797	0.0193		EPA 200.8
			Ammonia	23.4	0.425	*	EPA 350.1
			Arsenic		0.002	U	EPA 200.8
			Boron	0.0603	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00302	0.003	J	EPA 200.8
			Copper	0.0321	0.0003		EPA 200.8
			Fluoride	0.675	0.033		EPA 300.0
			Lead	0.000829	0.0005	J	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0782	0.0002		EPA 200.8
			Nickel	0.0023	0.0006		EPA 200.8
			Selenium		0.002	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	16-Apr-2021	Silver		0.0003	U	EPA 200.8
			Zinc	0.0746	0.0033		EPA 200.8

[a] Blank cells indicate that the data did not require a data qualifier.
CINT = Center for Integrated Nanotechnologies
MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99 percent confidence that the analyte is greater than zero; analyte is matrix-specific
PQL = practical quantitation limit; the lowest concentration of analytes in a sample that can be determined reliably within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions

Laboratory Data Qualifier
* = 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.

Table E-2. Inorganic results for permitted sanitary outfalls, fourth quarter of calendar year 2021

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	18-Oct-2021	Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
CINT	2238A	19-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	0.17	0.017		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00355	0.002	J	EPA 200.8
			Barium	0.0224	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0321	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.00209	0.0003		EPA 200.8
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Fluoride	1.03	0.033		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00358	0.0002		EPA 200.8
			Nickel		0.0006	U	EPA 200.8
			Selenium	0.0021	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00208	0.000067		EPA 200.8
			Zinc		0.0033	U	EPA 200.8
CINT	2238A	20-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	0.528	0.017		EPA 350.1

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	20-Oct-2021	Antimony		0.001	U	EPA 200.8
			Arsenic	0.00444	0.002	J	EPA 200.8
			Barium	0.00835	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0353	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.00235	0.0003		EPA 200.8
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Fluoride	1.77	0.033		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00397	0.0002		EPA 200.8
			Nickel		0.0006	U	EPA 200.8
			Selenium	0.00248	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00199	0.000067		EPA 200.8
			Zinc	0.00389	0.0033	J	EPA 200.8
CINT	2238A	21-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	0.162	0.017		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00593	0.002		EPA 200.8
			Barium	0.288	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0509	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	21-Oct-2021	Cobalt		0.0003	U	EPA 200.8
			Copper	0.00695	0.0003		EPA 200.8
			Fluoride	0.97	0.033		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00364	0.0002		EPA 200.8
			Nickel		0.0006	U	EPA 200.8
			Selenium	0.00239	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00184	0.000067		EPA 200.8
			Zinc		0.0033	U	EPA 200.8
CINT	2238A	22-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	0.527	0.017		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00448	0.002	J	EPA 200.8
			Barium	0.00931	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0322	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.00162	0.0003	J	EPA 200.8
			Fluoride	1.65	0.033		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00396	0.0002		EPA 200.8
			Nickel	0.00193	0.0006	J	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	22-Oct-2021	Selenium	0.00219	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00164	0.000067		EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW001	2069A	19-Oct-2021	Aluminum	0.0636	0.0193		EPA 200.8
			Ammonia	11.4	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00279	0.002	J	EPA 200.8
			Barium	0.138	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.079	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00407	0.003	J	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.0242	0.0003		EPA 200.8
			Fluoride	3.74	0.033		EPA 300.0
			Iron	0.172	0.033		EPA 200.8
			Lead	0.00356	0.0005		EPA 200.8
			Manganese	0.00807	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0113	0.0002		EPA 200.8
			Nickel	0.0019	0.0006	J	EPA 200.8
			Selenium	0.00326	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.0028	0.000067		EPA 200.8
			Zinc	0.0311	0.0033		EPA 200.8
WW001	2069A	20-Oct-2021	Aluminum	0.0507	0.0193		EPA 200.8
			Ammonia	10.4	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00264	0.002	J	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	20-Oct-2021	Barium	0.119	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0538	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00378	0.003	J	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.0306	0.0003		EPA 200.8
			Fluoride	3.94	0.33		EPA 300.0
			Iron	0.303	0.033		EPA 200.8
			Lead	0.00186	0.0005	J	EPA 200.8
			Manganese	0.00816	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0129	0.0002		EPA 200.8
			Nickel	0.0163	0.0006		EPA 200.8
			Selenium	0.0025	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00268	0.000067		EPA 200.8
			Zinc	0.0322	0.0033		EPA 200.8
WW001	2069A	21-Oct-2021	Aluminum	0.0387	0.0193	J	EPA 200.8
			Ammonia	8.65	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00236	0.002	J	EPA 200.8
			Barium	0.123	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0543	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00395	0.003	J	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.0185	0.0003		EPA 200.8
			Fluoride	3.79	0.033		EPA 300.0
			Iron	0.221	0.033		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	21-Oct-2021	Lead	0.00222	0.0005		EPA 200.8
			Manganese	0.00709	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0134	0.0002		EPA 200.8
			Nickel	0.00642	0.0006		EPA 200.8
			Selenium	0.00275	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00251	0.000067		EPA 200.8
			Zinc	0.0272	0.0033		EPA 200.8
WW001	2069A	22-Oct-2021	Aluminum	0.0375	0.0193	J	EPA 200.8
			Ammonia	9.1	0.085		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00284	0.002	J	EPA 200.8
			Barium	0.136	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0574	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00415	0.003	J	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.0191	0.0003		EPA 200.8
			Fluoride	3.51	0.066		EPA 300.0
			Iron	0.143	0.033		EPA 200.8
			Lead	0.00236	0.0005		EPA 200.8
			Manganese	0.00655	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0138	0.0002		EPA 200.8
			Nickel	0.0025	0.0006		EPA 200.8
			Selenium	0.00294	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00242	0.000067		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	22-Oct-2021	Zinc	0.0291	0.0033		EPA 200.8
WW006	2069F	18-Oct-2021	Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total	0.00216	0.00167	J	SM 4500-Cn E
			Cyanide, total	0.00342	0.00167	J	SM 4500-Cn E
WW006	2069F	19-Oct-2021	Aluminum	0.138	0.0193		EPA 200.8
			Ammonia	29	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00249	0.002	J	EPA 200.8
			Barium	0.129	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0631	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.0291	0.0003		EPA 200.8
			Cyanide, total	0.00288	0.00167	J	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Fluoride	0.689	0.033		EPA 300.0
			Iron	0.447	0.033		EPA 200.8
			Lead	0.00141	0.0005	J	EPA 200.8
			Manganese	0.0181	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00397	0.0002		EPA 200.8
			Nickel	0.00206	0.0006		EPA 200.8
			Selenium	0.00289	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00227	0.000067		EPA 200.8
			Zinc	0.13	0.0033		EPA 200.8
WW006	2069F	20-Oct-2021	Aluminum	0.111	0.0193		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	20-Oct-2021	Ammonia	1.71	0.085		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00219	0.002	J	EPA 200.8
			Barium	0.12	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0607	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.0247	0.0003		EPA 200.8
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Fluoride	0.98	0.066		EPA 300.0
			Iron	0.339	0.033		EPA 200.8
			Lead	0.000684	0.0005	J	EPA 200.8
			Manganese	0.0174	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00363	0.0002		EPA 200.8
			Nickel	0.00176	0.0006	J	EPA 200.8
			Selenium	0.00216	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.0021	0.000067		EPA 200.8
			Zinc	0.0898	0.0033		EPA 200.8
WW006	2069F	21-Oct-2021	Aluminum	0.0717	0.0193		EPA 200.8
			Ammonia	28.3	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00212	0.002	J	EPA 200.8
			Barium	0.15	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0745	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	21-Oct-2021	Cobalt		0.0003	U	EPA 200.8
			Copper	0.0211	0.0003		EPA 200.8
			Fluoride	0.732	0.033		EPA 300.0
			Iron	0.259	0.033		EPA 200.8
			Lead	0.000534	0.0005	J	EPA 200.8
			Manganese	0.0158	0.001		EPA 200.8
			Mercury	0.000069	0.000067	J	EPA 245.1/245.2
			Molybdenum	0.00337	0.0002		EPA 200.8
			Nickel	0.00138	0.0006	J	EPA 200.8
			Selenium	0.00167	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00186	0.000067		EPA 200.8
			Zinc	0.0618	0.0033		EPA 200.8
WW006	2069F	22-Oct-2021	Aluminum	0.0654	0.0193		EPA 200.8
			Ammonia	14.4	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00406	0.002	J	EPA 200.8
			Barium	0.103	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	1.02	0.052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.0247	0.0003		EPA 200.8
			Fluoride	0.917	0.033		EPA 300.0
			Iron	0.366	0.033		EPA 200.8
			Lead	0.00194	0.0005	J	EPA 200.8
			Manganese	0.0114	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00385	0.0002		EPA 200.8
			Nickel	0.00136	0.0006	J	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	22-Oct-2021	Selenium		0.0015	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00206	0.000067		EPA 200.8
			Zinc	0.0544	0.0033		EPA 200.8
WW007	2069G	18-Oct-2021	Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
WW007	2069G	19-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	4.19	0.085		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic		0.002	U	EPA 200.8
			Barium	0.0419	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.018	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.00339	0.0003		EPA 200.8
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Cyanide, total	0.384	0.00835		SM 4500-Cn E
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Fluoride	6.53	0.066		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0136	0.0002		EPA 200.8
			Nickel	0.00257	0.0006		EPA 200.8
			Selenium		0.0015	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	19-Oct-2021	Thallium		0.0006	U	EPA 200.8
			Uranium	0.0015	0.000067		EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW007	2069G	20-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	30.3	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic		0.002	U	EPA 200.8
			Barium	0.0502	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0174	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.00286	0.0003		EPA 200.8
			Cyanide, total		0.00167	U	SM 4500-Cn E
			Fluoride	5.76	0.066		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0152	0.0002		EPA 200.8
			Nickel	0.0442	0.0006		EPA 200.8
			Selenium		0.0015	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00211	0.000067		EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW007	2069G	21-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	1.94	0.085		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic		0.002	U	EPA 200.8
			Barium	0.047	0.00067		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	21-Oct-2021	Beryllium		0.0002	U	EPA 200.8
			Boron	0.0137	0.0052	J	EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.00212	0.0003		EPA 200.8
			Fluoride	5.64	0.066		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0151	0.0002		EPA 200.8
			Nickel	0.00461	0.0006		EPA 200.8
			Selenium		0.0015	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00166	0.000067		EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW007	2069G	22-Oct-2021	Aluminum		0.0193	U	EPA 200.8
			Ammonia	1.13	0.017		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic		0.002	U	EPA 200.8
			Barium	0.0465	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0202	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt		0.0003	U	EPA 200.8
			Copper	0.00376	0.0003		EPA 200.8
			Fluoride	5.38	0.066		EPA 300.0
			Iron		0.033	U	EPA 200.8
			Lead		0.0005	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	22-Oct-2021	Manganese		0.001	U	EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.015	0.0002		EPA 200.8
			Nickel	0.00181	0.0006	J	EPA 200.8
			Selenium		0.0015	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00167	0.000067		EPA 200.8
			Zinc		0.0033	U	EPA 200.8
WW008	2069I	19-Oct-2021	Aluminum	0.09	0.0193		EPA 200.8
			Ammonia	24.1	0.425		EPA 350.1
			Antimony	0.00177	0.001	J	EPA 200.8
			Arsenic	0.00231	0.002	J	EPA 200.8
			Barium	0.144	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0621	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt	0.00805	0.0003		EPA 200.8
			Copper	0.0639	0.0003		EPA 200.8
			Fluoride	0.611	0.033		EPA 300.0
			Iron	0.573	0.033		EPA 200.8
			Lead	0.000866	0.0005	J	EPA 200.8
			Manganese	0.031	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0038	0.0002		EPA 200.8
			Nickel	0.0588	0.0006		EPA 200.8
			Selenium	0.0022	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00226	0.000067		EPA 200.8
			Zinc	0.0978	0.0033		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	20-Oct-2021	Aluminum	0.0877	0.0193		EPA 200.8
			Ammonia	19.3	0.425		EPA 350.1
			Antimony	0.00146	0.001	J	EPA 200.8
			Arsenic	0.00311	0.002	J	EPA 200.8
			Barium	0.139	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0605	0.0052		EPA 200.8
			Cadmium	0.000512	0.0003	J	EPA 200.8
			Chromium	0.00415	0.003	J	EPA 200.8
			Cobalt	0.00544	0.0003		EPA 200.8
			Copper	0.0959	0.0003		EPA 200.8
			Fluoride	0.873	0.066		EPA 300.0
			Iron	1.34	0.033		EPA 200.8
			Lead	0.00287	0.0005		EPA 200.8
			Manganese	0.0253	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00621	0.0002		EPA 200.8
			Nickel	0.0403	0.0006		EPA 200.8
			Selenium	0.00344	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00285	0.000067		EPA 200.8
			Zinc	0.0888	0.0033		EPA 200.8
WW008	2069I	21-Oct-2021	Aluminum	0.0577	0.0193		EPA 200.8
			Ammonia	25.3	0.425		EPA 350.1
			Antimony	0.00146	0.001	J	EPA 200.8
			Arsenic		0.002	U	EPA 200.8
			Barium	0.118	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0555	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	21-Oct-2021	Cobalt	0.00405	0.0003		EPA 200.8
			Copper	0.0536	0.0003		EPA 200.8
			Fluoride	0.691	0.033		EPA 300.0
			Iron	0.566	0.033		EPA 200.8
			Lead	0.00104	0.0005	J	EPA 200.8
			Manganese	0.0184	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00365	0.0002		EPA 200.8
			Nickel	0.029	0.0006		EPA 200.8
			Selenium	0.00225	0.0015	J	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00205	0.000067		EPA 200.8
			Zinc	0.0591	0.0033		EPA 200.8
WW008	2069I	22-Oct-2021	Aluminum	0.0384	0.0193	J	EPA 200.8
			Ammonia	23.5	0.425		EPA 350.1
			Antimony	0.00141	0.001	J	EPA 200.8
			Arsenic		0.002	U	EPA 200.8
			Barium	0.119	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0559	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium		0.003	U	EPA 200.8
			Cobalt	0.00282	0.0003		EPA 200.8
			Copper	0.0292	0.0003		EPA 200.8
			Fluoride	0.736	0.033		EPA 300.0
			Iron	0.271	0.033		EPA 200.8
			Lead		0.0005	U	EPA 200.8
			Manganese	0.0148	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.00341	0.0002		EPA 200.8
			Nickel	0.0215	0.0006		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	22-Oct-2021	Selenium		0.0015	U	EPA 200.8
			Silver		0.0003	U	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00177	0.000067		EPA 200.8
			Zinc	0.0441	0.0033		EPA 200.8
WW011	2069K	19-Oct-2021	Aluminum	0.308	0.0193		EPA 200.8
			Ammonia	26.8	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.0025	0.002	J	EPA 200.8
			Barium	0.148	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.0873	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.0106	0.003		EPA 200.8
			Cobalt	0.00147	0.0003		EPA 200.8
			Copper	0.0866	0.0003		EPA 200.8
			Fluoride	0.825	0.033		EPA 300.0
			Iron	1.95	0.033		EPA 200.8
			Lead	0.00249	0.0005		EPA 200.8
			Manganese	0.113	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.047	0.0002		EPA 200.8
			Nickel	0.00707	0.0006		EPA 200.8
			Selenium	0.00198	0.0015	J	EPA 200.8
			Silver	0.00102	0.0003		EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.0027	0.000067		EPA 200.8
			Zinc	0.296	0.0033		EPA 200.8
WW011	2069K	20-Oct-2021	Aluminum	0.275	0.0193		EPA 200.8
			Ammonia	33.8	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.0046	0.002	J	EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	20-Oct-2021	Barium	0.36	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.065	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.0183	0.003		EPA 200.8
			Cobalt	0.00137	0.0003		EPA 200.8
			Copper	0.0822	0.0003		EPA 200.8
			Fluoride	0.999	0.066		EPA 300.0
			Iron	14.4	0.033		EPA 200.8
			Lead	0.00238	0.0005		EPA 200.8
			Manganese	0.204	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.042	0.0002		EPA 200.8
			Nickel	0.00885	0.0006		EPA 200.8
			Selenium	0.00248	0.0015	J	EPA 200.8
			Silver	0.000741	0.0003	J	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.0079	0.000067		EPA 200.8
			Zinc	0.972	0.0033		EPA 200.8
WW011	2069K	21-Oct-2021	Aluminum	0.23	0.0193		EPA 200.8
			Ammonia	24.2	0.425		EPA 350.1
			Antimony		0.001	U	EPA 200.8
			Arsenic	0.00202	0.002	J	EPA 200.8
			Barium	0.119	0.00067		EPA 200.8
			Beryllium		0.0002	U	EPA 200.8
			Boron	0.173	0.0052		EPA 200.8
			Cadmium		0.0003	U	EPA 200.8
			Chromium	0.00825	0.003	J	EPA 200.8
			Cobalt	0.000968	0.0003	J	EPA 200.8
			Copper	0.06	0.0003		EPA 200.8
			Fluoride	1	0.033		EPA 300.0
			Iron	2.57	0.033		EPA 200.8

