

DOE/EIS-0573

April 2026

**DRAFT**

# **Plutonium Pit Production**

**Programmatic Environmental Impact Statement**

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**VOLUME 2**



U.S. DEPARTMENT OF

**ENERGY**



## COVER SHEET

**RESPONSIBLE FEDERAL AGENCY:** U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA)

**TITLE:** Draft Plutonium Pit Production Programmatic Environmental Impact Statement (DOE/EIS-0573) (Pit Production PEIS or PEIS)

**LOCATION:** Los Alamos, New Mexico and Aiken, South Carolina

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This document is available for viewing and downloading on the DOE NEPA website (<https://www.energy.gov/nepa/doeais-0573-plutonium-pit-production-multiple-locations>).

**Abstract:** NNSA’s Proposed Action is to produce plutonium pits at required quantities to meet national security requirements (50 U.S.C. § 2538a). This PEIS presents potential environmental impacts associated with pit production at single or multiple sites. For analytical purposes, this PEIS evaluates potential impacts of continuous pit production over the next 50 years. The Proposed Action also includes activities across the Nuclear Security Enterprise related to transportation and waste management associated with the pit production mission.

This PEIS has been prepared to satisfy the Settlement Agreement and is compliant with Section 102(2)(C) of NEPA and DOE’s NEPA Implementing Procedures. **This Draft PEIS is approximately 240 pages.**

**Public and Tribal Involvement:** NNSA published a Notice of Intent on May 9, 2025 (90 FR 19706), announcing preparation of the Pit Production PEIS and a scoping period that ended on July 14, 2025. NNSA conducted online public scoping meetings on May 27 and 28, 2025, and accepted comments via the meetings, email, and postal mail. All comments received were systematically reviewed, organized into comment issue categories, and considered in developing the PEIS. A summary of scoping comments and NNSA’s consideration of those comments is provided in Appendix B. Pursuant to the Settlement Agreement, the Draft PEIS is subject to a 90-day public comment period beginning with publication of a Notice of Availability from the U.S. Environmental Protection Agency. NNSA will hold five in-person public hearings with at least 15 days’ advance notice provided through DOE NEPA webpage, local newspapers, established email distribution lists, and direct outreach to tribes and pueblos near potentially affected sites. NNSA will consider all comments received in preparing the Final PEIS, will append or otherwise publish all substantive comments or summaries thereof if comment volume is exceptionally large, will include all Draft PEIS comment documents in the Administrative Record, and intends to issue a Record of Decision concurrently with the Final PEIS in accordance with DOE NEPA Implementing Procedures (DOE 2025a).

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**ABBREVIATIONS AND ACRONYMS**

1980 WIPP EIS	Waste Isolation Pilot Plant Final Environmental Impact Statement
1999 LANL SWEIS	Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico
2008 LANL SWEIS	Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico
2026 LANL SWEIS	Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico
CFR	Code of Federal Regulations
CMRR-NF	Chemistry and Metallurgy Research Replacement–Nuclear Facility
Complex Transformation SPEIS	Complex Transformation Supplemental Programmatic Environmental Impact Statement
DAF	Device Assembly Facility
DCE	Distributed Center of Excellence
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOW	Department of War
EIS	environmental impact statement
FR	Federal Register
FY	fiscal year
HE&E	high explosives and energetics
HED	high energy density
HEU	highly enriched uranium
HPDU	high-purity depleted uranium
IT	information technology
KCNCS	Kansas City National Security Campus
LANSCC	Los Alamos Neutron Science Center
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
MFFF	Mixed-Oxid Fuel Fabrication Facility
NEPA	National Environmental Policy Act
NIF	National Ignition Facility
NM	New Mexico
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Sites
NSE	Nuclear Security Enterprise
PCB	polychlorinated biphenyl
PEIS	Programmatic Environmental Impact Statement
PF-4	Plutonium Facility-4
ppy	pits per year
PULSE	Principal Underground Laboratory for Subcritical Experimentation
R&D	research and development
ROD	Record of Decision
SA	Supplement Analysis
SNL	Sandia National Laboratories
SNL/NM	Sandia National Laboratories/New Mexico

SRPPF	Savannah River Plutonium Processing Facility
SRS	Savannah River Site
SSM PEIS	Programmatic Environmental Impact Statement for Stockpile Stewardship and Management
SSM Plan	Stockpile Stewardship and Management Plan
SWEIS	Site-Wide Environmental Impact Statement
TA	technical area
TPBAR	tritium-producing burnable absorber rod
TRU	transuranic (waste)
U.S.C.	United States Code
WIPP	Waste Isolation Pilot Plant
WIPP SEIS-I	Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant
WIPP SEIS-II	Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement
WM PEIS	Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste

## A SUPPLEMENTAL SUPPORTING INFORMATION

This programmatic environmental impact statement (PEIS) has been prepared in accordance with Section 102(2)(C) of the *National Environmental Policy Act of 1969* (42 U.S.C. §§ 4321–4336(e)), as amended; NEPA) and the U.S. Department of Energy (DOE) NEPA Implementing Procedures (DOE 2025). As identified in Chapter 1, Section 1.6, this PEIS also satisfies the signed settlement agreement, which includes specific requirements for the PEIS preparation process that are in addition to those requirements in DOE’s NEPA Implementing Procedures. NEPA specifies a maximum of 300 pages for complex EISs. Therefore, the material in Volume 1 was streamlined to include just those elements required by NEPA and to focus on actions and analyses that support decision-making. This appendix contains supplemental, supporting information that provides additional background on the following topics:

- Summary of plutonium and pit aging,
- Summary of the Stockpile Stewardship and Management Plan (SSM Plan), and
- Description of DOE NEPA documents that are relevant to the analysis and presentation in this PEIS.

### A.1 Plutonium and Pit Aging

The following information supports the discussion in Chapter 1, Section 1.2.1.

The radioactive decay of the plutonium<sup>1</sup> contained within a U.S. nuclear weapon’s primary component has potential cumulative effects on nuclear weapon performance. This cumulative effect of plutonium’s radioactive decay is referred to as “plutonium aging” or “pit aging.” To improve scientific understanding of this phenomenon, DOE/NNSA established a National Strategy for Plutonium Aging in 2017. This National Strategy, which was updated in 2020, is focused on obtaining experimental data to improve and underpin DOE/NNSA’s numerical simulation of nuclear weapons performance.

Pursued through the National Strategy and guided by the 10-year National Plutonium Aging Research Program Plan, the National Plutonium Aging Program will provide DOE/NNSA with an improved understanding of pit aging. This data will support the assessment of enduring stockpile systems and certification of ongoing and future warhead acquisition programs.

NNSA prepared a report to Congress in September 2021, *Research Program Plan for Plutonium and Pit Aging* (NNSA 2021). The classified report outlines a 10-year research program (2021–2030) to study the effects of plutonium aging on U.S. nuclear weapons. The plan aims to improve scientific understanding, reduce uncertainties in performance predictions, and support stockpile sustainment and warhead acquisition programs. The key points identified in the report are as follows (NNSA 2021):

1. **Plutonium Aging.** Plutonium undergoes radioactive decay, leading to changes in its material properties over time.
2. **National Strategy.** DOE/NNSA established a National Strategy for Plutonium Aging in 2017, updated in 2020, to guide research efforts. The strategy focuses on experimental data collection, modeling, and simulation to assess aging effects.

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<sup>1</sup> Throughout this PEIS, when referring to plutonium, the reference is to the isotope plutonium-239 (Pu-239), unless otherwise stated.

3. **Goals.** There are mid-term (FY 2025) and long-term (FY 2030) goals. The mid-term goals are to develop experimental data and models to reduce uncertainties in performance predictions for older pits. The long-term goals are to validate models through experiments and confidently predict primary lifetimes for stockpile systems.
4. **Facilities and Capabilities.** Research relies on several advanced facilities in the Nuclear Security Enterprise (NSE). These facilities are being utilized for pit aging research and not necessarily involved in pit production.
  - **Plutonium Facility-4 (PF-4)** at Los Alamos National Laboratory (LANL).
  - **Joint Actinide Shock Physics Experimental Research** facility at Nevada National Security Sites (NNSS).
  - **Principal Underground Laboratory for Subcritical Experimentation (PULSE)** and **Device Assembly Facility (DAF)** at NNSS.
  - **National Ignition Facility (NIF)** at Lawrence Livermore National Laboratory (LLNL).
  - **Z Pulsed Power Facility** at Sandia National Laboratories/New Mexico (SNL/NM).
  - **Proton Radiography** and Los Alamos Neutron Science Center (LANSCE).
5. **Budget.** The program's estimated budget from FY 2022 to FY 2030 is over \$792 million for experimental sciences and \$71 million for engineering and technology maturation.
6. **Stockpile Benefits.** The research supports assessments of legacy stockpile systems and certification of ongoing and planned warhead acquisition programs. Pit lifetime assessments have been or will be conducted in FY 2023, FY 2025, and FY 2030.

## A.2 Fiscal Year 2025 Stockpile Stewardship Management Plan

The following information supports the discussion in Chapter 1, Section 1.3.3.

The FY 2025 SSM Plan outlines strategies to maintain and modernize the U.S. nuclear stockpile over the next 25 years. The U.S. nuclear deterrent is vital for national security and global stability. NNSA is committed to maintaining a safe, secure, and reliable nuclear stockpile without underground testing. The plan includes production of a minimum of 80 plutonium pits annually. The SSM Plan includes discussion of all aspects related to stockpile stewardship and management. Some of these aspects are directly related to the production of plutonium pits, while others provide a background on developments occurring at other NSE sites related to the stockpile, but distinct from pit production. The following subsections provide a synopsis of the FY 2025 SSM Plan (NNSA 2024).

### Strategic Context and Policy Framework

The NNSA operates under a framework that emphasizes the importance of a safe and effective nuclear deterrent in response to evolving global threats. Coordination with the U.S. Department of Defense (DoD)<sup>2</sup> is essential for meeting national security objectives.

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<sup>2</sup> On September 5, 2025, Executive Order 14347, “Restoring the United States Department of War,” ordered that the Department of Defense may be referred to as the Department of War and the Secretary of Defense may be referred to as the Secretary of War. As such, this PEIS refers to the Department of Defense when referring to documents prepared prior to September 5, 2025, and when applicable, regulations refer to Department of Defense. The PEIS refer to Department of War (DOW) when referring to future actions or responsibilities.

- The Nuclear Posture Review and National Defense Strategy outline the role of nuclear weapons in deterring attacks.
- The *Atomic Energy Act of 1954, as amended* (42 U.S.C. §§ 2011–2021, 2022–2286i, 2296a–2297h-13) and the *NNSA Act* (50 U.S.C. § 2401 et seq.) authorize the NNSA to manage the stockpile.
- The current stockpile includes various warhead types, with ongoing modernization efforts.

### **Nuclear Warhead Modernization Efforts**

DOE/NNSA is actively modernizing the U.S. nuclear warhead stockpile in response to evolving international threats and technological challenges. This modernization includes updating existing capabilities, enhancing infrastructure, and ensuring a credible deterrent through various strategic initiatives.

- DOE/NNSA is modernizing warheads alongside DoD/DOW delivery platforms.
- The approach allows flexibility for future policy decisions on nuclear modernization.
- Immediate action is required to reestablish and recapitalize nuclear capabilities.
- Upgrades to facilities are necessary to meet increased workloads.

### **Stockpile Management Activities Overview**

The DOE/NNSA manages a comprehensive set of activities to sustain, modernize, and dismantle the U.S. nuclear weapons stockpile, ensuring safety, reliability, and performance. These activities are supported by robust production operations and scientific capabilities.

- *Stockpile Sustainment* includes maintenance, surveillance, and assessments of warheads.
- *Major Modernization* involves life extension programs and modifications to enhance capabilities.
- *Weapons Dismantlement and Disposition* manages retired weapons and their components.
- *Production Operations* enable the necessary capabilities for weapon operations and modernization.

### **Future Warhead Development Plans**

DOE/NNSA is coordinating with DoD/DOW to define future warheads that address anticipated threats, ensuring that the U.S. nuclear deterrent remains effective. This includes several strategic warhead programs.

- Future warheads include options for land-based, sea-based, and air-delivered systems.
- The development of these warheads is essential for maintaining national security.
- Coordination with DoD/DOW is ongoing to align warhead requirements with military needs.

### **Weapon Science and Engineering**

The Weapon Science and Engineering area encompasses the physical sciences and engineering disciplines necessary for assessing and certifying the U.S. nuclear stockpile. It integrates capabilities in atomic physics, materials science, high energy density (HED) science, and advanced diagnostics to ensure a reliable nuclear deterrent.

### **Atomic Physics, Nuclear Physics, and Radiochemistry**

Understanding atomic and nuclear properties is essential for enhancing predictive capabilities and validating weapon simulations.

- Atomic physics studies interactions among electrons, nuclei, and photons relevant to nuclear weapon function.
- Nuclear physics focuses on atomic nuclei and their reactions crucial for stockpile performance assessments.
- Radiochemistry connects modern assessments to legacy underground nuclear test data, informing weapon performance evaluations.
- Facilities such as the NIF (LLNL), LANSCE (LANL), and the Omega Laser Facility (University of Rochester) support experimental investigations to improve models and reduce uncertainties.

### **Materials Science, Chemistry, and Actinide Science**

This area is vital for understanding material performance in nuclear weapons throughout their lifecycle.

- Material science addresses stockpile issues, compatibility, and the development of new materials to replace aging components.
- Dynamic material studies investigate behaviors under extreme conditions using such facilities as NIF (LLNL) and Z Pulsed Power (SNL/NM).
- The high explosives and energetics (HE&E) science and engineering capability focuses on the design and testing of high explosives.
- Actinide science is crucial for understanding the production and compatibility of nuclear materials.

### **High Energy Density Science and Plasma Physics**

HED science studies matter and radiation under extreme conditions, providing data for validating weapon physics models.

- Experiments in plasma physics explore behaviors in high-temperature environments relevant to nuclear weapons.
- Inertial confinement fusion experiments at NIF (LLNL) and other such facilities aim to understand thermonuclear burn and plasma properties.
- Achievements in fusion ignition at NIF enhance experimental capabilities and understanding of weapon performance.

### **Technologies for Studying Extreme Conditions**

Lasers, accelerators, and pulsed-power technologies generate environments relevant for nuclear-weapon testing and qualification.

- These technologies create high-energy conditions to study material performance and inform design codes.
- Facilities such as NIF (LLNL), Z Pulsed Power (SNL/NM), and LANSCE (LANL) provide complementary data for weapon assessments and modernization efforts.
- Accelerator technology supports subcritical experiments and dynamic imaging diagnostics for weapon evaluations.

### **Advanced Experimental Diagnostics and Sensors**

This capability provides critical measurements for understanding material behavior in extreme conditions.

- New diagnostics enhance data collection for dynamic material experiments and HED science.
- High-fidelity measurements are essential for validating simulations and improving weapon performance assessments.
- A National Diagnostics Working Group collaborates to develop advanced diagnostic techniques for future experiments.

### **Hydrodynamic and Subcritical Experiments**

Hydrodynamic and Subcritical Experiments' capabilities provide data on weapon systems' hydrodynamic behavior without nuclear yield.

- These experiments assess primary performance and safety, informing stockpile certification decisions.
- The National Hydrodynamic Testing Complex operates at near capacity, necessitating infrastructure upgrades.
- New technologies, such as the Advanced Sources and Detectors Scorpius Project (NNSS), are being developed to enhance experimental capabilities and data collection.

### **Weapon Simulation and Computing Overview**

This area includes high-performance computing and simulation capabilities essential for assessing nuclear weapon behavior. It supports weapon design, production, and stockpile assessment without underground testing.

### **High-Performance Computing Capabilities**

High-performance computing involves integrated systems for simulating weapon systems and fundamental processes.

- The El Capitan (LLNL) system is the first exascale platform for national security and became operational in 2024.
- High-performance computing platforms are evolving toward heterogeneous computing, incorporating artificial intelligence and machine learning for enhanced simulations.
- Continuous upgrades and a strategic roadmap are necessary to meet future computing needs.

### **Simulation Capabilities for Weapon Science**

Advanced simulation codes enable the qualification and certification of nuclear weapons.

- Integrated design codes support multi-physics simulations for stockpile assessment and modernization.
- Improved predictive capabilities are essential for addressing aging stockpile issues and new material configurations.
- The Advanced Machine Learning Initiative aims to enhance simulation efficiency and predictive capabilities.

### **Weapon Physics Design and Analysis**

This capability assesses nuclear weapon performance and certifies changes to the stockpile.