Station	Permit Number	Date Collected	Analyte	Result (mg/L)	MDL (mg/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	21-Oct-2021	Lead	0.0017	0.0005	J	EPA 200.8
			Manganese	0.0862	0.001		EPA 200.8
			Mercury		0.000067	U	EPA 245.1/245.2
			Molybdenum	0.0353	0.0002		EPA 200.8
			Nickel	0.00568	0.0006		EPA 200.8
			Selenium	0.00168	0.0015	J	EPA 200.8
			Silver	0.000857	0.0003	J	EPA 200.8
			Thallium		0.0006	U	EPA 200.8
			Uranium	0.00212	0.000067		EPA 200.8
			Zinc	0.364	0.0033		EPA 200.8

[a] Blank cells indicate that the data did not require a data qualifier.
CINT = Center for Integrated Nanotechnologies
MDL = method detection limit; the minimum concentration or activity that can be measured and reported with 99 percent confidence that the analyte is greater than zero; analyte is matrix-specific

Laboratory Data Qualifier
J = An estimated value, the analyte concentration was above the effective MDL and below the effective PQL.
U = The analyte was absent or below the method detection limit.

Table E-3. Radiological results for permitted sanitary outfalls, second quarter of calendar year 2021

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	13-Apr-2021	Actinium-228	2.91 ± 15.9	11.2	U	EPA 901.1
			Alpha, gross	0.632 ± 2.84	4.97	U	EPA 900.0/SW846 9310
			Americium-241	17.4 ± 18.1	28.3	U	EPA 901.1
			Beryllium-7	2.98 ± 16.3	29.6	U	EPA 901.1
			Beta, gross	4.45 ± 1.74	2.75		EPA 900.0/SW846 9310
			Bismuth-212	15.2 ± 43.6	52.4	U	EPA 901.1
			Bismuth-214	−2.93 ± 8.41	8.51	U	EPA 901.1
			Cesium-137	0.913 ± 1.96	3.54	U	EPA 901.1
			Cobalt-60	2.77 ± 4.17	3.83	U	EPA 901.1
			Lead-212	2.35 ± 8.22	5.83	U	EPA 901.1
			Lead-214	3.64 ± 10.6	8.82	U	EPA 901.1
			Neptunium-237	1.56 ± 3.92	6.53	U	EPA 901.1
			Potassium-40	−25.3 ± 47.3	60.3	U	EPA 901.1
			Radium-223	21.5 ± 39.4	64.9	U	EPA 901.1
			Radium-224	30.1 ± 41.4	62.6	U	EPA 901.1
			Radium-226	3.69 ± 103	62.5	U	EPA 901.1
			Radium-228	2.91 ± 15.9	11.2	U	EPA 901.1
			Sodium-22	−1.28 ± 1.89	3.13	U	EPA 901.1
			Thorium-227	−2.06 ± 15.2	25.1	U	EPA 901.1
			Thorium-231	−3.5 ± 27.8	48.4	U	EPA 901.1
			Thorium-234	83.8 ± 255	210	U	EPA 901.1
			Tritium	−3.19 ± 118	205	U	EPA 906.0 Modified
			Uranium-235	6.31 ± 19	21.5	U	EPA 901.1
			Uranium-238	83.8 ± 255	210	U	EPA 901.1
		14-Apr-2021	Actinium-228	−2.61 ± 17.8	22.7	U	EPA 901.1
			Alpha, gross	1.17 ± .852	1.36	U	EPA 900.0/SW846 9310
			Americium-241	−0.208 ± 3.36	5.68	U	EPA 901.1
			Beryllium-7	7.52 ± 20	35.3	U	EPA 901.1
			Beta, gross	1.36 ± .627	0.996		EPA 900.0/SW846 9310
			Bismuth-212	24.9 ± 39.9	68.3	U	EPA 901.1
			Bismuth-214	2.4 ± 11.5	10.1	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	14-Apr-2021	Cesium-137	−4.59 ± 4.87	4.28	U	EPA 901.1
			Cobalt-60	2.85 ± 3.22	5.77	U	EPA 901.1
			Lead-212	−7.94 ± 8.23	7.45	U	EPA 901.1
			Lead-214	0.303 ± 10.8	9.33	U	EPA 901.1
			Neptunium-237	−1.28 ± 6.09	6.82	U	EPA 901.1
			Potassium-40	129 ± 66.2	49.8		EPA 901.1
			Radium-223	−36.5 ± 41.6	64.3	U	EPA 901.1
			Radium-224	−107 ± 62.5	61.5	U	EPA 901.1
			Radium-226	5.36 ± 87.7	60.5	U	EPA 901.1
			Radium-228	−2.61 ± 17.8	22.7	U	EPA 901.1
			Sodium-22	1.12 ± 2.79	5.17	U	EPA 901.1
			Thorium-227	−12.3 ± 15.4	24.4	U	EPA 901.1
			Thorium-231	−2.05 ± 25.1	30.3	U	EPA 901.1
			Thorium-234	−36.4 ± 61.4	76.6	U	EPA 901.1
			Tritium	−33.8 ± 118	208	U	EPA 906.0 Modified
			Uranium-235	32.9 ± 17.8	16.6	X	EPA 901.1
			Uranium-238	−36.4 ± 61.4	76.6	U	EPA 901.1
		15-Apr-2021	Actinium-228	−10.3 ± 14.2	13.8	U	EPA 901.1
			Alpha, gross	3.84 ± 3.66	5.91	U	EPA 900.0/SW846 9310
			Americium-241	−1.87 ± 8.05	14	U	EPA 901.1
			Beryllium-7	5.45 ± 14.1	25.4	U	EPA 901.1
			Beta, gross	12.9 ± 5.73	9.25		EPA 900.0/SW846 9310
			Bismuth-212	11.7 ± 22.5	39.9	U	EPA 901.1
			Bismuth-214	−5.08 ± 6.17	6.86	U	EPA 901.1
			Cesium-137	1.49 ± 1.83	3.16	U	EPA 901.1
			Cobalt-60	0.72 ± 1.7	3.13	U	EPA 901.1
			Lead-212	2.97 ± 5.71	5.45	U	EPA 901.1
			Lead-214	6.91 ± 8.6	7.07	U	EPA 901.1
			Neptunium-237	−0.864 ± 3.23	5.2	U	EPA 901.1
			Potassium-40	3.42 ± 48.6	30.2	U	EPA 901.1
			Radium-223	−15.9 ± 27.6	47.3	U	EPA 901.1
			Radium-224	5.62 ± 31.8	49	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	15-Apr-2021	Radium-226	15.1 ± 78.4	50.3	U	EPA 901.1
			Radium-228	−10.3 ± 14.2	13.8	U	EPA 901.1
			Sodium-22	−0.574 ± 1.7	3.04	U	EPA 901.1
			Thorium-227	7.05 ± 12.6	20.7	U	EPA 901.1
			Thorium-231	35.7 ± 47.2	35.1	X	EPA 901.1
			Thorium-234	−111 ± 143	148	U	EPA 901.1
			Tritium	−11.7 ± 91.4	172	U	EPA 906.0 Modified
			Uranium-235	21.9 ± 23.7	15.5	X	EPA 901.1
			Uranium-238	−111 ± 143	148	U	EPA 901.1
		16-Apr-2021	Actinium-228	−0.339 ± 12.2	17.3	U	EPA 901.1
			Alpha, gross	2 ± 1.02	1.49		EPA 900.0/SW846 9310
			Americium-241	2.15 ± 3.08	5.09	U	EPA 901.1
			Beryllium-7	−1.6 ± 19.7	33.9	U	EPA 901.1
			Beta, gross	1.64 ± 0.888	1.45		EPA 900.0/SW846 9310
			Bismuth-212	−12.1 ± 57.1	55.3	U	EPA 901.1
			Bismuth-214	7.55 ± 9.14	8.65	U	EPA 901.1
			Cesium-137	−1.83 ± 3.67	3.9	U	EPA 901.1
			Cobalt-60	−1.19 ± 2.59	4.3	U	EPA 901.1
			Lead-212	2.03 ± 6.72	6.26	U	EPA 901.1
			Lead-214	−0.446 ± 6.83	7.48	U	EPA 901.1
			Neptunium-237	1.77 ± 3.41	6	U	EPA 901.1
			Potassium-40	11.7 ± 44.8	37.2	U	EPA 901.1
			Radium-223	26 ± 50.6	59.8	U	EPA 901.1
			Radium-224	18 ± 34.1	54.6	U	EPA 901.1
			Radium-226	16.8 ± 83.1	48.8	U	EPA 901.1
			Radium-228	−0.339 ± 12.2	17.3	U	EPA 901.1
			Sodium-22	0.372 ± 2.42	4.38	U	EPA 901.1
			Thorium-227	−9.98 ± 13.6	21.9	U	EPA 901.1
			Thorium-231	−20.6 ± 28.3	29.6	U	EPA 901.1
			Thorium-234	2.24 ± 65.3	91.9	U	EPA 901.1
			Tritium	50.9 ± 102	178	U	EPA 906.0 Modified
			Uranium-235	19 ± 20.7	14.6	X	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	16-Apr-2021	Uranium-238	2.24 ± 65.3	91.9	U	EPA 901.1
WW001	2069A	13-Apr-2021	Actinium-228	−17.4 ± 17.3	17.5	U	EPA 901.1
			Alpha, gross	1.86 ± 1.93	3.21	U	EPA 900.0/SW846 9310
			Americium-241	14.6 ± 14	22.8	U	EPA 901.1
			Beryllium-7	−1.57 ± 16.7	30	U	EPA 901.1
			Beta, gross	8.82 ± 1.65	2.39		EPA 900.0/SW846 9310
			Bismuth-212	17.5 ± 31.4	54.8	U	EPA 901.1
			Bismuth-214	−3.72 ± 9.62	9.2	U	EPA 901.1
			Cesium-137	1.71 ± 2.35	4.09	U	EPA 901.1
			Cobalt-60	−0.43 ± 2.58	4.63	U	EPA 901.1
			Lead-212	0.75 ± 6.61	6.76	U	EPA 901.1
			Lead-214	−1.12 ± 7.1	8.01	U	EPA 901.1
			Neptunium-237	0.77 ± 3.71	6.52	U	EPA 901.1
			Potassium-40	0.407 ± 62.4	43.2	U	EPA 901.1
			Radium-223	−4.94 ± 38.9	63.9	U	EPA 901.1
			Radium-224	12.4 ± 34.8	56.4	U	EPA 901.1
			Radium-226	49.1 ± 85.2	54.7	U	EPA 901.1
			Radium-228	−17.4 ± 17.3	17.5	U	EPA 901.1
			Sodium-22	−1.69 ± 2.29	3.68	U	EPA 901.1
			Thorium-227	−6.88 ± 13.9	23.4	U	EPA 901.1
			Thorium-231	−1.46 ± 45.6	43	U	EPA 901.1
			Thorium-234	227 ± 238	163	X	EPA 901.1
			Tritium	69.6 ± 123	208	U	EPA 906.0 Modified
			Uranium-235	−14.7 ± 17.8	18.6	U	EPA 901.1
			Uranium-238	227 ± 238	163	X	EPA 901.1
		14-Apr-2021	Actinium-228	−9.14 ± 14.5	15.2	U	EPA 901.1
			Alpha, gross	3.01 ± 1.51	2.14		EPA 900.0/SW846 9310
			Americium-241	2.32 ± 5.83	6.61	U	EPA 901.1
			Beryllium-7	−1.83 ± 12.9	23.3	U	EPA 901.1
			Beta, gross	8.69 ± 1.41	1.98		EPA 900.0/SW846 9310
			Bismuth-212	3.28 ± 53.8	41.6	U	EPA 901.1
			Bismuth-214	5.03 ± 9.05	9.08	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	14-Apr-2021	Cesium-137	−1.04 ± 1.81	3.04	U	EPA 901.1
			Cobalt-60	−0.126 ± 1.71	3	U	EPA 901.1
			Lead-212	−1.24 ± 5.41	7.88	U	EPA 901.1
			Lead-214	−4.55 ± 6.72	7.63	U	EPA 901.1
			Neptunium-237	−2.82 ± 3.49	5.2	U	EPA 901.1
			Potassium-40	30.8 ± 46.3	29.1	X	EPA 901.1
			Radium-223	−13.5 ± 33.9	54.6	U	EPA 901.1
			Radium-224	−281 ± 143	53.3	U	EPA 901.1
			Radium-226	−73 ± 68.4	68.3	U	EPA 901.1
			Radium-228	−9.14 ± 14.5	15.2	U	EPA 901.1
			Sodium-22	1.3 ± 2.1	3.42	U	EPA 901.1
			Thorium-227	23.4 ± 20.1	23.4	U	EPA 901.1
			Thorium-231	14 ± 19.9	31.6	U	EPA 901.1
			Thorium-234	13.7 ± 106	63	U	EPA 901.1
			Tritium	−49.4 ± 118	208	U	EPA 906.0 Modified
			Uranium-235	−5.15 ± 16.9	18.8	U	EPA 901.1
			Uranium-238	13.7 ± 106	63	U	EPA 901.1
		15-Apr-2021	Actinium-228	7.79 ± 8.62	10.1	U	EPA 901.1
			Alpha, gross	2.39 ± 1.28	1.86		EPA 900.0/SW846 9310
			Americium-241	−3.52 ± 5.86	9.26	U	EPA 901.1
			Beryllium-7	−17.2 ± 27.9	22.8	U	EPA 901.1
			Beta, gross	7.92 ± 1.22	1.5		EPA 900.0/SW846 9310
			Bismuth-212	5.23 ± 33.9	42.5	U	EPA 901.1
			Bismuth-214	1.69 ± 8.24	5.38	U	EPA 901.1
			Cesium-137	0.47 ± 1.66	2.9	U	EPA 901.1
			Cobalt-60	2.23 ± 2	3.51	U	EPA 901.1
			Lead-212	1.36 ± 5.38	4.32	U	EPA 901.1
			Lead-214	3.9 ± 8.41	5.37	U	EPA 901.1
			Neptunium-237	−0.645 ± 2.66	4.65	U	EPA 901.1
			Potassium-40	1.05 ± 50	26	U	EPA 901.1
			Radium-223	−3.76 ± 27.5	48.4	U	EPA 901.1
			Radium-224	7.08 ± 28	45.3	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	15-Apr-2021	Radium-226	−54.2 ± 61.8	72.5	U	EPA 901.1
			Radium-228	7.79 ± 8.62	10.1	U	EPA 901.1
			Sodium-22	0.989 ± 1.63	3.06	U	EPA 901.1
			Thorium-227	−5.99 ± 11.1	18.6	U	EPA 901.1
			Thorium-231	0.953 ± 36.8	28.1	U	EPA 901.1
			Thorium-234	−20.9 ± 103	111	U	EPA 901.1
			Tritium	41.5 ± 121	207	U	EPA 906.0 Modified
			Uranium-235	−14.1 ± 16.3	15.9	U	EPA 901.1
			Uranium-238	−20.9 ± 103	111	U	EPA 901.1
		16-Apr-2021	Actinium-228	11.3 ± 12.9	12.9	U	EPA 901.1
			Alpha, gross	2.75 ± 1.53	2.25		EPA 900.0/SW846 9310
			Americium-241	−1.19 ± 6.21	9.95	U	EPA 901.1
			Beryllium-7	−6.49 ± 13.2	22.4	U	EPA 901.1
			Beta, gross	8.95 ± 1.62	2.34		EPA 900.0/SW846 9310
			Bismuth-212	20.9 ± 22.6	38.9	U	EPA 901.1
			Bismuth-214	0.935 ± 8.5	5.25	U	EPA 901.1
			Cesium-137	0.552 ± 1.42	2.56	U	EPA 901.1
			Cobalt-60	2.23 ± 1.91	3.36	U	EPA 901.1
			Lead-212	1.27 ± 5.25	4.11	U	EPA 901.1
			Lead-214	−4.96 ± 6.54	6.25	U	EPA 901.1
			Neptunium-237	−1.4 ± 2.61	4.5	U	EPA 901.1
			Potassium-40	−47.2 ± 43.4	41	U	EPA 901.1
			Radium-223	−16.1 ± 27.6	46.9	U	EPA 901.1
			Radium-224	−12.9 ± 35.5	43	U	EPA 901.1
			Radium-226	6.81 ± 60.5	41.6	U	EPA 901.1
			Radium-228	11.3 ± 12.9	12.9	U	EPA 901.1
			Sodium-22	0.884 ± 1.48	2.61	U	EPA 901.1
			Thorium-227	3.11 ± 10.3	17.2	U	EPA 901.1
			Thorium-231	−7.06 ± 28.2	30	U	EPA 901.1
			Thorium-234	7.7 ± 116	80.1	U	EPA 901.1
			Tritium	115 ± 118	192	U	EPA 906.0 Modified
			Uranium-235	2.92 ± 16.4	12.9	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	16-Apr-2021	Uranium-238	7.7 ± 116	80.1	U	EPA 901.1
WW006	2069F	13-Apr-2021	Actinium-228	−10.5 ± 15.2	15.2	U	EPA 901.1
			Alpha, gross	1.59 ± 1.07	1.62	U	EPA 900.0/SW846 9310
			Americium-241	11.5 ± 15.1	26	U	EPA 901.1
			Beryllium-7	−16.1 ± 20.6	28.4	U	EPA 901.1
			Beta, gross	17 ± 1.84	2.14		EPA 900.0/SW846 9310
			Bismuth-212	5.56 ± 29	50.9	U	EPA 901.1
			Bismuth-214	5.42 ± 8.68	7.24	U	EPA 901.1
			Cesium-137	0.606 ± 2.04	3.63	U	EPA 901.1
			Cobalt-60	0.26 ± 2.35	4.3	U	EPA 901.1
			Lead-212	4.86 ± 7.44	6.75	U	EPA 901.1
			Lead-214	0.969 ± 10.3	8.4	U	EPA 901.1
			Neptunium-237	−0.139 ± 3.4	6.17	U	EPA 901.1
			Potassium-40	17.5 ± 51.2	39.1	U	EPA 901.1
			Radium-223	−8.55 ± 34.6	61.5	U	EPA 901.1
			Radium-224	−23.1 ± 40.9	57.8	U	EPA 901.1
			Radium-226	20.3 ± 95.9	60	U	EPA 901.1
			Radium-228	−10.5 ± 15.2	15.2	U	EPA 901.1
			Sodium-22	2.69 ± 1.96	4.1	U	EPA 901.1
			Thorium-227	−11.5 ± 16	23.8	U	EPA 901.1
			Thorium-231	23.9 ± 28.5	47.5	U	EPA 901.1
			Thorium-234	25.9 ± 246	196	U	EPA 901.1
			Tritium	14.5 ± 122	211	U	EPA 906.0 Modified
			Uranium-235	−29.1 ± 24.2	19.4	U	EPA 901.1
			Uranium-238	25.9 ± 246	196	U	EPA 901.1
		14-Apr-2021	Actinium-228	2.7 ± 15.3	15.5	U	EPA 901.1
			Alpha, gross	3.2 ± 1.84	2.83		EPA 900.0/SW846 9310
			Americium-241	−4.71 ± 16.4	28.3	U	EPA 901.1
			Beryllium-7	1.34 ± 16.2	29.2	U	EPA 901.1
			Beta, gross	17 ± 2.33	3.05		EPA 900.0/SW846 9310
			Bismuth-212	−4.76 ± 28.5	49.6	U	EPA 901.1
			Bismuth-214	0.259 ± 10.2	9.23	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	14-Apr-2021	Cesium-137	−0.376 ± 1.96	3.43	U	EPA 901.1
			Cobalt-60	0.669 ± 2.52	4.25	U	EPA 901.1
			Lead-212	−0.294 ± 5.97	7.04	U	EPA 901.1
			Lead-214	3 ± 8.63	8.63	U	EPA 901.1
			Neptunium-237	−1.86 ± 4.23	6.62	U	EPA 901.1
			Potassium-40	−1.65 ± 45	68.2	U	EPA 901.1
			Radium-223	0.652 ± 36.7	66.7	U	EPA 901.1
			Radium-224	−50.6 ± 46.3	62.2	U	EPA 901.1
			Radium-226	9.62 ± 96.5	65.5	U	EPA 901.1
			Radium-228	2.7 ± 15.3	15.5	U	EPA 901.1
			Sodium-22	0.088 ± 2	3.78	U	EPA 901.1
			Thorium-227	−9.54 ± 16.6	25.6	U	EPA 901.1
			Thorium-231	59.2 ± 48.4	48.2	X	EPA 901.1
			Thorium-234	−7.21 ± 207	247	U	EPA 901.1
			Tritium	−3.71 ± 120	209	U	EPA 906.0 Modified
			Uranium-235	2.24 ± 23.8	19.7	U	EPA 901.1
			Uranium-238	−7.21 ± 207	247	U	EPA 901.1
		15-Apr-2021	Actinium-228	12.3 ± 15	14.7	U	EPA 901.1
			Alpha, gross	1.18 ± 1.54	2.62	U	EPA 900.0/SW846 9310
			Americium-241	−4.96 ± 7.72	12.6	U	EPA 901.1
			Beryllium-7	−1.55 ± 13.2	23.5	U	EPA 901.1
			Beta, gross	17.1 ± 2.46	3.33		EPA 900.0/SW846 9310
			Bismuth-212	35.7 ± 47.4	41	U	EPA 901.1
			Bismuth-214	5.03 ± 7.45	6.19	U	EPA 901.1
			Cesium-137	−0.0792 ± 1.75	2.76	U	EPA 901.1
			Cobalt-60	−1.09 ± 1.86	3.11	U	EPA 901.1
			Lead-212	3.18 ± 5.88	4.56	U	EPA 901.1
			Lead-214	−1.74 ± 6.68	6.67	U	EPA 901.1
			Neptunium-237	0.561 ± 3.06	5.57	U	EPA 901.1
			Potassium-40	32.9 ± 48	26.1	X	EPA 901.1
			Radium-223	−13.7 ± 29.6	51.2	U	EPA 901.1
			Radium-224	−16.7 ± 51.2	55	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	15-Apr-2021	Radium-226	−2.04 ± 57.3	67.8	U	EPA 901.1
			Radium-228	12.3 ± 15	14.7	U	EPA 901.1
			Sodium-22	0.0867 ± 1.73	3.24	U	EPA 901.1
			Thorium-227	−15.2 ± 14.7	19.6	U	EPA 901.1
			Thorium-231	95.5 ± 55.6	30.7	X	EPA 901.1
			Thorium-234	−62.8 ± 123	128	U	EPA 901.1
			Tritium	−17.3 ± 118	206	U	EPA 906.0 Modified
			Uranium-235	−8.08 ± 15.1	15.9	U	EPA 901.1
			Uranium-238	−62.8 ± 123	128	U	EPA 901.1
		16-Apr-2021	Actinium-228	12.2 ± 15.7	13.4	U	EPA 901.1
			Alpha, gross	−0.897 ± 2.12	3.87	U	EPA 900.0/SW846 9310
			Americium-241	−6.53 ± 13.6	23.2	U	EPA 901.1
			Beryllium-7	−15.4 ± 20.3	32.1	U	EPA 901.1
			Beta, gross	16.4 ± 2.25	2.94		EPA 900.0/SW846 9310
			Bismuth-212	−27.5 ± 47.3	51.3	U	EPA 901.1
			Bismuth-214	3.47 ± 11.7	8.86	U	EPA 901.1
			Cesium-137	−0.626 ± 2.18	3.69	U	EPA 901.1
			Cobalt-60	0.322 ± 2.27	4.18	U	EPA 901.1
			Lead-212	0.513 ± 5.57	6.8	U	EPA 901.1
			Lead-214	−7.84 ± 9.32	7.89	U	EPA 901.1
			Neptunium-237	0.778 ± 3.6	6.56	U	EPA 901.1
			Potassium-40	9.19 ± 56.1	42.5	U	EPA 901.1
			Radium-223	−14.5 ± 37.1	64.8	U	EPA 901.1
			Radium-224	−84.9 ± 55.8	59.1	U	EPA 901.1
			Radium-226	19.8 ± 83.4	59.7	U	EPA 901.1
			Radium-228	12.2 ± 15.7	13.4	U	EPA 901.1
			Sodium-22	1.21 ± 2.65	4.41	U	EPA 901.1
			Thorium-227	2.7 ± 14.6	24.4	U	EPA 901.1
			Thorium-231	24.9 ± 28.3	46.9	U	EPA 901.1
			Thorium-234	53.1 ± 181	201	U	EPA 901.1
			Tritium	2.97 ± 107	197	U	EPA 906.0 Modified
			Uranium-235	−4.88 ± 20.7	20.2	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	16-Apr-2021	Uranium-238	53.1 ± 181	201	U	EPA 901.1
WW007	2069G	13-Apr-2021	Actinium-228	1.75 ± 15.9	15	U	EPA 901.1
			Alpha, gross	1.19 ± .938	1.51	U	EPA 900.0/SW846 9310
			Americium-241	−1.43 ± 8.41	14.7	U	EPA 901.1
			Beryllium-7	4.1 ± 13.7	24.2	U	EPA 901.1
			Beta, gross	2.56 ± .985	1.57		EPA 900.0/SW846 9310
			Bismuth-212	−13 ± 36.7	40.8	U	EPA 901.1
			Bismuth-214	2.57 ± 11	5.95	U	EPA 901.1
			Cesium-137	0.451 ± 1.76	3.05	U	EPA 901.1
			Cobalt-60	−0.298 ± 1.81	3.17	U	EPA 901.1
			Lead-212	1.04 ± 6	4.88	U	EPA 901.1
			Lead-214	0.186 ± 7.24	7.05	U	EPA 901.1
			Neptunium-237	−0.161 ± 3.54	5.66	U	EPA 901.1
			Potassium-40	−1.37 ± 34.1	44.6	U	EPA 901.1
			Radium-223	−0.0911 ± 30.3	54.1	U	EPA 901.1
			Radium-224	42.1 ± 34.8	49.8	U	EPA 901.1
			Radium-226	−39.3 ± 67.6	75.2	U	EPA 901.1
			Radium-228	1.75 ± 15.9	15	U	EPA 901.1
			Sodium-22	0.912 ± 1.93	3.52	U	EPA 901.1
			Thorium-227	−9.9 ± 12.8	20.7	U	EPA 901.1
			Thorium-231	25.9 ± 31.9	34.8	U	EPA 901.1
			Thorium-234	−17 ± 125	158	U	EPA 901.1
			Tritium	−12.1 ± 120	209	U	EPA 906.0 Modified
			Uranium-235	7.84 ± 21.5	18.2	U	EPA 901.1
			Uranium-238	−17 ± 125	158	U	EPA 901.1
		14-Apr-2021	Actinium-228	−11.1 ± 13.9	15.7	U	EPA 901.1
			Alpha, gross	1.62 ± 1.01	1.56		EPA 900.0/SW846 9310
			Americium-241	−6.27 ± 12.5	18.8	U	EPA 901.1
			Beryllium-7	−1.46 ± 17.8	30.4	U	EPA 901.1
			Beta, gross	1.66 ± .736	1.17		EPA 900.0/SW846 9310
			Bismuth-212	−47.2 ± 46.5	49	U	EPA 901.1
			Bismuth-214	13.8 ± 12.4	13.8	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	14-Apr-2021	Cesium-137	−0.454 ± 2	3.57	U	EPA 901.1
			Cobalt-60	−1.01 ± 1.99	3.45	U	EPA 901.1
			Lead-212	−7.09 ± 7.45	7.2	U	EPA 901.1
			Lead-214	6.42 ± 11	8.29	U	EPA 901.1
			Neptunium-237	1.62 ± 4.04	6.4	U	EPA 901.1
			Potassium-40	25.7 ± 62.3	30.8	U	EPA 901.1
			Radium-223	25.3 ± 37.3	64.2	U	EPA 901.1
			Radium-224	−126 ± 70.1	61.2	U	EPA 901.1
			Radium-226	−113 ± 105	94.5	U	EPA 901.1
			Radium-228	−11.1 ± 13.9	15.7	U	EPA 901.1
			Sodium-22	−1.87 ± 2.18	3.41	U	EPA 901.1
			Thorium-227	−6.22 ± 14.4	24.5	U	EPA 901.1
			Thorium-231	−14.7 ± 42	49.9	U	EPA 901.1
			Thorium-234	225 ± 221	159	X	EPA 901.1
			Tritium	−49.1 ± 117	206	U	EPA 906.0 Modified
			Uranium-235	−1.05 ± 19.2	21.1	U	EPA 901.1
			Uranium-238	225 ± 221	159	X	EPA 901.1
		15-Apr-2021	Actinium-228	8.96 ± 12.4	10.2	U	EPA 901.1
			Alpha, gross	−0.861 ± 1.19	2.17	U	EPA 900.0/SW846 9310
			Americium-241	5.69 ± 6.43	8.8	U	EPA 901.1
			Beryllium-7	−5.74 ± 15.6	23.4	U	EPA 901.1
			Beta, gross	0.661 ± .964	1.63	U	EPA 900.0/SW846 9310
			Bismuth-212	−16.1 ± 38.5	38.7	U	EPA 901.1
			Bismuth-214	−0.00338 ± 5.59	6.56	U	EPA 901.1
			Cesium-137	1.51 ± 1.72	2.92	U	EPA 901.1
			Cobalt-60	−0.838 ± 1.66	2.8	U	EPA 901.1
			Lead-212	−2.53 ± 4.09	5.36	U	EPA 901.1
			Lead-214	1.01 ± 7.46	6.09	U	EPA 901.1
			Neptunium-237	0.358 ± 2.77	4.94	U	EPA 901.1
			Potassium-40	−15.7 ± 33.6	40.8	U	EPA 901.1
			Radium-223	−17.7 ± 29.8	49.3	U	EPA 901.1
			Radium-224	−40.3 ± 34.6	49.4	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	15-Apr-2021	Radium-226	−38.9 ± 59	73.6	U	EPA 901.1
			Radium-228	8.96 ± 12.4	10.2	U	EPA 901.1
			Sodium-22	0.835 ± 1.85	3.1	U	EPA 901.1
			Thorium-227	1.27 ± 10.9	19.5	U	EPA 901.1
			Thorium-231	35.8 ± 23.6	27.4	X	EPA 901.1
			Thorium-234	−82.7 ± 95.9	115	U	EPA 901.1
			Tritium	−31.5 ± 93.5	180	U	EPA 906.0 Modified
			Uranium-235	11.7 ± 16.9	17	U	EPA 901.1
			Uranium-238	−82.7 ± 95.9	115	U	EPA 901.1
		16-Apr-2021	Actinium-228	−0.864 ± 13.7	15	U	EPA 901.1
			Alpha, gross	1.93 ± 1.2	1.84		EPA 900.0/SW846 9310
			Americium-241	3.24 ± 5.02	7.03	U	EPA 901.1
			Beryllium-7	2.43 ± 14.9	27.4	U	EPA 901.1
			Beta, gross	1.82 ± .867	1.39		EPA 900.0/SW846 9310
			Bismuth-212	−14.6 ± 42.1	47.2	U	EPA 901.1
			Bismuth-214	7.52 ± 10.8	8.96	U	EPA 901.1
			Cesium-137	0.117 ± 1.52	2.77	U	EPA 901.1
			Cobalt-60	0.0407 ± 1.68	2.99	U	EPA 901.1
			Lead-212	−2.39 ± 5.79	7.59	U	EPA 901.1
			Lead-214	2.94 ± 8.32	7.2	U	EPA 901.1
			Neptunium-237	−1.09 ± 3.32	4.98	U	EPA 901.1
			Potassium-40	−32.9 ± 51	55.8	U	EPA 901.1
			Radium-223	−3.27 ± 31.9	53.1	U	EPA 901.1