- It relies on historical test data and modern experimental capabilities to validate design tools.
- Continuous development of certification methodologies is necessary for designs without extensive test histories.

### **Weapon Engineering Design and Integration**

This capability supports the development and qualification of weapon designs to meet military requirements.

- Digital engineering tools are being implemented to streamline design processes and reduce production issues.
- Collaboration with DoD/DOW ensures integration of nonnuclear subsystems with nuclear explosive packages.

### **Environmental Effects Analysis and Testing**

This capability simulates environments to measure the response of weapon systems to various conditions.

- Modernization of experimental facilities is necessary to meet increasing technical requirements.
- The Combined Radiation Environments for Survivability Testing capability (SNL/NM) is being developed to replace aging facilities and support diverse radiation testing.

### **Weapons Surety Design and Manufacturing**

This capability focuses on safety and use of control systems for nuclear weapons.

- Ongoing assessments integrate security and control capabilities to address evolving threats.
- Novel technologies are being explored to enhance safety and reliability in weapon systems.

### **Radiation-Hardened Microelectronics Development**

This capability at SNL/NM ensures reliable microelectronics for nuclear weapons under various radiation conditions.

- The Microsystems Engineering, Science and Applications complex provides trusted microelectronics, with plans for upgrades to sustain capabilities through 2040.
- Collaboration with manufacturers and research institutions is essential to address risks and sustain production.

### **Plutonium Management and Production Capabilities**

DOE/NNSA is focused on reestablishing plutonium pit manufacturing capabilities to ensure the reliability and safety of the nuclear stockpile. This involves producing a minimum of 80 pits per year (ppy) by 2030.

- DOE/NNSA aims to produce 80 ppy year by 2030.
- LANL will produce 30 ppy using PF-4.
- SRS proposes to produce 50 ppy after repurposing the Mixed-Oxide Fuel Fabrication Facility (MFFF) to the Savannah River Plutonium Processing Facility (SRPPF).
- Key requirements include infrastructure completion, war-reserve-quality pit manufacturing capability, and full-rate production demonstration.
- Ongoing projects include the Los Alamos Plutonium Pit Production Project and the SRPPF.
- Aging facilities pose operational risks, necessitating significant investments in infrastructure and workforce.

### **Uranium Modernization and Processing Initiatives**

The Uranium Modernization Program is essential for ensuring a reliable supply of highly enriched uranium (HEU) for various defense applications while transitioning from aging facilities. The program focuses on relocating HEU capabilities from the outdated Building 9212 at Y-12 to the new Uranium Processing Facility also at Y-12.

- HEU is critical for stockpile programs, naval reactors, and nonproliferation efforts.
- The program aims to phase out reliance on Building 9212, which is over 80 years old.
- Key actions include relocating HEU capabilities and investing in new technologies for improved safety and efficiency.
- The Uranium Processing Facility will replace Building 9212 for HEU casting and processing.
- Ongoing projects include Electrorefining and Direct Chip Melt to enhance production processes.

### **Depleted Uranium Modernization Efforts**

The Depleted Uranium Modernization Program at Y-12 aims to restore and maintain production capabilities for high-purity depleted uranium (HPDU) and binary alloys essential for nuclear components. This program addresses the need for reliable feedstock and modernized manufacturing processes.

- The program seeks to establish a reliable supply of HPDU by 2030.
- Key activities include converting depleted uranium hexafluoride into HPDU and restarting alloying capabilities at Y-12.
- New technologies like direct casting and electron beam cold hearth melting are being developed to improve efficiency.
- The program is also focused on modernizing existing facilities to reduce reliance on aging equipment.

### **Domestic Uranium Enrichment Program Overview**

The Domestic Uranium Enrichment Program is responsible for ensuring a reliable supply of enriched uranium to meet national security needs, particularly for tritium production. The program is implementing a strategy to develop domestic enrichment capabilities following the closure of the Paducah Gaseous Diffusion Plant.

- The program focuses on downblending HEU to extend tritium fuel needs to 2044.
- Centrifuge technologies are prioritized for developing a domestic enrichment capability.
- The program is assessing unobligated enriched uranium inventory to support future needs.
- NSNA contracted an engineering study to inform the acquisition approach for demonstrating DOE's Oak Ridge National Laboratory's Domestic Uranium Enrichment Centrifuge Experiment technology in a pilot plant.

### **Lithium Handling and Processing Capabilities**

Lithium is a critical material for nuclear weapon components, and the DOE/NNSA is focused on modernizing lithium processing capabilities at Y-12 to meet stockpile requirements. The aging infrastructure poses risks, necessitating the construction of a new Lithium Processing Facility.

- The current Lithium Processing Facility is more than 80 years old and faces structural issues.
- The new Lithium Processing Facility is aiming for completion by 2033.

- Advanced processing technologies are being pursued to improve efficiency and material quality.
- The strategy includes maintaining sufficient lithium processing capabilities until the new facility is operational.

### **Tritium Production and Management Strategies**

Tritium is essential for nuclear weapons, requiring periodic replenishment due to its radioactive decay. The DOE/NNSA manages tritium production through the irradiation of tritium-producing burnable absorber rods (TPBARs) in reactors operated by the Tennessee Valley Authority.

- Tritium is produced by irradiating TPBARs in Watts Bar Unit 1 and 2 reactors.
- Ongoing extraction and recycling efforts at SRS are critical for maintaining tritium inventories.
- Aging infrastructure at SRS necessitates recapitalization and maintenance to ensure continued tritium availability.

### **High Explosives and Energetics Management**

The management of HE&E is crucial for the current and future nuclear stockpile, requiring modernization of aging facilities and processes. The DOE/NNSA is planning significant construction projects to enhance HE&E capabilities.

- Aging facilities pose risks to HE&E production and require extensive maintenance.
- Major construction projects include the High Explosives Science and Engineering facility and the High Explosives Synthesis, Formulation, and Production facility at Pantex.
- The program aims to consolidate and modernize existing facilities to improve safety and efficiency.

### **Nonnuclear Component Production and Modernization**

The Nonnuclear Component Production area focuses on the development and manufacturing of essential nonnuclear components for weapon systems, ensuring safety, security, and functionality. The modernization program at the Kansas City National Security Campus (KCNSC) aims to enhance capabilities and address challenges in production and supply chain management.

- Nonnuclear components support weapon functions such as arming, fuzing, and safety.
- The KCNSC Non-Nuclear Capabilities Modernization Program manages projects to modernize and strengthen production capabilities.
- Key activities include procuring advanced manufacturing equipment, sustaining microelectronics production, and mitigating supply chain risks.
- Accomplishments include establishing the multi-site Electronic Parts Program and achieving significant design milestones in power source capabilities.

### **Weapon Component and Material Process Development**

This capability focuses on advancing manufacturing processes and technologies to improve efficiency, cost, and safety in weapon component production. The goal is to address obsolescence and enhance NSE responsiveness.

- The capability aims to rapidly develop and mature manufacturing processes for weapon components.
- Aging infrastructure and equipment are hindering innovation and production demands.

- The Facility for the Advanced Manufacturing of Energetics at LLNL has been established to print large HE components.
- Investments in advanced manufacturing technologies are necessary to reduce costs and improve agility.
- Ongoing studies are being conducted to mitigate potential adverse effects on existing and future programs.

### **Weapon Component and System Prototyping**

The prototyping capability supports the development and testing of high-fidelity weapon components to reduce costs and cycle times before production. This includes the use of innovative technologies and materials to enhance performance.

- Prototyping facilitates accelerated learning cycles and integration of new technologies.
- Accomplishments include the development of novel control software for rapid prototyping at SNL/NM.
- KCNSC shipped more than 21,000 prototype items in FY 2023 to support modernization efforts.
- The capability supports the replacement of obsolete materials and technologies.
- Collaboration with DoD/DOW enhances the development of integrated system architectures.

### **Advanced Manufacturing Innovations**

Advanced manufacturing capabilities are crucial for creating a responsive and resilient NSE. These innovations aim to reduce costs and improve production efficiency.

- The KCNSC has launched a Smart Factory System to enhance operational efficiency.
- Advanced additive manufacturing techniques are being developed for safer HE production.
- The construction of the Advanced Fabrication Facility at Pantex was completed in early 2025.
- Investments in new materials and manufacturing simulation capabilities are ongoing.
- The goal is to align technology maturation with future warhead modernization schedules.