			Radium-224	−206 ± 102	51.2	U	EPA 901.1
			Radium-226	87.3 ± 83.8	49.4	X	EPA 901.1
			Radium-228	−0.864 ± 13.7	15	U	EPA 901.1
			Sodium-22	−0.993 ± 1.88	3.04	U	EPA 901.1
			Thorium-227	4.66 ± 12.4	20.9	U	EPA 901.1
			Thorium-231	13.6 ± 40	29.7	U	EPA 901.1
			Thorium-234	5.5 ± 89.2	57.6	U	EPA 901.1
			Tritium	81.3 ± 107	180	U	EPA 906.0 Modified
			Uranium-235	5.37 ± 18.5	16.8	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	16-Apr-2021	Uranium-238	5.5 ± 89.2	57.6	U	EPA 901.1
WW008	2069I	13-Apr-2021	Actinium-228	4.45 ± 23.2	15.8	U	EPA 901.1
			Alpha, gross	2.52 ± 1.25	1.8		EPA 900.0/SW846 9310
			Americium-241	0.53 ± 3.61	5.67	U	EPA 901.1
			Beryllium-7	2.84 ± 19.5	34.3	U	EPA 901.1
			Beta, gross	24.9 ± 2.12	2.49		EPA 900.0/SW846 9310
			Bismuth-212	46.9 ± 40.7	65.3	U	EPA 901.1
			Bismuth-214	1.93 ± 12.2	8.71	U	EPA 901.1
			Cesium-137	−4.38 ± 4.81	4.25	U	EPA 901.1
			Cobalt-60	0.192 ± 2.66	4.88	U	EPA 901.1
			Lead-212	−7.26 ± 8.25	7.54	U	EPA 901.1
			Lead-214	6.41 ± 10.7	9.04	U	EPA 901.1
			Neptunium-237	3.21 ± 6.19	7.05	U	EPA 901.1
			Potassium-40	59.3 ± 73	44.2	X	EPA 901.1
			Radium-223	11.1 ± 38.7	68.8	U	EPA 901.1
			Radium-224	22.9 ± 46.5	83.8	U	EPA 901.1
			Radium-226	50.5 ± 90.5	57.9	U	EPA 901.1
			Radium-228	4.45 ± 23.2	15.8	U	EPA 901.1
			Sodium-22	2.02 ± 2.92	5.36	U	EPA 901.1
			Thorium-227	−5.09 ± 14.4	24.9	U	EPA 901.1
			Thorium-231	2.08 ± 24.8	29.6	U	EPA 901.1
			Thorium-234	5.46 ± 71.8	55.1	U	EPA 901.1
			Tritium	−0.972 ± 121	210	U	EPA 906.0 Modified
			Uranium-235	13.7 ± 15.7	17.8	U	EPA 901.1
			Uranium-238	5.46 ± 71.8	55.1	U	EPA 901.1
		14-Apr-2021	Actinium-228	2.87 ± 15.8	15.1	U	EPA 901.1
			Alpha, gross	4.12 ± 1.2	1.39		EPA 900.0/SW846 9310
			Americium-241	−1.99 ± 6.97	11.3	U	EPA 901.1
			Beryllium-7	14.9 ± 15.6	26.4	U	EPA 901.1
			Beta, gross	13.8 ± 1.44	1.74		EPA 900.0/SW846 9310
			Bismuth-212	−9.93 ± 48.7	45.1	U	EPA 901.1
			Bismuth-214	6.31 ± 8.95	5.96	X	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	14-Apr-2021	Cesium-137	0.508 ± 4.48	3.04	U	EPA 901.1
			Cobalt-60	−0.162 ± 1.57	2.86	U	EPA 901.1
			Lead-212	0.19 ± 5.98	6.09	U	EPA 901.1
			Lead-214	−10.4 ± 8.81	6.58	U	EPA 901.1
			Neptunium-237	1.14 ± 3.03	5.49	U	EPA 901.1
			Potassium-40	66.5 ± 50.6	31.5		EPA 901.1
			Radium-223	−25 ± 31.9	51.7	U	EPA 901.1
			Radium-224	4.22 ± 33.9	51.7	U	EPA 901.1
			Radium-226	−45.2 ± 66.3	73.7	U	EPA 901.1
			Radium-228	2.87 ± 15.8	15.1	U	EPA 901.1
			Sodium-22	0.305 ± 1.61	3.01	U	EPA 901.1
			Thorium-227	−6.67 ± 13.4	20.9	U	EPA 901.1
			Thorium-231	−9.59 ± 30.6	33	U	EPA 901.1
			Thorium-234	131 ± 140	136	U	EPA 901.1
			Tritium	−21.9 ± 119	209	U	EPA 906.0 Modified
			Uranium-235	4.87 ± 17.8	17.8	U	EPA 901.1
			Uranium-238	131 ± 140	136	U	EPA 901.1
		15-Apr-2021	Actinium-228	−0.45 ± 14.8	16.8	U	EPA 901.1
			Alpha, gross	3.61 ± 1.45	1.92		EPA 900.0/SW846 9310
			Americium-241	23.2 ± 18.8	14.6	X	EPA 901.1
			Beryllium-7	9.91 ± 16.5	29.3	U	EPA 901.1
			Beta, gross	23 ± 1.98	2.09		EPA 900.0/SW846 9310
			Bismuth-212	18.8 ± 27.4	48	U	EPA 901.1
			Bismuth-214	−9.23 ± 9.64	8.26	U	EPA 901.1
			Cesium-137	−0.364 ± 3.22	3.6	U	EPA 901.1
			Cobalt-60	−0.716 ± 2.02	3.5	U	EPA 901.1
			Lead-212	5.16 ± 7.71	4.81	X	EPA 901.1
			Lead-214	5.89 ± 10	8.03	U	EPA 901.1
			Neptunium-237	−3.06 ± 3.56	5.69	U	EPA 901.1
			Potassium-40	0.665 ± 47.3	39.8	U	EPA 901.1
			Radium-223	−19.2 ± 31.8	53.8	U	EPA 901.1
			Radium-224	1.45 ± 33.1	51	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	15-Apr-2021	Radium-226	43.8 ± 82.6	54.4	U	EPA 901.1
			Radium-228	−0.45 ± 14.8	16.8	U	EPA 901.1
			Sodium-22	0.23 ± 2.09	3.85	U	EPA 901.1
			Thorium-227	−3.43 ± 13.6	22.2	U	EPA 901.1
			Thorium-231	−8.89 ± 22.1	37.7	U	EPA 901.1
			Thorium-234	113 ± 158	121	U	EPA 901.1
			Tritium	−25.5 ± 117	206	U	EPA 906.0 Modified
			Uranium-235	−15.5 ± 16.9	17.5	U	EPA 901.1
			Uranium-238	113 ± 158	121	U	EPA 901.1
		16-Apr-2021	Actinium-228	14.5 ± 15.2	14.5	U	EPA 901.1
			Alpha, gross	4.03 ± 2.2	3.4		EPA 900.0/SW846 9310
			Americium-241	−1.2 ± 5.53	9.01	U	EPA 901.1
			Beryllium-7	12.7 ± 16.6	27.5	U	EPA 901.1
			Beta, gross	23.3 ± 1.68	1.57		EPA 900.0/SW846 9310
			Bismuth-212	14.1 ± 33.6	38.2	U	EPA 901.1
			Bismuth-214	4.03 ± 8.9	7.41	U	EPA 901.1
			Cesium-137	1.74 ± 1.9	3.25	U	EPA 901.1
			Cobalt-60	0.791 ± 1.82	3.25	U	EPA 901.1
			Lead-212	4.2 ± 6.41	4.41	U	EPA 901.1
			Lead-214	−2.59 ± 6.62	6.51	U	EPA 901.1
			Neptunium-237	−0.405 ± 3.03	5.2	U	EPA 901.1
			Potassium-40	−7.4 ± 38.9	45.5	U	EPA 901.1
			Radium-223	−2.03 ± 29.4	50.5	U	EPA 901.1
			Radium-224	17 ± 32	49.6	U	EPA 901.1
			Radium-226	72.8 ± 86.3	48.3	X	EPA 901.1
			Radium-228	14.5 ± 15.2	14.5	U	EPA 901.1
			Sodium-22	0.6 ± 1.88	3.36	U	EPA 901.1
			Thorium-227	−11.7 ± 13.1	19.8	U	EPA 901.1
			Thorium-231	13.3 ± 32.3	30.2	U	EPA 901.1
			Thorium-234	−55.2 ± 86.1	102	U	EPA 901.1
			Tritium	−23.5 ± 104	198	U	EPA 906.0 Modified
			Uranium-235	16.4 ± 13.4	14.7	X	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	16-Apr-2021	Uranium-238	−55.2 ± 86.1	102	U	EPA 901.1
WW011	2069K	13-Apr-2021	Actinium-228	9.18 ± 7.5	12.4	U	EPA 901.1
			Alpha, gross	0.944 ± 1.14	1.93	U	EPA 900.0/SW846 9310
			Americium-241	−3.63 ± 6.19	9.01	U	EPA 901.1
			Beryllium-7	−25.6 ± 28.9	21.7	U	EPA 901.1
			Beta, gross	15.3 ± 1.5	1.6		EPA 900.0/SW846 9310
			Bismuth-212	17.2 ± 39.6	34.7	U	EPA 901.1
			Bismuth-214	4.55 ± 8.24	5.53	U	EPA 901.1
			Cesium-137	−0.447 ± 1.64	2.76	U	EPA 901.1
			Cobalt-60	0.889 ± 1.8	3.35	U	EPA 901.1
			Lead-212	0.979 ± 4.44	5.56	U	EPA 901.1
			Lead-214	2.35 ± 7.17	6.76	U	EPA 901.1
			Neptunium-237	−2.23 ± 2.93	4.69	U	EPA 901.1
			Potassium-40	16.8 ± 49	29.5	U	EPA 901.1
			Radium-223	0.423 ± 27.6	48.9	U	EPA 901.1
			Radium-224	−83.3 ± 48.3	47	U	EPA 901.1
			Radium-226	10.7 ± 76.6	45.4	U	EPA 901.1
			Radium-228	9.18 ± 7.5	12.4	U	EPA 901.1
			Sodium-22	−0.158 ± 1.69	3.06	U	EPA 901.1
			Thorium-227	−4.11 ± 11.2	19.3	U	EPA 901.1
			Thorium-231	2.05 ± 25.8	30.6	U	EPA 901.1
			Thorium-234	78.1 ± 113	81	U	EPA 901.1
			Tritium	2.35 ± 121	210	U	EPA 906.0 Modified
			Uranium-235	0.948 ± 17.5	13.8	U	EPA 901.1
			Uranium-238	78.1 ± 113	81	U	EPA 901.1
		14-Apr-2021	Actinium-228	−8.21 ± 13.5	13.7	U	EPA 901.1
			Alpha, gross	2.13 ± 1.01	1.4		EPA 900.0/SW846 9310
			Americium-241	8.89 ± 11.4	14.5	U	EPA 901.1
			Beryllium-7	9.99 ± 15.1	26.2	U	EPA 901.1
			Beta, gross	18.4 ± 1.5	1.75		EPA 900.0/SW846 9310
			Bismuth-212	15.4 ± 37.7	46.1	U	EPA 901.1
			Bismuth-214	1.4 ± 10.1	5.62	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	14-Apr-2021	Cesium-137	1.22 ± 1.89	3.25	U	EPA 901.1
			Cobalt-60	−0.552 ± 1.77	3.03	U	EPA 901.1
			Lead-212	−1.06 ± 5.1	6.08	U	EPA 901.1
			Lead-214	2.26 ± 8.34	7.12	U	EPA 901.1
			Neptunium-237	1.84 ± 3.24	5.72	U	EPA 901.1
			Potassium-40	36.4 ± 50.1	33.2	X	EPA 901.1
			Radium-223	−3.03 ± 30.8	54.5	U	EPA 901.1
			Radium-224	−58.8 ± 41.4	53	U	EPA 901.1
			Radium-226	16 ± 84.4	50.1	U	EPA 901.1
			Radium-228	−8.21 ± 13.5	13.7	U	EPA 901.1
			Sodium-22	−0.105 ± 1.92	3.4	U	EPA 901.1
			Thorium-227	−11.7 ± 13.3	20.9	U	EPA 901.1
			Thorium-231	31.9 ± 35.9	36.1	U	EPA 901.1
			Thorium-234	−0.0791 ± 128	159	U	EPA 901.1
			Tritium	11.3 ± 120	208	U	EPA 906.0 Modified
			Uranium-235	2.24 ± 18.8	16.2	U	EPA 901.1
			Uranium-238	−0.0791 ± 128	159	U	EPA 901.1
		15-Apr-2021	Actinium-228	0.423 ± 16	14.9	U	EPA 901.1
			Alpha, gross	3.45 ± 1.38	1.86		EPA 900.0/SW846 9310
			Americium-241	0.107 ± 8.8	14.5	U	EPA 901.1
			Beryllium-7	12.8 ± 18	31.4	U	EPA 901.1
			Beta, gross	22.2 ± 2.06	2.38		EPA 900.0/SW846 9310
			Bismuth-212	36.4 ± 34.8	45.4	U	EPA 901.1
			Bismuth-214	−3.27 ± 7.52	7.32	U	EPA 901.1
			Cesium-137	2.11 ± 2.04	3.4	U	EPA 901.1
			Cobalt-60	−0.259 ± 1.64	2.98	U	EPA 901.1
			Lead-212	0.996 ± 6.26	5.35	U	EPA 901.1
			Lead-214	6.49 ± 9.36	7.58	U	EPA 901.1
			Neptunium-237	0.915 ± 3.21	5.83	U	EPA 901.1
			Potassium-40	21.7 ± 51	34.4	U	EPA 901.1
			Radium-223	−0.0399 ± 33	59.6	U	EPA 901.1
			Radium-224	−6.25 ± 37.3	56.1	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	15-Apr-2021	Radium-226	9.87 ± 67.7	74.1	U	EPA 901.1
			Radium-228	0.423 ± 16	14.9	U	EPA 901.1
			Sodium-22	−0.494 ± 1.74	3.1	U	EPA 901.1
			Thorium-227	7.34 ± 14.3	23.4	U	EPA 901.1
			Thorium-231	−9.58 ± 36.2	40	U	EPA 901.1
			Thorium-234	42.7 ± 143	120	U	EPA 901.1
			Tritium	−9.03 ± 102	190	U	EPA 906.0 Modified
			Uranium-235	−5.5 ± 16.6	18.2	U	EPA 901.1
			Uranium-238	42.7 ± 143	120	U	EPA 901.1
		16-Apr-2021	Actinium-228	−1.6 ± 10.9	12.4	U	EPA 901.1
			Alpha, gross	0.78 ± 1.38	2.22	U	EPA 900.0/SW846 9310
			Americium-241	−0.035 ± 5.25	9.21	U	EPA 901.1
			Beryllium-7	11.7 ± 13.6	23.7	U	EPA 901.1
			Beta, gross	22.3 ± 1.87	2.15		EPA 900.0/SW846 9310
			Bismuth-212	1.15 ± 20.1	35.6	U	EPA 901.1
			Bismuth-214	14.9 ± 7.48	4.63	X	EPA 901.1
			Cesium-137	1.18 ± 1.59	2.77	U	EPA 901.1
			Cobalt-60	1.23 ± 2.29	2.96	U	EPA 901.1
			Lead-212	0.631 ± 5.16	4.91	U	EPA 901.1
			Lead-214	1.07 ± 7.18	5.47	U	EPA 901.1
			Neptunium-237	1.41 ± 2.47	4.46	U	EPA 901.1
			Potassium-40	29.4 ± 37.1	24.9	X	EPA 901.1
			Radium-223	2.73 ± 23.9	43.6	U	EPA 901.1
			Radium-224	21.3 ± 27	40.5	U	EPA 901.1
			Radium-226	104 ± 65.7	40.8	X	EPA 901.1
			Radium-228	−1.6 ± 10.9	12.4	U	EPA 901.1
			Sodium-22	1.11 ± 1.49	2.81	U	EPA 901.1
			Thorium-227	−0.709 ± 10.3	16.9	U	EPA 901.1
			Thorium-231	−36 ± 39.3	29.1	U	EPA 901.1
			Thorium-234	−13.4 ± 90.4	102	U	EPA 901.1
			Tritium	3.77 ± 103	190	U	EPA 906.0 Modified

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	16-Apr-2021	Uranium-235	−6.3 ± 11.9	13.8	U	EPA 901.1
			Uranium-238	−13.4 ± 90.4	102	U	EPA 901.1

[a] Blank cells indicate that the data did not require a data qualifier.
CINT = Center for Integrated Nanotechnologies
MDA = minimal detectable activity or minimum measured activity in a sample required to ensure a 95 percent probability that the measured activity is accurately quantified above the critical level

Laboratory Data Qualifier
U = The analyte was absent or below the method detection limit.
X = The data was rejected due to the peak not meeting identification criteria.

Table E-4. Radiological results for permitted sanitary outfalls, fourth quarter of calendar year 2021

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	19-Oct-2021	Actinium-228	−3.75 ± 11.1	13.6	U	EPA 901.1
			Alpha, gross	2.15 ± 1.66	2.65	U	EPA 900.0/SW846 9310
			Americium-241	7.04 ± 9.19	14.6	U	EPA 901.1
			Beryllium-7	3.22 ± 13.7	24	U	EPA 901.1
			Beta, gross	0.931 ± 1.66	2.81	U	EPA 900.0/SW846 9310
			Bismuth-212	7.61 ± 22.4	40.9	U	EPA 901.1
			Bismuth-214	5.87 ± 9.23	8.34	U	EPA 901.1
			Cesium-137	0.825 ± 1.73	2.97	U	EPA 901.1
			Cobalt-60	0.182 ± 1.51	2.74	U	EPA 901.1
			Lead-212	2.28 ± 5.75	5.72	U	EPA 901.1
			Lead-214	8.34 ± 9.14	8.35	U	EPA 901.1
			Neptunium-237	−2.24 ± 3.48	5.12	U	EPA 901.1
			Potassium-40	−58.5 ± 44.1	42.2	U	EPA 901.1
			Radium-223	−5.41 ± 29.7	52.1	U	EPA 901.1
			Radium-224	21.2 ± 32.2	51.2	U	EPA 901.1
			Radium-226	1.24 ± 72.6	49.2	U	EPA 901.1
			Radium-228	−3.75 ± 11.1	13.6	U	EPA 901.1
			Sodium-22	−1.53 ± 1.84	2.75	U	EPA 901.1
			Thorium-227	−4.02 ± 11.7	20.4	U	EPA 901.1
			Thorium-231	−11 ± 36.1	34.7	U	EPA 901.1
			Thorium-234	−56.4 ± 142	147	U	EPA 901.1
			Tritium	−44 ± 102	201	U	EPA 906.0 Modified
			Uranium-235	−0.198 ± 17.7	17.7	U	EPA 901.1
			Uranium-238	−56.4 ± 142	147	U	EPA 901.1
		20-Oct-2021	Actinium-228	1.42 ± 17.8	11.4	U	EPA 901.1
			Alpha, gross	1.85 ± 1.4	2.21	U	EPA 900.0/SW846 9310
			Americium-241	−8.72 ± 14.6	22.6	U	EPA 901.1
			Beryllium-7	6.63 ± 14.2	25.4	U	EPA 901.1
			Beta, gross	1.61 ± 1.13	1.86	U	EPA 900.0/SW846 9310
			Bismuth-212	23.7 ± 29.6	38.2	U	EPA 901.1
			Bismuth-214	0.513 ± 7.01	5.59	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	20-Oct-2021	Cesium-137	0.112 ± 1.8	3.14	U	EPA 901.1
			Cobalt-60	1.02 ± 2.14	3.55	U	EPA 901.1
			Lead-212	1.77 ± 6.09	6.08	U	EPA 901.1
			Lead-214	2.89 ± 8.6	7.4	U	EPA 901.1
			Neptunium-237	−0.602 ± 3.24	5.78	U	EPA 901.1
			Potassium-40	0.944 ± 59.1	34.9	U	EPA 901.1
			Radium-223	−0.662 ± 34.7	56.1	U	EPA 901.1
			Radium-224	13.1 ± 35.4	54.2	U	EPA 901.1
			Radium-226	−39.5 ± 62.9	72.9	U	EPA 901.1
			Radium-228	1.42 ± 17.8	11.4	U	EPA 901.1
			Sodium-22	−0.0209 ± 1.85	3.34	U	EPA 901.1
			Thorium-227	4.14 ± 13.7	22.7	U	EPA 901.1
			Thorium-231	14.3 ± 53.9	41.7	U	EPA 901.1
			Thorium-234	−177 ± 197	219	U	EPA 901.1
			Tritium	29.8 ± 113	203	U	EPA 906.0 Modified
			Uranium-235	−13.6 ± 18.3	17.5	U	EPA 901.1
			Uranium-238	−177 ± 197	219	U	EPA 901.1
		21-Oct-2021	Actinium-228	6.16 ± 18.1	17.5	U	EPA 901.1
			Alpha, gross	3.37 ± 3.57	5.92	U	EPA 900.0/SW846 9310
			Americium-241	6.04 ± 10.3	17.9	U	EPA 901.1
			Beryllium-7	−3.74 ± 16.4	28.4	U	EPA 901.1
			Beta, gross	3.86 ± 4.48	7.51	U	EPA 900.0/SW846 9310
			Bismuth-212	22 ± 28.5	49.2	U	EPA 901.1
			Bismuth-214	14.5 ± 9.5	6.32		EPA 901.1
			Cesium-137	0.723 ± 1.93	3.42	U	EPA 901.1
			Cobalt-60	−0.0803 ± 2.07	3.75	U	EPA 901.1
			Lead-212	5.05 ± 6.94	7.03	U	EPA 901.1
			Lead-214	0.0279 ± 8.48	8.48	U	EPA 901.1
			Neptunium-237	−1.98 ± 3.45	5.84	U	EPA 901.1
			Potassium-40	43 ± 44.2	35.4	X	EPA 901.1
			Radium-223	−16.5 ± 37.2	57.2	U	EPA 901.1
			Radium-224	26.4 ± 39	58.4	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	21-Oct-2021	Radium-226	−31.3 ± 61.7	78.4	U	EPA 901.1
			Radium-228	6.16 ± 18.1	17.5	U	EPA 901.1
			Sodium-22	−1.07 ± 2.15	3.6	U	EPA 901.1
			Thorium-227	8.35 ± 13.7	24.5	U	EPA 901.1
			Thorium-231	−2.68 ± 39.2	40.3	U	EPA 901.1
			Thorium-234	3.76 ± 164	143	U	EPA 901.1
			Tritium	96.1 ± 118	197	U	EPA 906.0 Modified
			Uranium-235	−4.21 ± 17.3	18.4	U	EPA 901.1
			Uranium-238	3.76 ± 164	143	U	EPA 901.1
		22-Oct-2021	Actinium-228	−7.82 ± 15.6	14.8	U	EPA 901.1
			Alpha, gross	1.8 ± 1.05	1.64		EPA 900.0/SW846 9310
			Americium-241	−4.95 ± 9.06	14	U	EPA 901.1
			Beryllium-7	1.37 ± 17.3	27.7	U	EPA 901.1
			Beta, gross	0.51 ± .645	1.08	U	EPA 900.0/SW846 9310
			Bismuth-212	7.71 ± 39.9	46	U	EPA 901.1
			Bismuth-214	−2.18 ± 7.16	8.2	U	EPA 901.1
			Cesium-137	0.304 ± 1.94	3.41	U	EPA 901.1
			Cobalt-60	0.513 ± 1.69	3.19	U	EPA 901.1
			Lead-212	6.03 ± 7.9	6.28	U	EPA 901.1
			Lead-214	2.21 ± 8.84	7.73	U	EPA 901.1
			Neptunium-237	4.13 ± 4.41	5.71	U	EPA 901.1
			Potassium-40	−22 ± 40.4	45.3	U	EPA 901.1
			Radium-223	−30.3 ± 36.8	59.4	U	EPA 901.1
			Radium-224	23.6 ± 37	55.7	U	EPA 901.1
			Radium-226	−56.5 ± 78.1	75.5	U	EPA 901.1
			Radium-228	−7.82 ± 15.6	14.8	U	EPA 901.1
			Sodium-22	−0.225 ± 1.6	2.93	U	EPA 901.1
			Thorium-227	−3.47 ± 14	22.7	U	EPA 901.1
			Thorium-231	13.6 ± 29.6	35.7	U	EPA 901.1
			Thorium-234	36.3 ± 134	145	U	EPA 901.1
			Tritium	95.5 ± 114	190	U	EPA 906.0 Modified
			Uranium-235	−17.8 ± 21.3	18.3	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
CINT	2238A	22-Oct-2021	Uranium-238	36.3 ± 134	145	U	EPA 901.1
WW001	2069A	19-Oct-2021	Actinium-228	−7.1 ± 14.7	12.7	U	EPA 901.1
			Alpha, gross	2.51 ± 1.73	2.5		EPA 900.0/SW846 9310
			Americium-241	−1.11 ± 5.71	8.46	U	EPA 901.1
			Beryllium-7	10.4 ± 13.7	23.8	U	EPA 901.1
			Beta, gross	6.66 ± 1.79	2.72		EPA 900.0/SW846 9310
			Bismuth-212	2.68 ± 21.6	38.4	U	EPA 901.1
			Bismuth-214	−11.3 ± 9.87	7.3	U	EPA 901.1
			Cesium-137	1.32 ± 3.22	3.15	U	EPA 901.1
			Cobalt-60	1.25 ± 1.71	3.12	U	EPA 901.1
			Lead-212	13.6 ± 9.75	13.6	U	EPA 901.1
			Lead-214	−0.395 ± 5.86	6.63	U	EPA 901.1
			Neptunium-237	−5.46 ± 5.39	4.91	U	EPA 901.1
			Potassium-40	53.8 ± 50.6	27.1		EPA 901.1
			Radium-223	33.7 ± 45.2	52.1	U	EPA 901.1
			Radium-224	42.1 ± 33.4	49.1	U	EPA 901.1
			Radium-226	−31 ± 66.2	65.3	U	EPA 901.1
			Radium-228	−7.1 ± 14.7	12.7	U	EPA 901.1
			Sodium-22	0.458 ± 1.78	3.28	U	EPA 901.1
			Thorium-227	−11.8 ± 13.1	19.6	U	EPA 901.1
			Thorium-231	20.8 ± 32.4	29.4	U	EPA 901.1
			Thorium-234	17.2 ± 102	97.7	U	EPA 901.1
			Tritium	2.75 ± 106	197	U	EPA 906.0 Modified
			Uranium-235	−0.988 ± 14.8	16.1	U	EPA 901.1
			Uranium-238	17.2 ± 102	97.7	U	EPA 901.1
		20-Oct-2021	Actinium-228	9.29 ± 14.5	7.57	X	EPA 901.1
			Alpha, gross	−0.0233 ± 1.5	2.56	U	EPA 900.0/SW846 9310
			Americium-241	1.14 ± 5.19	9.32	U	EPA 901.1
			Beryllium-7	−0.494 ± 11.3	18.3	U	EPA 901.1
			Beta, gross	8.9 ± 1.6	2.28		EPA 900.0/SW846 9310
			Bismuth-212	13.2 ± 18.7	35.8	U	EPA 901.1
			Bismuth-214	−5.11 ± 5.93	5.61	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	20-Oct-2021	Cesium-137	−0.343 ± .972	1.82	U	EPA 901.1
			Cobalt-60	0.307 ± 1.22	2.43	U	EPA 901.1
			Lead-212	−11.8 ± 7.78	6.64	U	EPA 901.1
			Lead-214	3.08 ± 9.2	5.5	U	EPA 901.1
			Neptunium-237	0.018 ± 2.42	4.01	U	EPA 901.1
			Potassium-40	−32.7 ± 48.3	43.2	U	EPA 901.1
			Radium-223	4.15 ± 23.4	39.2	U	EPA 901.1
			Radium-224	6.87 ± 21.8	36.9	U	EPA 901.1
			Radium-226	29.5 ± 77	33.3	U	EPA 901.1
			Radium-228	9.29 ± 14.5	7.57	X	EPA 901.1
			Sodium-22	−0.77 ± 1.13	1.85	U	EPA 901.1
			Thorium-227	3.94 ± 8.87	15.1	U	EPA 901.1
			Thorium-231	−36.8 ± 34.5	26	U	EPA 901.1
			Thorium-234	55.7 ± 144	80.8	U	EPA 901.1
			Tritium	−19.4 ± 105	200	U	EPA 906.0 Modified
			Uranium-235	4.03 ± 17.2	11.2	U	EPA 901.1
			Uranium-238	55.7 ± 144	80.8	U	EPA 901.1
		21-Oct-2021	Actinium-228	−13.8 ± 14.8	14.5	U	EPA 901.1
			Alpha, gross	0.868 ± 2.07	3.56	U	EPA 900.0/SW846 9310
			Americium-241	15.7 ± 17.4	26.5	U	EPA 901.1
			Beryllium-7	−1.08 ± 14.1	24.5	U	EPA 901.1
			Beta, gross	8.24 ± 1.77	2.7		EPA 900.0/SW846 9310
			Bismuth-212	−22.4 ± 47.8	49	U	EPA 901.1
			Bismuth-214	3.82 ± 9.09	5.86	U	EPA 901.1
			Cesium-137	−0.219 ± 1.72	2.95	U	EPA 901.1
			Cobalt-60	0.683 ± 2.13	3.71	U	EPA 901.1
			Lead-212	−0.309 ± 6.7	8.23	U	EPA 901.1
			Lead-214	−6.5 ± 8.41	7.65	U	EPA 901.1
			Neptunium-237	−1.18 ± 3.17	5.43	U	EPA 901.1
			Potassium-40	5.85 ± 59	29.2	U	EPA 901.1
			Radium-223	29.2 ± 35	59.9	U	EPA 901.1
			Radium-224	−20.9 ± 34	56.6	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	21-Oct-2021	Radium-226	−102 ± 81	72.7	U	EPA 901.1
			Radium-228	−13.8 ± 14.8	14.5	U	EPA 901.1
			Sodium-22	0.175 ± 1.65	3.16	U	EPA 901.1
			Thorium-227	0.0078 ± 12.8	22.8	U	EPA 901.1
			Thorium-231	29.6 ± 38.7	41.3	U	EPA 901.1
			Thorium-234	223 ± 257	176	X	EPA 901.1
			Tritium	61.6 ± 115	201	U	EPA 906.0 Modified
			Uranium-235	4.67 ± 24.6	19.1	U	EPA 901.1
			Uranium-238	223 ± 257	176	X	EPA 901.1
		22-Oct-2021	Actinium-228	2.4 ± 19.7	12.8	U	EPA 901.1