### **Weapon Assembly, Storage, and Disposition**

This capability encompasses the assembly, disassembly, and inspection of nuclear weapon systems, ensuring safety and security throughout the process. Aging infrastructure poses challenges that require modernization efforts.

- The Warhead Assembly Modernization program to enhance capabilities at Pantex started in FY 2025.
- Aging facilities and equipment are becoming increasingly difficult to maintain and replace.
- Capital investments are essential for modernizing assembly and disassembly operations.
- DOE/NNSA is developing actions to address storage challenges at production agencies.
- The focus is on increasing efficiency and throughput to meet mission demands.

### **Secure Transportation and Safeguards**

The Secure Transportation capability ensures the safe and secure transport of nuclear weapons and materials, while the Safeguards and Security capability protects personnel and facilities from various threats. Both areas are critical for maintaining national security.

- The Secure Transportation Asset program completed more than 150 shipments without incident in FY 2023.
- The Mobile Guardian Transporter is being developed to replace aging transport vehicles.
- Safeguards and security initiatives include increasing protective force personnel and modernizing security systems.
- Continuous vetting and insider threat mitigation strategies are being implemented.
- Investments in security infrastructure are necessary to address evolving threats.

### **Information Technology (IT) and Cybersecurity Enhancements**

DOE/NNSA is focused on improving IT and cybersecurity to protect information assets and enhance operational efficiency. This includes modernizing infrastructure and implementing advanced technologies.

- The IT and cybersecurity strategy aims to deliver secure and agile solutions across the enterprise.
- Accomplishments include deploying new classified cloud technologies and enhancing unified communications.
- Goals include improving incident detection and response through automation and training.
- The workforce strategy focuses on attracting and retaining IT and cybersecurity professionals.
- Continuous investments are required to address risks and enhance cybersecurity capabilities.

### **Area Planning for Nuclear Security**

Area planning connects DOE/NNSA’s strategic vision with infrastructure investments, ensuring alignment with mission needs and lifecycle management strategies. Regular updates and stakeholder communication are vital for adapting to changing priorities.

- SRS transitioned management from the DOE Office of Environmental Management to DOE/NNSA in 2025.
- The SRS Landlord Transition Plan was signed in September 2023, transferring four major responsibilities to NNSA.

### **Programmatic Construction and Line-Item Projects**

Programmatic construction projects are categorized by Weapons Activities capability areas, addressing long-term funding needs for infrastructure replacement. These projects are essential for maintaining and enhancing nuclear security capabilities.

- Current projects include the High Explosive Science and Engineering Facility (Pantex) and the Uranium Processing Facility (Y-12).
- Future proposals focus on modernization and addressing mission gaps in various areas, including Weapon Science and Engineering.

### **Mission-Enabling Construction Projects**

Mission-enabling infrastructure supports sitewide utilities and services essential for nuclear deterrence. Recent projects have improved NSE operational capabilities.

- Completed projects include the SNL/NM Emergency Operations Center and replacement of the 138-kilovolt power transmission system.

- Ongoing projects focus on enhancing emergency operations and electrical power capacity and redundancy.

### **Stockpile Major Modernization Overview**

Stockpile Major Modernization programs aim to extend the lifespan of the U.S. nuclear stockpile while enhancing safety and security. These programs also focus on developing new warheads without requiring underground nuclear testing.

### **Plutonium Pit Production Capacity Requirements**

The NNSA is tasked with ensuring the production of plutonium pits, which are critical components of nuclear weapons. The production schedule outlines specific targets for plutonium pits through 2030.

- The current law (50 U.S.C. § 2538a) includes a requirement to produce 30 ppy by 2026.
- The ultimate goal is to produce not less than 80 war-reserve plutonium pits by 2030.
- Annual certifications to Congress are required to confirm that the NNSA's programs and budget will meet these production requirements.

### **Nuclear Weapons Council Assessment Requirements**

The Nuclear Weapons Council is responsible for assessing NNSA detailed reports regarding the nuclear stockpile. This assessment ensures that the plans align with national security strategies and infrastructure needs.

- The Council must analyze whether the NNSA's plans support the national security strategy and modernization requirements.
- A risk assessment is required if the plans do not adequately support modernization or infrastructure recapitalization.

### **Weapon Science and Engineering**

The Weapon Science and Engineering area focuses on the physical sciences and engineering disciplines necessary for assessing and certifying the nuclear stockpile. This includes understanding materials and their behavior under extreme conditions.

- Key disciplines include atomic physics, materials science, and HED science.
- Facilities such as the NIF (LLNL) and LANSCE (LANL) are critical for experimental data.
- Advanced diagnostics and hydrodynamic experiments provide essential data for validating nuclear weapon performance.

### **Weapon Simulation and Computing Capabilities**

The Weapon Simulation and Computing area involves high-performance computing and advanced modeling to assess nuclear weapon behavior. This capability is vital for ensuring the reliability and safety of the stockpile.

- High-performance computing supports complex simulations of weapon systems and fundamental physical processes.
- Advanced computer codes and data analytics are utilized to model weapon behavior and assess performance.
- Continuous development in computational capabilities is necessary to maintain the effectiveness of the stockpile stewardship program.

### **Weapon Material Processing and Manufacturing**

The Weapon Material Processing and Manufacturing area focuses on the handling and production of materials essential for nuclear weapons. This includes managing plutonium, uranium, and tritium.

- Special protocols are required for the management of such hazardous materials as plutonium and tritium.
- Tritium management involves periodic replenishment and extraction processes.
- HE&E management is critical for developing materials used in nuclear weapons.

### **Weapon Component Production and Testing**

The Weapon Component Production area includes the capabilities for producing and testing all components necessary for nuclear weapons. This ensures that weapons can be armed, fuzed, and fired reliably.

- Nonnuclear components are essential for weapon functionality and require specialized manufacturing processes.
- Advanced manufacturing techniques are employed to improve efficiency and safety in production.
- Surveillance and assessment activities are conducted to evaluate the health of the stockpile and ensure reliability.

### **Transportation and Security of Nuclear Weapons**

The Transportation and Security area involves the protection and movement of nuclear weapons and materials. This is crucial for maintaining national security and preventing unauthorized access.

- Secure transportation protocols are established for the movement of nuclear weapons and components.
- Safeguards and security measures protect nuclear materials from theft and sabotage.
- Cybersecurity efforts ensure the integrity of information systems related to nuclear security operations.

## **A.3 Descriptions of Relevant DOE/NNSA NEPA Documents**

Chapter 1, Section 1.6 provides a brief discussion of the previously completed DOE/NNSA NEPA documents that are relevant to pit production and this PEIS. Table 1.6-1 in that section lists those documents. The following sections provide a description of these documents.

### **A.3.1 Programmatic Environmental Impact Statements**

In accordance with DOE's NEPA Implementing Procedures (DOE 2025), DOE evaluates programmatic NEPA documents at least every five years by means of supplement analysis (SA). Based on the SA, DOE determines whether the existing NEPA document remains adequate or a new or supplement to the existing document is needed. The determination and supporting analysis are made publicly available.

The statutory requirements that were included in the *Fiscal Responsibility Act* (2023) and subsequently codified in NEPA at 42 U.S.C. 4336b state the following:

*“When an agency prepares a programmatic environmental document for which judicial review was available, the agency may rely on the analysis included in the*

*programmatic environmental document in a subsequent environmental document for related actions as follows: (1) Within 5 years and without additional review of the analysis in the programmatic environmental document, unless there are substantial new circumstances or information about the significance of adverse effects that bear on the analysis. (2) After 5 years, so long as the agency reevaluates the analysis in the programmatic environmental document and any underlying assumption to ensure reliance on the analysis remains valid.”*

This PEIS identifies several programmatic (or sitewide) EISs that are relevant to this PEIS. Many of these programmatic EISs have been reevaluated or updated through SAs. Where applicable in the descriptions below, NNSA has indicated whether SAs have been prepared.

***Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE/EIS-0236)*** (SSM PEIS) (DOE 1996). During the mid-1990s, DOE prepared the SSM PEIS to evaluate alternatives for maintaining the safety and reliability of the U.S. nuclear weapons stockpile and preserving competencies in nuclear weapons in the post-Cold War era. During the Cold War, the U.S. could produce more than 1,000 ppy. With regard to LANL activities, the SSM PEIS analyzed the potential impacts of a proposed action to provide enhanced experimental capability for stockpile stewardship. In particular, pit production, HE fabrication, nonnuclear component fabrication, and plutonium research and development (R&D), among other things, were evaluated in the SSM PEIS. The No-Action Alternative in the SSM PEIS proposed continuing to use existing capabilities at the Laboratory and elsewhere, as LANL maintained a limited capability to fabricate plutonium components using its plutonium R&D facility (including producing pits for nuclear explosives testing) and for performing surveillance to provide stockpile safety and reliability assessments. An SSM PEIS ROD published in the *Federal Register* (FR) on December 26, 1996 (61 FR 68014), documents DOE’s decision to, among other things, transport and store an inventory of plutonium-242 from SRS to LANL. With regard to pit production, this ROD documented DOE’s decision to reestablish the pit fabrication capability, at a small capacity, at LANL which involved reconfiguration of the Laboratory’s Plutonium Facility at TA-55. The SSM PEIS is relevant for background information and was supplemented in 2008.

***Final Complex Transformation Supplemental Programmatic Environmental Impact Statement (DOE/EIS-0236-S4)*** (Complex Transformation SPEIS) (NNSA 2008a). In 2008, NNSA prepared the Complex Transformation SPEIS, a supplement to the 1996 SSM PEIS, to evaluate the potential environmental impacts of alternatives for transforming the nuclear weapons complex into a smaller, more efficient enterprise that could respond to changing national security challenges and ensure the long-term safety, security, and reliability of the nuclear weapons stockpile. A Complex Transformation SPEIS ROD, published in the *Federal Register* on December 19, 2008 (73 FR 77644), documents, among other things, the decision that manufacturing and R&D involving plutonium would remain at LANL at the authorized level of approximately 20 ppy. This ROD also documents NNSA decision to construct and operate the Chemistry and Metallurgy Research Replacement–Nuclear Facility (CMRR-NF) at LANL as a replacement for portions of the Chemistry and Metallurgy Research facility.

The Complex Transformation SPEIS is the current and best available information regarding potential impacts of its programmatic proposal. The SPEIS has been the subject of two SAs, one of which was related to evaluation of pit production at LANL and SRS (see below).

***Final Supplement Analysis of the Complex Transformation Supplemental Programmatic Impact Statement (DOE/EIS-0236-S4-SA-02)*** (Complex Transformation SPEIS SA) (NNSA 2019a). In December 2019, NNSA prepared an SA to evaluate NNSA’s proposed action to adopt the Modified Distributed Center of Excellence (DCE) Alternative for plutonium operations. The Modified DCE Alternative enables NNSA to produce a minimum of 50 ppy at a repurposed MFFF at SRS and a minimum of 30 ppy at LANL, with additional surge capacity at each site, if needed, to meet the requirements of producing pits at a rate of no fewer than 80 ppy by 2030 for the nuclear weapons stockpile. The SA evaluated the potential complex-wide impacts of adopting the Modified DCE Alternative and of producing up to 80 ppy at both SRS and LANL and considered new circumstances or information relevant to environmental concerns. For all resource areas, the analyses verified that the potential programmatic environmental impacts would not be different, or would not be significantly different, than impacts considered in existing NEPA analyses. Based on the results of the SA, NNSA determined that the Modified DCE Alternative does not constitute a substantial change from actions analyzed previously and that there were no significant new circumstances or information relevant to environmental concerns. As a result of the SA, NNSA published an amended ROD relative to programmatic decisions for pit production involving LANL. Specifically, this amended ROD stated:

*“NNSA has decided at a programmatic level to implement aspects of a Modified DCE Alternative. LANL will implement actions to produce a minimum of 30 war reserve pits per year during 2026 for the national pit production mission and implement surge efforts to exceed 30 pits per year up to the analyzed limit as necessary. Pit production at these levels will take place without construction of CMRR-NF.”*

Therefore, this amended ROD cancelled NNSA’s prior commitment to build the CMRR-NF support facility (as analyzed in DOE/EIS-0350-SA-02; see description in Section A.1.4.2, below). The decision in this amended ROD is being implemented through a site-specific decision on the 2008 LANL SWEIS (see Chapter 1, Section 1.4.2). Since publication of the amended ROD, the 2026 pit production milestone has been delayed until 2028 (NNSA 2023).

### **A.3.2 Site-Specific Environmental Impact Statements**

***Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EIS-0238)*** (1999 LANL SWEIS) (DOE 1999). The 1999 LANL SWEIS assessed four alternatives for the continued operation of the Laboratory: (1) No-Action, (2) Expanded Operations, (3) Reduced Operations, and (4) Greener. As analyzed in the 1999 SWEIS, the Expanded Operations Alternative was identified as the preferred alternative and would expand operations at the Laboratory, as the need arises, to increase the level of existing operations to the highest reasonably foreseeable levels, and to fully implement the mission elements assigned to the Laboratory. The preferred alternative presented in the Final 1999 LANL SWEIS included implementation of pit manufacturing at a level of 20 ppy. A 1999 SWEIS ROD published in the *Federal Register* on September 20, 1999 (64 FR 50797), documents NNSA’s decisions. Regarding pit production, the 1999 ROD announced that DOE would establish a pit production capability at LANL with a capacity of nominally 20 ppy. The 1999 SWEIS is relevant for background information and was updated by issuance of the 2008 LANL SWEIS. The 2008 SWEIS tiers from the 1999 SWEIS.

***Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EIS-0380)*** (2008 LANL SWEIS) (NNSA 2008b). In May 2008, NNSA issued the 2008 LANL SWEIS, which analyzed NNSA’s proposal to continue operating the Laboratory. NNSA assessed three alternatives for continued operation of LANL: (1) No-Action, (2) Reduced Operations, and (3) Expanded Operations. Expanded Operations was NNSA’s preferred alternative. As mentioned above, the Expanded Operations Alternative selected in the 1999 ROD for the 1999 LANL SWEIS formed the basis of the No-Action Alternative in the 2008 SWEIS. In a ROD for the 2008 SWEIS, published in the *Federal Register* on September 26, 2008 (73 FR 55833), DOE/NNSA announced its selection of the No-Action Alternative to continue operation of the Laboratory with the addition of two types of elements from the Expanded Operations Alternative: (1) changes in the level of operations for ongoing activities within existing facilities, and (2) new facility projects. One of the new specific facility projects relevant to pit production at LANL was the decision to repair and replace mission-critical cooling system components for buildings in TA-55. This ROD did not make decisions on the number of plutonium pits to produce annually at LANL.

On July 10, 2009, DOE/NNSA issued a second ROD (74 FR 33232), in which DOE/NNSA documented its decision to maintain its selection of the No-Action Alternative from the 2008 LANL SWEIS but also decided to implement additional elements of the Expanded Operations Alternative. The decision did not change the plutonium pit production throughput capability at LANL (20 ppy). A key project relevant to pit production that was included in the 2009 ROD was to refurbish the Plutonium Facility Complex at TA-55. That project is still ongoing and was evaluated again in the 2026 LANL SWEIS.

NNSA prepared six SAs on the 2008 LANL SWEIS. Information related to the SAs that are relevant to pit production and any subsequently amended RODs are listed below:

In April 2018, NNSA prepared **DOE/EIS-0380-SA-05** (NNSA 2018a) to review changes in operations at the Laboratory since the publication of the 2008 LANL SWEIS (2008–2017) and evaluate the continued adequacy of the 2008 SWEIS for the future of LANL operations (2018–2022). The SA included a summary of major projects and programs including the TA-55 Reinvestment Project and the modifications to the Radioactive Liquid Waste Treatment Facility. The SA determined that the 2008 SWEIS provided a bounding NEPA analysis for a majority of projects planned over the next five years and no further NEPA evaluation was required.

In September 2020, NNSA prepared **DOE/EIS-0380-SA-06** (NNSA 2020) to evaluate NNSA’s proposal to implement elements of the Expanded Operations Alternative from the 2008 LANL SWEIS as needed to produce a minimum of 30 war-reserve plutonium ppy for the national pit production mission and to implement surge efforts to produce up to 80 ppy to meet Nuclear Posture Review and national policy. The SA determined that the potential environmental impacts of the proposal would not be different, or would not be significantly different, than impacts in existing NEPA analyses. On the basis of the SA, NNSA published an amended ROD in the *Federal Register* (85 FR 54544, September 2, 2020), documenting its decision to implement elements of the Expanded Operations Alternative in the 2008 LANL SWEIS, as needed, to produce a minimum of 30 ppy for the national pit production mission and to implement surge efforts to exceed 30 ppy up to the analyzed limit.

***Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EIS-0552)*** (2026 LANL SWEIS) (NNSA

2026a). In 2026, DOE/NNSA published the Final LANL SWEIS, which evaluated three alternatives: the No-Action Alternative, Modernized Operations Alternative, and Expanded Operations Alternative. The No-Action Alternative included the continued mission to produce a minimum of 30 plutonium ppy for the national pit production mission and to implement surge efforts up to the analyzed limit to meet the previous and current Nuclear Posture Reviews and national policy. It also included several supporting facilities related to pit production. For instance, it included warehouses TA-51; an empty drum storage facility in TA-36; new office buildings in TA-48, TA-50, and TA-63; additional security facilities for TA-46 and TA-55; new cafeterias in TA-48, TA-50, and TA-52; one parking garage in TA-48; and implementation of a pilot project for offsite parking and shuttle-bus service. Additionally, the 2026 LANL SWEIS included 240,000 square feet of TRU waste staging facilities at four locations across the site (TAs-16, -54, -55, and -60). The staging facilities would be constructed to minimize effects from the potential long-term WIPP shutdown on pit production activities at LANL. TRU waste staging was an element of the Expanded Operations Alternative. In the ROD published with the 2026 LANL SWEIS, DOE/NNSA decided to implement the Expanded Operations Alternative, which included all proposed projects and operational changes related to pit production at LANL (NNSA 2026b).

### **A.3.3 Waste Related Environmental Impact Statements**

***Waste Isolation Pilot Plant Final Environmental Impact Statement (1980 WIPP EIS; DOE/EIS-0026)*** (DOE 1980) analyzed the environmental impacts of initial construction and operation of the WIPP facility. The ROD (DOE 1981) documented DOE's decision to proceed with the phased construction and operation of the WIPP facility. The WIPP facility receives defense-related TRU waste for permanent disposal. The 1980 WIPP EIS is relevant for background information and was supplemented in 1990.

***Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant (WIPP SEIS-I; DOE/EIS-0026-S)*** (DOE 1990a) evaluated the environmental impacts associated with new information and changes since the issuance of the 1980 WIPP EIS and 1981 ROD. WIPP SEIS-I included an analysis of changes in the TRU waste inventory, consideration of the hazardous chemical constituents in the TRU waste, modification and refinement of the system for the transportation of TRU waste to the WIPP facility, modification of the Test Phase, and changes in the understanding of the hydrogeological characteristics of the WIPP site. The ROD for WIPP SEIS-I (DOE 1990b) documented DOE's decision to continue the phased development of the WIPP facility by instituting an experimental program to further examine WIPP's suitability as a TRU waste repository. The 1990 WIPP SEIS-1 is relevant for background information and was supplemented in 1997.

***Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement (WIPP SEIS-II; DOE/EIS-0026-S2)*** (DOE 1997a) analyzed the potential environmental impacts associated with disposing of TRU waste at the WIPP facility and polychlorinated biphenyl (PCB)-commingled TRU waste in the DOE inventory at the time. DOE's proposed action was to open the WIPP facility and dispose of up to 175,564 cubic meters of TRU waste generated from defense activities. The ROD (DOE 1998) documented DOE's decision to authorize the disposal of up to 175,564 cubic meters of TRU waste (except PCB-commingled TRU waste) at the WIPP facility. The WIPP SEIS and its 12 SAs since 1997 are relevant to the Proposed Action for the current and best available information of potential impacts related to disposal of TRU waste. The SAs are available at <https://www.energy.gov/nepa/eis-0026-s2-waste-isolation-pilot-plant-disposal-phase-carlsbad-new-mexico>.

**Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (WM PEIS; DOE/EIS-0200-F)** (DOE 1997b) is a DOE complex-wide study examining the environmental impacts of managing more than 2 million cubic meters of radioactive waste from past, present, and future DOE activities. Waste analyzed in the WM PEIS results primarily from nuclear weapons production and related activities. DOE’s goal in preparing the WM PEIS was to develop a nationwide strategy to treat, store, and dispose of low-level radioactive waste, mixed low-level radioactive waste, high-level radioactive waste, TRU waste, and hazardous waste in a safe, responsible, and efficient manner that minimizes the impacts on workers and the public. The WM PEIS provides information on the impacts of using various alternatives and sites to consolidate or decentralize treatment, storage, and disposal activities for each waste type. DOE would conduct further NEPA reviews regarding the specific location of new facilities at selected sites, as appropriate. DOE has prepared four SAs of the WM PEIS, which are available at: <https://www.energy.gov/nepa/eis-0200-waste-management-programmatic-environmental-impact-statement-managing-treatment>.

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APPENDIX B  
Scoping Process and Summary

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## **ABBREVIATIONS AND ACRONYMS**

DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
EIS	environmental impact statement
FR	<i>Federal Register</i>
LANL	Los Alamos National Laboratory
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NOI	Notice of Intent
NPT	Nuclear Non-Proliferation Treaty
PEIS	Plutonium Pit Production Programmatic Environmental Impact Statement
ppy	pits per year
SALT	Strategic Arms Limitation Talks
SRS	Savannah River Site
START	Strategic Arms Reduction Treaty
SWEIS	Site-Wide Environmental Impact Statement
TRU	transuranic
U.S.	United States
U.S.C.	United States Code
WIPP	Waste Isolation Pilot Plant

## B SCOPING PROCESS AND SUMMARY

### B.1 The Scoping Process

DOE NEPA Implementing Procedures (DOE 2025a) require that an initial process be conducted to engage the public and tribal nations to obtain input on the scope of issues to be addressed in an environmental impact statement (EIS) and to identify significant issues related to the proposed action.<sup>1</sup> As discussed in Chapter 1, Section 1.6, the Settlement Agreement (DOE 2025b) includes requirements for scoping in addition to those in DOE’s NEPA Implementing Procedures. This scoping process is an opportunity for public and federally recognized tribal involvement in this programmatic EIS (PEIS) process.

On Friday, May 9, 2025, the NNSA initiated public involvement on this PEIS with publication of a Notice of Intent (NOI) in the *Federal Register* (90 FR 19706). The NOI started the public scoping period. As noted in Chapter 1, Section 1.6, the scoping period was required to remain open for 45 days after the last scoping meeting. Therefore, the scoping period was open until July 14, 2025.

Congressional and intergovernmental notifications were sent to inform key stakeholders and tribal nations of the public scoping period. NNSA sent notifications to the GovDelivery mailing list and published the notice in an Environmental Bulletin at SRS.<sup>2</sup> In accordance with DOE Order 144.1A, NNSA sent tribal consultation letters to potentially affected tribes and hosted a tribal-only scoping meeting, which was attended by representatives from 12 tribes or pueblos.

NNSA hosted two virtual scoping meetings on May 27 and 28, 2025. These meetings were held at different times of day to accommodate participants located across multiple time zones. NNSA used the Microsoft Teams platform to host the virtual scoping meetings. People were able to participate in these meetings either by internet connection (providing audio and visual access) or by phone (providing only audio access).

As shown in Table B.1-1, the virtual scoping meetings were attended by 357 people; 166 people during the first meeting and 191 people during the second meeting.

**Table B.1-1 Attendance in the Pit Production PEIS Public Scoping Meetings**

Date	Participation	Commenters
May 27, 2025	166	39
May 28, 2025	191	37
<b>TOTAL</b>	<b>357</b>	<b>76</b>

The scoping meetings began with a presentation by NNSA providing background information about LANL, SRS, the purpose and need for the Proposed Action, the alternatives to be evaluated, the proposed scope of the PEIS, and the anticipated PEIS schedule. The presentation, which was the same for both meetings, was followed by a formal comment period.

<sup>1</sup> NNSA has prepared this Plutonium Pit Production Programmatic Environmental Impact Statement (DOE/EIS-0573) (Pit Production PEIS or PEIS) in accordance with the National Environmental Policy Act of 1969 (42 U.S.C. §§ 4321–4336(e), as amended; NEPA) and DOE’s NEPA Implementing Procedures (issued on June 30, 2025) (DOE 2025a)

<sup>2</sup> Provided in Appendix F of this PEIS and also online at [https://www.srs.gov/general/pubs/envbul/documents/Environment%20Bulletin\\_v37n4\\_Web.pdf](https://www.srs.gov/general/pubs/envbul/documents/Environment%20Bulletin_v37n4_Web.pdf)

Details regarding the dates and times for the virtual scoping meetings, how to connect to the meeting by internet or phone, and how to provide comments during the virtual meetings were posted on the NNSA NEPA Reading Room website (<https://www.energy.gov/nnsa/nnsa-nepa-reading-room>). These details also were disseminated via existing LANL and SRS communication channels (e.g., GovDelivery emails at LANL and publication of an Environmental Bulletin at SRS), and via published advertisements in local New Mexico and South Carolina newspapers, as outlined in Table B-2.

**Table B.1-2 Public Scoping Advertisements**

Newspaper	Dates of Publication (2025)
Aiken Standard	May 10, 17, 24
Augusta Chronicle	May 18, 25
Santa Fe New Mexican	May 11, 18, 25

NNSA provided multiple mechanisms for accepting scoping comments, including by mail, email, and verbally during either of the scoping meetings. Individuals who had questions about the NNSA NEPA process were directed to contact the NNSA NEPA Compliance Officer, either by mail or by email.

In total, NNSA received 388 written comment documents (including those from tribes and pueblos) – each representing a single submission by mail or email – and verbal comments from 76 individuals during the public meetings, for a combined total of 464 comment documents. Transcripts from both scoping meetings were considered equally as written comment documents, are included in the Administrative Record (as are the comment documents received), and are reflected in Tables B.1-3 and B.2-1. NNSA reviewed all comment documents and identified individual comments within each document. The individual comments were organized into 12 issue categories and 57 subcategories, as shown in Table B.1-3. As indicated from the total number of comments in Table B.2-1 (1,146), many of the 464 comment documents had multiple comments addressing a variety of topics.

**Table B.1-3 Summary of Scoping Comments by Category/Subcategory**

Issue Category		Comments
<b><i>1 Purpose and Need (215 total)</i></b>		
1-a	General objection to nuclear weapons / preference for disarmament	92
1-b	No need for new pits (existing pits sufficient; pit lifetimes adequate)	68
1-c	Lack of justification for pit production scale	21
1-d	Questioning the role or purpose of new pits/weapons	34
<b><i>2 National Security Policies and NNSA Missions (114 total)</i></b>		
2-a	Compliance with treaties (e.g., NPT, START, SALT)	10
2-b	Risk of renewed arms race	45
2-c	Questioning deterrence justification	33
2-d	National/global security risks from pit production	26
<b><i>3 NEPA Process (119 total)</i></b>		
3-a	Inadequate scoping or public involvement	22

Issue Category		Comments
3-b	Need for a comprehensive, programmatic analysis and avoidance of segmentation	44
3-c	Lack of Tribal/Section 106 consultation	28
3-d	Procedural and accessibility	18
3-e	Virtual meeting barriers and public access inequities	7
<b>4 PEIS Alternatives (101 total)</b>		
4-a	Include reduced operations alternative	21
4-b	Include pit reuse or refurbishment alternative	15
4-c	Include true 'no new pit production' alternative	32
4-d	Evaluate flexible response to arms control scenarios	19
4-e	Conversion / Transition Alternative	14
<b>5 Pit Production and Safety (115 total)</b>		
5-a	Technical feasibility and facility readiness (e.g., LANL, SRS)	16
5-b	Worker safety, radiological risk, and DNFSB concerns	23
5-c	Costs, delays, and schedule uncertainty	18
5-d	National network of facilities and transportation issues	19
5-e	Local community impacts and workforce considerations	12
5-f	Climate and natural disaster risks	15
5-g	Facility legacy risks and cumulative contamination	9
5-h	Cybersecurity and physical security risks	3
<b>6 Distinct Resource Analyses (124 total)</b>		
6-a	Land use and aesthetics and scenic resources	5
6-b	Geology and soils	6
6-c	Water resources	17
6-d	Climate and air quality	9
6-e	Noise	3
6-f	Biological resources	10
6-g	Cultural and paleontological resources	7
6-h	Socioeconomics	19
6-i	Traffic and transportation	12
6-j	Infrastructure	8
6-k	Waste and materials management	10
6-l	Human health and safety	18
<b>7 WIPP / Waste Disposal (36 total)</b>		
7-a	Disposal capacity and long-term viability	15
7-b	TRU waste prioritization and licensing compliance	5
7-c	Transportation and shipping safety	9
7-d	Contingency planning for WIPP closure or failure	7

Issue Category		Comments
<b>8 Environmental Remediation (53 total)</b>		
8-a	Legacy waste management adequacy	22
8-b	Cleanup funding and prioritization	17
8-c	Groundwater and soil contamination	14
<b>9 General Support (15 total)</b>		
9-a	Support for pit production or NNSA mission	6
9-b	Support for national defense or modernization efforts	4
9-c	Support for workforce and local economic benefits	5
<b>10 General Opposition (232 total)</b>		
10-a	Opposition to pit production or new nuclear weapons	89
10-b	Moral or ethical opposition to nuclear programs	37
10-c	Environmental and human health opposition arguments	22
10-d	Greenwashing critiques	5
10-e	Arms race and global instability (escalation and proliferation concerns)	33
10-f	Moral / intergenerational responsibility (risks to children, future generations)	28
10-g	Economic burden and fiscal waste	18
<b>11 Miscellaneous (12 total)</b>		
11-a	Miscellaneous	12
<b>12 Out of Scope (10 total)</b>		
12-a	Out of scope	10
<b>TOTAL</b>		<b>1,146</b>

DNFSB = Defense Nuclear Facilities Safety Board; LANL = Los Alamos National Laboratory; NEPA = National Environmental Policy Act; NNSA = National Nuclear Security Administration; NPT = Nuclear Non-Proliferation Treaty; PEIS = Plutonium Pit Production Programmatic Environmental Impact Statement; SALT = Strategic Arms Limitation Talks; SRS = Savannah River Site; START = Strategic Arms Reduction Treaty; TRU = transuranic; WIPP = Waste Isolation Pilot Plant

## B.2 Scoping Comment Summaries

Table B.2-1 provides a summary of the scoping comments received during the scoping process and NNSA’s responses. The table is organized by issue category and subcategory and includes the number of comments received for each subcategory.

NNSA considered all comments received during the scoping process for this PEIS, including comments received after the close of the comment period (i.e., after July 14, 2025). Comments were systematically reviewed by NNSA: as represented in Table B.2-1, comments on similar or related topics were grouped under comment issue categories and corresponding topic areas so that all comments on a particular topic could be considered individually and collectively.

Table B.2-1 Comments and Responses by Category

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
<b>1 Purpose and Need (215 total)</b>				
1-a	General objection to nuclear weapons / preference for disarmament	92	Commenters state that the United States should reduce or eliminate its nuclear arsenal rather than pursue production of new plutonium pits. They emphasize that pit production conflicts with long-standing goals of nuclear disarmament and nonproliferation and assert that NNSA's mission should shift toward dismantlement of existing weapons and cleanup of legacy contamination rather than modernization or expansion of the stockpile.	The purpose and need for this PEIS are described in <i>Section 1.2</i> , which explains that NNSA must ensure that the Nation's nuclear deterrent remains safe, secure, and effective, as required by national policy. Related directives and strategies, including the Nuclear Posture Review, Nuclear Weapons Stockpile Memorandum, and Stockpile Stewardship Management Plan, are summarized in <i>Sections 1.3.1–1.3.3</i> . NNSA's mission does not include setting national policy on nuclear disarmament, but rather implementing those policies established by the President and Congress. The relationship of pit production to nonproliferation and treaty compliance is discussed in <i>Section 1.3.4</i> . Alternatives focused solely on dismantlement or eliminating the stockpile were not analyzed in detail because they would not meet the agency's purpose and need, as explained in <i>Section 2.8</i> .
1-b	No need for new pits (existing pits sufficient; pit lifetimes adequate)	68	Commenters contend that new pit production is unnecessary because existing plutonium pits remain viable for many decades. They reference studies such as the JASON reviews and laboratory analyses, indicating pit lifetimes exceeding 100 years, and request that the PEIS evaluate continued reliance on the existing stockpile and reuse of stored pits as a reasonable alternative to new production.	The potential longevity of existing plutonium pits and related technical studies are discussed in <i>Section 1.2.1</i> . That section explains that, while previous analyses (including JASON and other laboratory studies) have found that most pits may remain viable for decades, uncertainty remains regarding long-term pit performance, aging effects, and future stockpile requirements. NNSA must ensure an enduring capability to produce certified pits to meet national security needs, as outlined in <i>Sections 1.2 and 1.3.1–1.3.3</i> . The reuse of existing or stored pits is addressed as part of the pit production process in <i>Section 2.2</i> and evaluated within all alternatives. An alternative limited solely to the reuse of existing pits was not analyzed in detail because it would not meet the agency's purpose and need for ensuring a responsive, long-term pit production capability, as explained in <i>Section 2.8</i> .
1-c	Lack of justification for pit production scale	21	Commenters question the basis for the proposed production level of up to 80 ppy, asserting that NNSA has not demonstrated a national security requirement for that scale of operation.	The national security basis for producing up to 80 ppy is described in <i>Sections 1.3.1–1.3.3</i> , which summarize the requirements set forth in the Nuclear Posture Review, Nuclear Weapons Stockpile Memorandum, and Stockpile Stewardship Management Plan. As explained in <i>Section 1.2</i> ,