			Alpha, gross	3.44 ± 1.37	1.73		EPA 900.0/SW846 9310
			Americium-241	−3.48 ± 17.9	28.8	U	EPA 901.1
			Beryllium-7	−3.04 ± 15.5	27.4	U	EPA 901.1
			Beta, gross	11.7 ± 1.86	2.7		EPA 900.0/SW846 9310
			Bismuth-212	25.1 ± 61	42.5	U	EPA 901.1
			Bismuth-214	3.63 ± 9.75	8.67	U	EPA 901.1
			Cesium-137	1.89 ± 2.25	3.59	U	EPA 901.1
			Cobalt-60	2.47 ± 2.39	4.32	U	EPA 901.1
			Lead-212	13.5 ± 10.4	13.5	U	EPA 901.1
			Lead-214	−0.437 ± 7.34	8.47	U	EPA 901.1
			Neptunium-237	−1.54 ± 3.48	6.06	U	EPA 901.1
			Potassium-40	37 ± 59.5	32.8	X	EPA 901.1
			Radium-223	−26.2 ± 36.2	59.7	U	EPA 901.1
			Radium-224	48.3 ± 44	62.3	U	EPA 901.1
			Radium-226	−42.4 ± 74.3	78.5	U	EPA 901.1
			Radium-228	2.4 ± 19.7	12.8	U	EPA 901.1
			Sodium-22	0.5 ± 2.06	3.9	U	EPA 901.1
			Thorium-227	12.5 ± 16.8	27	U	EPA 901.1
			Thorium-231	−47.5 ± 50.3	50.2	U	EPA 901.1
			Thorium-234	64.8 ± 292	214	U	EPA 901.1
			Tritium	131 ± 131	214	U	EPA 906.0 Modified
			Uranium-235	6.87 ± 21.3	21.6	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW001	2069A	22-Oct-2021	Uranium-238	64.8 ± 292	214	U	EPA 901.1
WW006	2069F	19-Oct-2021	Actinium-228	−12.7 ± 12.3	13	U	EPA 901.1
			Alpha, gross	3.25 ± 1.52	2.14		EPA 900.0/SW846 9310
			Americium-241	8.07 ± 9.04	10.2	U	EPA 901.1
			Beryllium-7	12.4 ± 13.2	22.4	U	EPA 901.1
			Beta, gross	12.9 ± 1.74	2.31		EPA 900.0/SW846 9310
			Bismuth-212	12 ± 20.4	35.8	U	EPA 901.1
			Bismuth-214	3.85 ± 8.97	6.43	U	EPA 901.1
			Cesium-137	−1.79 ± 3.39	3.49	U	EPA 901.1
			Cobalt-60	0.182 ± 1.6	2.92	U	EPA 901.1
			Lead-212	1.94 ± 6.69	4.19	U	EPA 901.1
			Lead-214	−3.91 ± 6.72	6.35	U	EPA 901.1
			Neptunium-237	−0.528 ± 2.79	4.97	U	EPA 901.1
			Potassium-40	−4.46 ± 31.8	44.2	U	EPA 901.1
			Radium-223	−6.25 ± 27.6	49	U	EPA 901.1
			Radium-224	26.5 ± 30.8	45.3	U	EPA 901.1
			Radium-226	−51.9 ± 69.5	69.8	U	EPA 901.1
			Radium-228	−12.7 ± 12.3	13	U	EPA 901.1
			Sodium-22	0.545 ± 1.58	2.93	U	EPA 901.1
			Thorium-227	−7.05 ± 12	18.4	U	EPA 901.1
			Thorium-231	16.6 ± 38.9	28.6	U	EPA 901.1
			Thorium-234	111 ± 122	90.9	X	EPA 901.1
			Tritium	−10.7 ± 107	202	U	EPA 906.0 Modified
			Uranium-235	1.34 ± 16.8	15.8	U	EPA 901.1
			Uranium-238	111 ± 122	90.9	X	EPA 901.1
		20-Oct-2021	Actinium-228	−19 ± 13.8	12.4	U	EPA 901.1
			Alpha, gross	2.56 ± 1.31	1.84		EPA 900.0/SW846 9310
			Americium-241	1.8 ± 6.98	11.6	U	EPA 901.1
			Beryllium-7	8.72 ± 14.9	26.2	U	EPA 901.1
			Beta, gross	14.1 ± 2.1	2.87		EPA 900.0/SW846 9310
			Bismuth-212	13.2 ± 24.1	42.2	U	EPA 901.1
			Bismuth-214	3.8 ± 9.03	7.57	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	20-Oct-2021	Cesium-137	0.555 ± 5.46	2.95	U	EPA 901.1
			Cobalt-60	0.296 ± 1.85	3.4	U	EPA 901.1
			Lead-212	1.57 ± 6.06	4.6	U	EPA 901.1
			Lead-214	−4.45 ± 6.9	6.92	U	EPA 901.1
			Neptunium-237	1.15 ± 3.11	5.62	U	EPA 901.1
			Potassium-40	−6.21 ± 33.3	48.6	U	EPA 901.1
			Radium-223	−36.6 ± 34.4	51.2	U	EPA 901.1
			Radium-224	−11.2 ± 33.1	48.8	U	EPA 901.1
			Radium-226	59.4 ± 50	47.2	X	EPA 901.1
			Radium-228	−19 ± 13.8	12.4	U	EPA 901.1
			Sodium-22	0.328 ± 1.76	3.25	U	EPA 901.1
			Thorium-227	−0.0984 ± 12.2	20.2	U	EPA 901.1
			Thorium-231	−34 ± 38.2	34	U	EPA 901.1
			Thorium-234	71.4 ± 128	95.2	U	EPA 901.1
			Tritium	−14.8 ± 107	203	U	EPA 906.0 Modified
			Uranium-235	20.4 ± 20.9	20.4	U	EPA 901.1
			Uranium-238	71.4 ± 128	95.2	U	EPA 901.1
		21-Oct-2021	Actinium-228	5.45 ± 9.38	16.4	U	EPA 901.1
			Alpha, gross	0.263 ± 2.23	3.78	U	EPA 900.0/SW846 9310
			Americium-241	−2.78 ± 17.8	29	U	EPA 901.1
			Beryllium-7	−3.69 ± 16.6	29.4	U	EPA 901.1
			Beta, gross	12.4 ± 2.56	3.78		EPA 900.0/SW846 9310
			Bismuth-212	61.5 ± 57.8	44.9	X	EPA 901.1
			Bismuth-214	−0.496 ± 7.56	9.42	U	EPA 901.1
			Cesium-137	1.26 ± 2.16	3.85	U	EPA 901.1
			Cobalt-60	0.339 ± 2.24	4.23	U	EPA 901.1
			Lead-212	7.22 ± 7.85	7.22	U	EPA 901.1
			Lead-214	−7.94 ± 8.93	8.41	U	EPA 901.1
			Neptunium-237	−0.255 ± 3.89	7.05	U	EPA 901.1
			Potassium-40	65.9 ± 57.8	37.7		EPA 901.1
			Radium-223	5.64 ± 54.7	72.2	U	EPA 901.1
			Radium-224	74.5 ± 48.9	58.7	X	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	21-Oct-2021	Radium-226	−53.7 ± 84	92	U	EPA 901.1
			Radium-228	5.45 ± 9.38	16.4	U	EPA 901.1
			Sodium-22	−0.214 ± 2.02	3.75	U	EPA 901.1
			Thorium-227	−4.18 ± 16.1	26.2	U	EPA 901.1
			Thorium-231	3.33 ± 46.1	52.1	U	EPA 901.1
			Thorium-234	147 ± 287	221	U	EPA 901.1
			Tritium	138 ± 119	192	U	EPA 906.0 Modified
			Uranium-235	7.91 ± 26.3	22.9	U	EPA 901.1
			Uranium-238	147 ± 287	221	U	EPA 901.1
		22-Oct-2021	Actinium-228	1.62 ± 19.6	17.6	U	EPA 901.1
			Alpha, gross	2.99 ± 1.61	2.37		EPA 900.0/SW846 9310
			Americium-241	9.59 ± 17.5	26.7	U	EPA 901.1
			Beryllium-7	0.914 ± 17.7	30.2	U	EPA 901.1
			Beta, gross	13.8 ± 2.29	3.32		EPA 900.0/SW846 9310
			Bismuth-212	−14.1 ± 39.1	51.5	U	EPA 901.1
			Bismuth-214	5.87 ± 11.4	6.97	U	EPA 901.1
			Cesium-137	1.2 ± 2	3.61	U	EPA 901.1
			Cobalt-60	0.614 ± 2.16	4.07	U	EPA 901.1
			Lead-212	4.58 ± 8.74	6	U	EPA 901.1
			Lead-214	−2.88 ± 8.97	8.53	U	EPA 901.1
			Neptunium-237	4.45 ± 4.89	6.26	U	EPA 901.1
			Potassium-40	−13.7 ± 46	56.2	U	EPA 901.1
			Radium-223	40.2 ± 41.1	66.4	U	EPA 901.1
			Radium-224	36.3 ± 42.2	63.4	U	EPA 901.1
			Radium-226	24.8 ± 93.8	65.6	U	EPA 901.1
			Radium-228	1.62 ± 19.6	17.6	U	EPA 901.1
			Sodium-22	1.65 ± 2.22	4.12	U	EPA 901.1
			Thorium-227	−4.27 ± 14.4	24.6	U	EPA 901.1
			Thorium-231	39.2 ± 66.2	47.8	U	EPA 901.1
			Thorium-234	157 ± 276	267	U	EPA 901.1
			Tritium	162 ± 121	193	U	EPA 906.0 Modified
			Uranium-235	−6.72 ± 19.8	22.4	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW006	2069F	22-Oct-2021	Uranium-238	157 ± 276	267	U	EPA 901.1
WW007	2069G	19-Oct-2021	Actinium-228	1 ± 12.5	9.55	U	EPA 901.1
			Alpha, gross	1.54 ± 1.2	1.91	U	EPA 900.0/SW846 9310
			Americium-241	8.85 ± 9.61	15.2	U	EPA 901.1
			Beryllium-7	1.21 ± 12.3	22.4	U	EPA 901.1
			Beta, gross	1.82 ± 1.3	2.15	U	EPA 900.0/SW846 9310
			Bismuth-212	6.49 ± 21.1	38.1	U	EPA 901.1
			Bismuth-214	1.15 ± 8.23	6.77	U	EPA 901.1
			Cesium-137	−0.024 ± 1.46	2.62	U	EPA 901.1
			Cobalt-60	3.4 ± 4.33	3.4	U	EPA 901.1
			Lead-212	−0.37 ± 5.21	5.36	U	EPA 901.1
			Lead-214	−5.1 ± 5.38	6.21	U	EPA 901.1
			Neptunium-237	−1.01 ± 2.88	4.63	U	EPA 901.1
			Potassium-40	21.4 ± 44.1	29.3	U	EPA 901.1
			Radium-223	7.67 ± 28.5	47.7	U	EPA 901.1
			Radium-224	−44.7 ± 35.5	45.2	U	EPA 901.1
			Radium-226	−16.7 ± 63.7	66.8	U	EPA 901.1
			Radium-228	1 ± 12.5	9.55	U	EPA 901.1
			Sodium-22	−0.545 ± 1.73	2.72	U	EPA 901.1
			Thorium-227	−2.76 ± 10.6	17.5	U	EPA 901.1
			Thorium-231	4.36 ± 33	34.5	U	EPA 901.1
			Thorium-234	11.8 ± 145	114	U	EPA 901.1
			Tritium	−12.9 ± 106	200	U	EPA 906.0 Modified
			Uranium-235	−11.6 ± 17.1	14.6	U	EPA 901.1
			Uranium-238	11.8 ± 145	114	U	EPA 901.1
		20-Oct-2021	Actinium-228	−2.95 ± 13.6	15.8	U	EPA 901.1
			Alpha, gross	2.66 ± 1.26	1.76		EPA 900.0/SW846 9310
			Americium-241	1.44 ± 8.47	15	U	EPA 901.1
			Beryllium-7	5.41 ± 16	28.5	U	EPA 901.1
			Beta, gross	1.78 ± 1.34	2.22	U	EPA 900.0/SW846 9310
			Bismuth-212	−4.31 ± 28.4	48.7	U	EPA 901.1
			Bismuth-214	2.08 ± 9.2	6.71	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	20-Oct-2021	Cesium-137	−0.554 ± 1.88	3.21	U	EPA 901.1
			Cobalt-60	0.197 ± 3.25	3.7	U	EPA 901.1
			Lead-212	−1.2 ± 4.88	6.04	U	EPA 901.1
			Lead-214	−10.6 ± 9.75	7.4	U	EPA 901.1
			Neptunium-237	−1.75 ± 3.65	5.67	U	EPA 901.1
			Potassium-40	−21.5 ± 41.1	42	U	EPA 901.1
			Radium-223	−6.99 ± 34.1	60.7	U	EPA 901.1
			Radium-224	−94.8 ± 64.6	55.5	U	EPA 901.1
			Radium-226	13.8 ± 69.3	54.1	U	EPA 901.1
			Radium-228	−2.95 ± 13.6	15.8	U	EPA 901.1
			Sodium-22	0.377 ± 1.75	3.28	U	EPA 901.1
			Thorium-227	7.59 ± 14.7	24.1	U	EPA 901.1
			Thorium-231	24.8 ± 35.9	34.7	U	EPA 901.1
			Thorium-234	−20.8 ± 141	148	U	EPA 901.1
			Tritium	76.3 ± 116	198	U	EPA 906.0 Modified
			Uranium-235	−7.13 ± 19.6	18.4	U	EPA 901.1
			Uranium-238	−20.8 ± 141	148	U	EPA 901.1
		21-Oct-2021	Actinium-228	4.96 ± 16.8	17.5	U	EPA 901.1
			Alpha, gross	2.6 ± .972	1.16		EPA 900.0/SW846 9310
			Americium-241	−4 ± 16.6	26.8	U	EPA 901.1
			Beryllium-7	6.98 ± 17.8	32.2	U	EPA 901.1
			Beta, gross	1.61 ± .992	1.63	U	EPA 900.0/SW846 9310
			Bismuth-212	−10.8 ± 28.2	47.5	U	EPA 901.1
			Bismuth-214	8.19 ± 9.79	6.99	X	EPA 901.1
			Cesium-137	−0.221 ± 1.92	3.39	U	EPA 901.1
			Cobalt-60	−0.308 ± 2.11	3.87	U	EPA 901.1
			Lead-212	3.81 ± 7.23	7.31	U	EPA 901.1
			Lead-214	−1.4 ± 8.03	8.03	U	EPA 901.1
			Neptunium-237	0.486 ± 3.68	6.73	U	EPA 901.1
			Potassium-40	25.2 ± 55.2	37	U	EPA 901.1
			Radium-223	−36.3 ± 40.6	64.1	U	EPA 901.1
			Radium-224	−1.74 ± 42.2	64.1	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	21-Oct-2021	Radium-226	27.9 ± 100	63.1	U	EPA 901.1
			Radium-228	4.96 ± 16.8	17.5	U	EPA 901.1
			Sodium-22	−0.0355 ± 1.93	3.62	U	EPA 901.1
			Thorium-227	10.3 ± 16.4	26.8	U	EPA 901.1
			Thorium-231	28.7 ± 45.4	49.5	U	EPA 901.1
			Thorium-234	230 ± 317	251	U	EPA 901.1
			Tritium	158 ± 122	194	U	EPA 906.0 Modified
			Uranium-235	−1.43 ± 18	22	U	EPA 901.1
			Uranium-238	230 ± 317	251	U	EPA 901.1
		22-Oct-2021	Actinium-228	−4.43 ± 13	14.7	U	EPA 901.1
			Alpha, gross	2.75 ± 1.13	1.44		EPA 900.0/SW846 9310
			Americium-241	−1.28 ± 7.88	13.6	U	EPA 901.1
			Beryllium-7	−6.73 ± 14.8	25.1	U	EPA 901.1
			Beta, gross	2.4 ± 1.16	1.89		EPA 900.0/SW846 9310
			Bismuth-212	9.94 ± 51.9	37.6	U	EPA 901.1
			Bismuth-214	4.69 ± 9.8	5.87	U	EPA 901.1
			Cesium-137	−0.727 ± 1.77	2.97	U	EPA 901.1
			Cobalt-60	0.796 ± 1.8	3.34	U	EPA 901.1
			Lead-212	8.92 ± 7.63	8.92	U	EPA 901.1
			Lead-214	3.45 ± 6.67	7.02	U	EPA 901.1
			Neptunium-237	0.00778 ± 2.85	5.18	U	EPA 901.1
			Potassium-40	28.1 ± 47.2	30.4	U	EPA 901.1
			Radium-223	26.5 ± 32.7	57.1	U	EPA 901.1
			Radium-224	66.6 ± 52.8	47.8	X	EPA 901.1
			Radium-226	20.6 ± 91.4	47.9	U	EPA 901.1
			Radium-228	−4.43 ± 13	14.7	U	EPA 901.1
			Sodium-22	0.482 ± 1.72	3.28	U	EPA 901.1
			Thorium-227	0.131 ± 11	20	U	EPA 901.1
			Thorium-231	33.8 ± 26.6	32.8	X	EPA 901.1
			Thorium-234	−56.5 ± 102	126	U	EPA 901.1
			Tritium	177 ± 123	194	U	EPA 906.0 Modified
			Uranium-235	−5.67 ± 16.3	17	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW007	2069G	22-Oct-2021	Uranium-238	−56.5 ± 102	126	U	EPA 901.1
WW008	2069I	19-Oct-2021	Actinium-228	−10.1 ± 13.3	13.7	U	EPA 901.1
			Alpha, gross	1.26 ± 1.43	2.4	U	EPA 900.0/SW846 9310
			Americium-241	−3.31 ± 4.88	7.96	U	EPA 901.1
			Beryllium-7	−2.02 ± 13.4	22.5	U	EPA 901.1
			Beta, gross	12.8 ± 1.75	2.3		EPA 900.0/SW846 9310
			Bismuth-212	18.6 ± 22.7	39.2	U	EPA 901.1
			Bismuth-214	−7.29 ± 7.58	7.03	U	EPA 901.1
			Cesium-137	0.515 ± 1.65	2.96	U	EPA 901.1
			Cobalt-60	0.00549 ± 1.61	2.93	U	EPA 901.1
			Lead-212	6.97 ± 8.44	6.97	U	EPA 901.1
			Lead-214	−7.04 ± 7.03	6.51	U	EPA 901.1
			Neptunium-237	−0.307 ± 2.81	4.9	U	EPA 901.1
			Potassium-40	−16.8 ± 52	48.8	U	EPA 901.1
			Radium-223	16.2 ± 29.2	50.4	U	EPA 901.1
			Radium-224	23.3 ± 27.9	47.1	U	EPA 901.1
			Radium-226	−49.4 ± 62.5	68.4	U	EPA 901.1
			Radium-228	−10.1 ± 13.3	13.7	U	EPA 901.1
			Sodium-22	−1.18 ± 1.72	2.82	U	EPA 901.1
			Thorium-227	−1.45 ± 10.6	18.7	U	EPA 901.1
			Thorium-231	−6.7 ± 26.8	29.2	U	EPA 901.1
			Thorium-234	−5.67 ± 88.6	101	U	EPA 901.1
			Tritium	3.41 ± 105	196	U	EPA 906.0 Modified
			Uranium-235	−1 ± 15.2	16	U	EPA 901.1
			Uranium-238	−5.67 ± 88.6	101	U	EPA 901.1
		20-Oct-2021	Actinium-228	6.79 ± 11.9	12	U	EPA 901.1
			Alpha, gross	2.85 ± 1.12	1.33		EPA 900.0/SW846 9310
			Americium-241	−2.33 ± 6.09	9.2	U	EPA 901.1
			Beryllium-7	−3.63 ± 13.4	22.7	U	EPA 901.1
			Beta, gross	16.5 ± 1.76	2.27		EPA 900.0/SW846 9310
			Bismuth-212	0.522 ± 21.6	39.5	U	EPA 901.1
			Bismuth-214	−3.97 ± 6.56	6.82	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	20-Oct-2021	Cesium-137	0.18 ± 1.75	3.01	U	EPA 901.1
			Cobalt-60	0.501 ± 1.86	3.03	U	EPA 901.1
			Lead-212	8.86 ± 8.14	8.86	U	EPA 901.1
			Lead-214	−4.13 ± 7.55	6.44	U	EPA 901.1
			Neptunium-237	−.000248 ± 2.83	4.99	U	EPA 901.1
			Potassium-40	−3.52 ± 32	45.9	U	EPA 901.1
			Radium-223	−11.6 ± 28.1	47.7	U	EPA 901.1
			Radium-224	20.1 ± 27.7	47.8	U	EPA 901.1
			Radium-226	−61.3 ± 63.1	73.3	U	EPA 901.1
			Radium-228	6.79 ± 11.9	12	U	EPA 901.1
			Sodium-22	−0.982 ± 1.72	2.81	U	EPA 901.1
			Thorium-227	0.883 ± 10.7	19.2	U	EPA 901.1
			Thorium-231	−4.14 ± 29.3	31.5	U	EPA 901.1
			Thorium-234	60.6 ± 102	81.3	U	EPA 901.1
			Tritium	117 ± 120	196	U	EPA 906.0 Modified
			Uranium-235	5.09 ± 14.1	16.3	U	EPA 901.1
			Uranium-238	60.6 ± 102	81.3	U	EPA 901.1
		21-Oct-2021	Actinium-228	35.5 ± 26.4	35.6	U	EPA 901.1
			Alpha, gross	1.7 ± 1.34	2.02	U	EPA 900.0/SW846 9310
			Americium-241	−2.91 ± 3.85	5.45	U	EPA 901.1
			Beryllium-7	6.31 ± 19.9	35	U	EPA 901.1
			Beta, gross	12.1 ± 1.7	2.39		EPA 900.0/SW846 9310
			Bismuth-212	70.4 ± 65.1	59.5	X	EPA 901.1
			Bismuth-214	−5.32 ± 8.64	10.2	U	EPA 901.1
			Cesium-137	0.426 ± 2.73	4.73	U	EPA 901.1
			Cobalt-60	1.32 ± 2.54	4.78	U	EPA 901.1
			Lead-212	−3.43 ± 6.28	7.18	U	EPA 901.1
			Lead-214	0.0987 ± 11.1	8.98	U	EPA 901.1
			Neptunium-237	−2.03 ± 3.77	6.32	U	EPA 901.1
			Potassium-40	49.4 ± 67.7	44.2	X	EPA 901.1
			Radium-223	19.1 ± 40	70.6	U	EPA 901.1
			Radium-224	−99.9 ± 59.5	60.9	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	21-Oct-2021	Radium-226	35.6 ± 96.2	58.4	U	EPA 901.1
			Radium-228	35.5 ± 26.4	35.6	U	EPA 901.1
			Sodium-22	−4.25 ± 5.56	4.67	U	EPA 901.1
			Thorium-227	−2.84 ± 13.9	24.5	U	EPA 901.1
			Thorium-231	17.5 ± 31.8	25.7	U	EPA 901.1
			Thorium-234	19.2 ± 74.9	55.4	U	EPA 901.1
			Tritium	18.5 ± 109	199	U	EPA 906.0 Modified
			Uranium-235	10.7 ± 18.9	16.7	U	EPA 901.1
			Uranium-238	19.2 ± 74.9	55.4	U	EPA 901.1
		22-Oct-2021	Actinium-228	12.4 ± 16.1	15	U	EPA 901.1
			Alpha, gross	1.42 ± 1.47	2.42	U	EPA 900.0/SW846 9310
			Americium-241	0.0789 ± 7.11	11.8	U	EPA 901.1
			Beryllium-7	3.62 ± 14.5	26	U	EPA 901.1
			Beta, gross	8.88 ± 1.71	2.56		EPA 900.0/SW846 9310
			Bismuth-212	7.43 ± 21.9	38.9	U	EPA 901.1
			Bismuth-214	6.45 ± 7.72	6.3	X	EPA 901.1
			Cesium-137	2.01 ± 4.09	2.96	U	EPA 901.1
			Cobalt-60	−0.353 ± 1.88	3.33	U	EPA 901.1
			Lead-212	2.26 ± 7.15	6.49	U	EPA 901.1
			Lead-214	4.44 ± 7.17	6.9	U	EPA 901.1
			Neptunium-237	−0.298 ± 2.89	5.21	U	EPA 901.1
			Potassium-40	32.8 ± 40.5	29.2	X	EPA 901.1
			Radium-223	−0.922 ± 28.8	51.9	U	EPA 901.1
			Radium-224	44.4 ± 37	51.1	U	EPA 901.1
			Radium-226	38.6 ± 71.3	49.3	U	EPA 901.1
			Radium-228	12.4 ± 16.1	15	U	EPA 901.1
			Sodium-22	−0.916 ± 1.87	3.16	U	EPA 901.1
			Thorium-227	2.54 ± 13.4	20.5	U	EPA 901.1
			Thorium-231	9 ± 36.7	31.6	U	EPA 901.1
			Thorium-234	62.4 ± 108	94.8	U	EPA 901.1
			Tritium	168 ± 122	193	U	EPA 906.0 Modified
			Uranium-235	−4.52 ± 14.8	17	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW008	2069I	22-Oct-2021	Uranium-238	62.4 ± 108	94.8	U	EPA 901.1
WW011	2069K	19-Oct-2021	Actinium-228	−10.1 ± 13.4	12.4	U	EPA 901.1
			Alpha, gross	1.18 ± 1.18	1.89	U	EPA 900.0/SW846 9310
			Americium-241	−12.4 ± 11.7	12.2	U	EPA 901.1
			Beryllium-7	32.9 ± 22	20.3	X	EPA 901.1
			Beta, gross	23.1 ± 1.76	1.89		EPA 900.0/SW846 9310
			Bismuth-212	12.6 ± 21.4	37.5	U	EPA 901.1
			Bismuth-214	4.55 ± 8.57	5.07	U	EPA 901.1
			Cesium-137	1.47 ± 1.86	2.6	U	EPA 901.1
			Cobalt-60	−0.975 ± 1.56	2.62	U	EPA 901.1
			Iodine-131	37.5 ± 7.19	4.83		EPA 901.1
			Lead-212	0.366 ± 5.25	5.38	U	EPA 901.1
			Lead-214	−1.91 ± 6.32	6.63	U	EPA 901.1
			Neptunium-237	1.01 ± 2.9	4.79	U	EPA 901.1
			Potassium-40	−14.7 ± 37.4	48.9	U	EPA 901.1
			Radium-223	−8.18 ± 26.1	46.4	U	EPA 901.1
			Radium-224	32.2 ± 33.6	48.4	U	EPA 901.1
			Radium-226	37.3 ± 74.7	48.6	U	EPA 901.1
			Radium-228	−10.1 ± 13.4	12.4	U	EPA 901.1
			Sodium-22	−1.09 ± 1.47	2.39	U	EPA 901.1
			Thorium-227	4.1 ± 11.4	18.9	U	EPA 901.1
			Thorium-231	19.3 ± 46.4	32.7	U	EPA 901.1
			Thorium-234	−90.3 ± 138	137	U	EPA 901.1
			Tritium	−32.7 ± 103	199	U	EPA 906.0 Modified
			Uranium-235	1.94 ± 19.4	15.1	U	EPA 901.1
			Uranium-238	−90.3 ± 138	137	U	EPA 901.1
		20-Oct-2021	Actinium-228	−14.5 ± 16.2	13.4	U	EPA 901.1
			Alpha, gross	1.81 ± 1.37	2.13	U	EPA 900.0/SW846 9310
			Americium-241	1.74 ± 6.3	9.51	U	EPA 901.1
			Beryllium-7	−7.79 ± 14.6	24.8	U	EPA 901.1
			Beta, gross	20.7 ± 1.84	2.28		EPA 900.0/SW846 9310
			Bismuth-212	20.6 ± 25.5	44	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	20-Oct-2021	Bismuth-214	−14.2 ± 10.7	7.38	U	EPA 901.1
			Cesium-137	0.76 ± 3.18	3.45	U	EPA 901.1
			Cobalt-60	0.226 ± 1.81	3.36	U	EPA 901.1
			Iodine-131	22 ± 6.37	5.77		EPA 901.1
			Lead-212	10.3 ± 8.07	10.3	U	EPA 901.1
			Lead-214	−2.83 ± 6.17	7	U	EPA 901.1
			Neptunium-237	−6.59 ± 6.14	5.56	U	EPA 901.1
			Potassium-40	54.8 ± 58.4	26	X	EPA 901.1
			Radium-223	−28.1 ± 34.8	52.9	U	EPA 901.1
			Radium-224	−3.59 ± 34.6	52.9	U	EPA 901.1
			Radium-226	−48.7 ± 70.2	71.3	U	EPA 901.1
			Radium-228	−14.5 ± 16.2	13.4	U	EPA 901.1
			Sodium-22	0.602 ± 1.71	3.2	U	EPA 901.1
			Thorium-227	14.2 ± 18.2	22.2	U	EPA 901.1
			Thorium-231	14.7 ± 36.2	32.9	U	EPA 901.1
			Thorium-234	6.01 ± 89.2	103	U	EPA 901.1
			Tritium	−15.9 ± 102	195	U	EPA 906.0 Modified
			Uranium-235	−9.46 ± 16.4	17.2	U	EPA 901.1
			Uranium-238	6.01 ± 89.2	103	U	EPA 901.1
		21-Oct-2021	Actinium-228	6.39 ± 15.2	15	U	EPA 901.1
			Alpha, gross	0.938 ± 1.56	2.64	U	EPA 900.0/SW846 9310
			Americium-241	−5.48 ± 9.09	15.1	U	EPA 901.1
			Beryllium-7	−2.17 ± 14.2	24.6	U	EPA 901.1
			Beta, gross	19.1 ± 1.89	2.45		EPA 900.0/SW846 9310
			Bismuth-212	16.2 ± 25.5	46.2	U	EPA 901.1
			Bismuth-214	−6.26 ± 7.6	7.97	U	EPA 901.1
			Cesium-137	−0.182 ± 1.93	3.28	U	EPA 901.1
			Cobalt-60	−0.233 ± 1.97	3.44	U	EPA 901.1
			Iodine-131	14.6 ± 5.92	5.58		EPA 901.1
			Lead-212	−1.16 ± 4.57	6.14	U	EPA 901.1
			Lead-214	−2.6 ± 6.14	7.33	U	EPA 901.1
			Neptunium-237	−0.553 ± 3.21	5.66	U	EPA 901.1

Station	Permit Number	Date Collected	Analyte	Activity (pCi/L)	MDA (pCi/L)	Laboratory Data Qualifiers[a]	Analytical Method
WW011	2069K	21-Oct-2021	Potassium-40	−9.46 ± 36.5	51.9	U	EPA 901.1
			Radium-223	−16.2 ± 33.1	56.1	U	EPA 901.1
			Radium-224	−65.5 ± 44.8	55.9	U	EPA 901.1
			Radium-226	26.4 ± 79	58.3	U	EPA 901.1
			Radium-228	6.39 ± 15.2	15	U	EPA 901.1
			Sodium-22	0.339 ± 1.67	3.07	U	EPA 901.1
			Thorium-227	−3.69 ± 12.6	22.2	U	EPA 901.1
			Thorium-231	−5.35 ± 36.6	37.9	U	EPA 901.1
			Thorium-234	−67.4 ± 148	157	U	EPA 901.1
			Tritium	−29.4 ± 103	200	U	EPA 906.0 Modified
			Uranium-235	−4.57 ± 18.3	18.7	U	EPA 901.1
			Uranium-238	−67.4 ± 148	157	U	EPA 901.1

[a] Blank cells indicate that the data did not require a data qualifier.
CINT = Center for Integrated Nanotechnologies
MDA = minimal detectable activity or minimum measured activity in a sample required to ensure a 95 percent probability that the measured activity is accurately quantified above the critical level

Laboratory Data Qualifier
U = The analyte was absent or below the method detection limit.
X = The data was rejected due to the peak not meeting identification criteria.

Glossary

Flame skimmer (*Libellula saturata*)

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).

alluvial Relating to and/or sand deposited by flowing water.

ambient That portion of the atmosphere, external to buildings, to which the general public has access.

ambient air Any unconfined portion of the atmosphere: open air or surrounding air.

analyte A substance or chemical constituent undergoing analysis.

anthropogenic Of, relating to, or resulting from the influence of human beings on nature.

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.

arroyo A deep gully cut by an intermittent stream; a dry gulch.

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

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

basin (1) A low-lying area, wholly or largely surrounded by higher land, which ranges from a small, nearly enclosed valley to an extensive, mountain-rimmed depression. (2) An entire area drained by a given stream and its tributaries. (3) An area in which the rock strata are inclined downward from all sides toward the center. (4) An area in which sediment accumulates.

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.

bird banding The process of capturing a bird, adding a leg band, and then releasing the bird unharmed.

bird survey The process of counting birds visually and audibly.

C

containment An enclosed space or facility designed to contain and prevent the escape of hazardous material.

containment cell An engineered structure designed to contain and prevent the migration of hazardous waste.

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.

diurnal (1) Relating to or occurring in a 24-hour period; daily. (2) Occurring or active during the daytime rather than at night (e.g., diurnal animals).

dosimeter A device used to measure the dose of ionizing radiation.

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.

ecosystem services The natural resources and processes that occur in a well-functioning environment, which benefit humans at no cost.

effective dose equivalent The weighted average of the estimated biological effect of a dose of ionizing radiation in certain human organs or tissues; can be used to estimate the health-effects risk for an exposed individual.

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

Electronic Product Environmental Assessment Tool A set of criteria for six categories of technology products to determine the environmental attributes of particular electronic office products.

electroplating The act of coating or covering a substrate with a thin layer of metal.

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.

ephemeral spring A spring that flows only briefly in the immediate locality in response to precipitation.

exceedance Violation of the regulatory limits for pollutants permitted by environmental protection standards.

explosives waste Any explosive substance, article, or explosive-contaminated item that cannot be used for its intended purpose and does not have a legitimate investigative or research use.

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.

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

flora (1) Plants considered as a group, especially of a particular region or period. (2) The plant life characterizing a specific geographic region or environment.

fungicide An agent that destroys fungi or inhibits their growth.

G

gamma radiation Very high-energy and high-frequency electromagnetic radiation that is emitted by the nuclei of radioactive substances during decay, or by the interactions of high-energy electrons with matter. They are similar to but have a shorter wavelength than X-rays.

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.

hazardous waste site Any facility or location at which hazardous waste operations take place.

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

herpetofauna The reptiles and amphibians of a particular region, habitat, or geological period.

herpetology The study of reptiles and amphibians.

high-level radioactive waste Materials produced as a byproduct of the reactions that occur inside nuclear reactors and determined to be waste.

I

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

industrial discharge Wastewater emitting from general laboratory research operations that may contain pollutants at levels that could affect the quality of receiving waters or interfere with publicly owned treatment works.

inertial confinement fusion A type of energy research that attempts to initiate nuclear fusion reactions.

inhalation hazard Risk from materials or chemicals that present a hazard if respired (inhaled) into the lungs.

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 missions are accomplished while protecting the worker, the public, and the environment.

ion An atom or molecule with a net electric charge due to the loss or gain of one or more electrons.

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.

leachate Water that collects contaminants as it percolates through wastes, pesticides, or fertilizers. Leaching may occur in farming areas, feedlots, or landfills and may result in hazardous substances entering surface water, groundwater, or soil.

legacy site A former Environmental Restoration site.

legacy waste Waste originally generated between 1990 and 1998.

low-level radioactive waste Items that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation and determined to be waste.

M

Materials Sustainability and Pollution Prevention Program A program to facilitate the use and reuse of materials in the most productive and sustainable manner across their entire life cycle.

maximally exposed individual A member of the public who is located in an area that receives or has the potential to receive the maximum radiological dose from air emissions of a NESHAP radionuclide source. The dose estimates are based on realistic, yet conservative, input parameters.

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).

N

National Emission Standards for Hazardous Air Pollutants Emission standards set by EPA for air pollutants not covered by National Ambient Air Quality Standards that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. Primary standards are designed to protect human health; secondary standards are designed to protect public welfare (e.g., building facades, visibility, crops, and domestic animals).

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.

National Pollutant Discharge Elimination System A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, a tribal government, or a territorial government.

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

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

nitrite (1) An intermediate in the process of nitrification. (2) Nitrous oxide salts used in food preservation.

nuclear particle acceleration A method for imparting large kinetic energy to electrically charged subatomic nuclear particles by applying electrical potential differences for the purpose of physics experiments.

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.

optically stimulated luminescent dosimeter A device used to measure ionizing radiation.

outfall The place where effluent is discharged into receiving waters.

ozone (O_3) A colorless gas soluble in alkalis and cold water; a strong oxidizing agent; can be produced by electric discharge in oxygen or by the action of ultraviolet radiation on oxygen in the stratosphere (where it acts as a screen for ultraviolet radiation).

P

perched aquifer A body of groundwater that is separated from an underlying body of groundwater by unsaturated earth materials.

perennial spring A source of water issuing from the ground that flows continuously, as opposed to an intermittent spring or a periodic spring.

$PM_{2.5}$ Respirable particulate matter that has a diameter equal to or less than 2.5 microns.

PM_{10} Particulate matter that has a diameter equal to or less than 10 microns.

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.

proximity fuze (or fuse) An explosive ignition device used in bombs, artillery shells, and mines that detonates automatically when the distance to the target becomes smaller than a predetermined value.

pulsed power Technology used to generate and apply energetic beams and high-power energy pulses.

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.

radionuclide A radioactive particle, man-made or natural, with a distinct atomic weight number.

radon A colorless, naturally occurring, radioactive, inert gas formed by the radioactive decay of radium atoms in soil or rocks.

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.

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.

sanitary discharge Liquid effluent that is exclusive of industrial wastewater and stormwater. It includes the liquid discharges from restrooms and showers, food preparation activities, and other domestic-type activities.

secondary containment Any structure or device that has been installed to prevent leaks, spills, or other discharges of stored chemicals, waste, oil, or fuel from storage, transfer, or end-use equipment from being released to the environment. Examples of secondary containment include pans, basins, sumps, dikes, berms, or curbs.

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.

split sample A single sample that is separated into at least two parts so that each part is representative of the original sample.

statement of work A comprehensive description of the goods, services, or combination of goods and services for which Sandia contracts.

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

surface discharge A release of water and water-based compounds to roads, open areas, or confined areas such as reservoirs.

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.

time-weighted composite A sample consisting of several portions of the discharge collected during a 24-hour period in which each portion of the sample is collected within a specific time frame that is irrespective of flow.

topography The physical features of a surface area, including relative elevations and the position of natural and man-made features.

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."

transect A sample area (i.e., vegetation) usually in the form of a long, continuous strip.

transuranic waste Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92 and a half-life greater than 20 years in concentrations greater than 100 nanocuries per gram.

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

U

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).

upstream (1) In the direction opposite the flow of a stream. (2) In or to a position within the production stream closer to manufacturing processes.

U.S. Forest Service withdrawal area A portion of KAFB consisting of land within the Cibola National Forest that has been withdrawn from public access for use by the U.S. Air Force and DOE.

V

vadose zone The part of the Earth between land surface and the water table.

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

volatile organic compound An organic chemical compound with a high vapor pressure causing it to evaporate.

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.

water table The level of groundwater.

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.

wind direction The direction from which the wind originates.

wind rose A graphical presentation of wind speed and wind direction frequency distribution.

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