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
			They request detailed justification supported by quantitative analyses of future stockpile needs, potential arms control limits, and alternative production rates that would minimize environmental impacts.	NNSA's role is to implement these established national directives rather than determine their scope or scale. The PEIS analyzes the potential environmental impacts of pit production under the No-Action, Multi-Site, and Single-Site alternatives in <i>Chapter 4</i> , and the rationale for the selected production level and planning assumptions is provided in <i>Section 2.3</i> .
1-d	Questioning the role or purpose of new pits/weapons	34	Commenters ask NNSA to clarify the intended purpose of new-design pits and weapons, expressing concern that they could enable new military capabilities or trigger renewed nuclear competition. They recommend that the PEIS fully explain how pit production aligns with U.S. policy objectives and treaty obligations, and distinguish between activities needed for stockpile stewardship versus development of new warhead designs.	The purpose and need for pit production are described in <i>Section 1.2</i> , which emphasizes maintaining a safe, secure, and effective nuclear deterrent in support of U.S. national security policy. Related policy frameworks, including the Nuclear Posture Review, Nuclear Weapons Stockpile Memorandum, and Stockpile Stewardship Management Plan, are summarized in <i>Sections 1.3.1–1.3.3</i> . These documents guide NNSA's mission to sustain existing stockpile capabilities rather than develop new military capabilities or initiate new weapons programs, which is the purview of Congress and the President. As explained in <i>Section 1.3.4</i> , NNSA's activities are conducted consistent with U.S. nonproliferation commitments and treaty obligations. The PEIS evaluates pit production as part of stockpile stewardship to replace aging components and ensure continued certification of existing warheads; it does not specifically propose or authorize development of new weapon designs.
<b>2 National Security Policies and NNSA Missions (114 total)</b>				
2-a	Compliance with treaties (e.g., NPT, START, SALT)	10	Commenters assert that the proposed pit production expansion is inconsistent with U.S. treaty obligations under the NPT and other arms control agreements. They request that NNSA demonstrate how the proposal aligns with these commitments and avoids actions that could undermine global disarmament or nonproliferation efforts.	U.S. obligations under the NPT and other arms control agreements are addressed in <i>Section 1.3.4</i> . As discussed therein, NNSA's Proposed Action to maintain and modernize plutonium pit production capabilities is consistent with U.S. treaty commitments and long-standing nonproliferation objectives. The NPT does not prohibit the United States, as a recognized nuclear-weapon state, from maintaining the safety, security, and reliability of its existing stockpile. Pit production supports these objectives by ensuring the continued certification of weapons necessary for national defense without the need for nuclear testing. NNSA remains committed to implementing all applicable

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
				treaty and nonproliferation obligations while fulfilling its mission as defined by national policy.
2-b	Risk of renewed arms race	45	Commenters express concern that expanded pit production could contribute to a renewed nuclear arms race among major powers. They state that new weapons manufacturing may encourage other nations to increase their arsenals and urge NNSA to assess the international security consequences of expanded pit production.	The purpose and need for pit production, including its role in maintaining the existing U.S. nuclear deterrent, are discussed in <i>Section 1.2</i> . The broader policy context—defined by the Nuclear Posture Review, Nuclear Weapons Stockpile Memorandum, and Stockpile Stewardship Management Plan—is summarized in <i>Sections 1.3.1–1.3.3</i> . These documents affirm that NNSA’s mission is to maintain and certify the current stockpile, not to expand it or develop new nuclear capabilities. As explained in <i>Section 1.3.4</i> , pit production is conducted consistent with U.S. nonproliferation and treaty commitments and does not alter U.S. policy regarding deterrence or arms control. The potential international security implications of national policy decisions are evaluated and responded to by Congress and the President and are beyond the scope of this PEIS.
2-c	Questioning deterrence justification	33	Commenters question whether increasing the number of pits or developing new warhead designs enhances U.S. deterrence. They request that the PEIS provide clear evidence supporting the need for additional pits in maintaining the credibility of the deterrent and explore nonnuclear alternatives for national security.	The basis for maintaining a pit production capability and its relationship to U.S. deterrence policy are described in <i>Section 1.2</i> , with supporting national security directives outlined in <i>Sections 1.3.1–1.3.3</i> . These policy documents, issued by the President and Congress, direct NNSA to sustain the Nation’s nuclear deterrent by ensuring a safe, secure, and reliable stockpile. As explained in <i>Section 1.3.4</i> , this mission is consistent with U.S. nonproliferation and treaty commitments. The PEIS does not reexamine or redefine the national deterrence strategy or consider nonnuclear alternatives, which are determined at the policy level outside of NNSA’s authority. The environmental analyses in <i>Chapters 3 and 4</i> focus on the potential impacts of implementing the pit production alternatives needed to meet those established national requirements.
2-d	National/global security risks from pit production	26	Commenters express concern that expanded plutonium operations could increase risks of nuclear proliferation, terrorism, and environmental hazards. They urge NNSA to evaluate the broader security implications of pit production, including the potential for	Potential proliferation, security, and environmental considerations associated with pit production are addressed throughout this PEIS. As explained in <i>Section 1.3.4</i> , NNSA’s mission is implemented consistent with U.S. nonproliferation and treaty obligations, and pit production does not alter U.S. policy regarding deterrence or nuclear weapons development. Physical protection, material control,

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
			misperception or escalation among adversaries.	and safeguards for special nuclear material are integral to facility design and operations and are discussed in the analyses of waste management, human health and safety, and accidents in <i>Sections 4.1.12–4.1.14 (LANL) and 4.2.12–4.2.14 (SRS)</i> . The potential environmental consequences of expanded plutonium operations are evaluated in <i>Chapters 3 and 4</i> , and reasonably foreseeable effects, including waste disposition at WIPP, are addressed in <i>Chapter 5</i> . Broader geopolitical or policy implications related to deterrence or international perception are determined at the national policy level and are outside the scope of this PEIS.
<b>3 NEPA Process (148 total)</b>				
3-a	Inadequate scoping or public involvement	22	Commenters state that public engagement opportunities have been insufficient and request additional hearings and extended comment periods. They assert that meaningful public participation is essential for transparency and accountability in decisions regarding nuclear weapons production. Several urged NNSA to extend the comment period.	The public involvement process for this PEIS is described in <i>Section 1.7</i> , which outlines opportunities for public comment during scoping and on the future Draft PEIS. As noted in that section, NNSA provided multiple mechanisms for submitting comments and held public meetings for scoping to maximize accessibility. Requests for comment period extensions were considered in accordance with DOE procedures, and all comments received, including those submitted after the close of the scoping period, were reviewed and are part of the Administrative Record. The length of the scoping period met the requirements of the Settlement Agreement, which were broader than the requirements under the NEPA statute.
3-b	Need for a comprehensive, programmatic analysis and avoidance of segmentation	44	Commenters state that NNSA's NEPA review is too narrow and segmented. They urge the agency to prepare a single, comprehensive programmatic EIS addressing cumulative impacts of pit production across all DOE sites, arguing that separate site analyses risk understating nation-wide effects.	NNSA determined that the current PEIS provides the appropriate program-level analysis for pit production. This document is a PEIS, prepared in accordance with NEPA and DOE NEPA Implementing Procedures to evaluate the potential environmental impacts of pit production across multiple DOE sites. As described in <i>Sections 1.1 and 1.5</i> , the PEIS provides a program-level analysis of the Proposed Action and alternatives, including the Multi-Site Alternative ( <i>Section 2.5</i> ), to assess cumulative and site-specific effects. The relationship of this PEIS to prior and site-specific NEPA documents is summarized in <i>Section 1.6</i> , and cumulative and reasonably foreseeable effects are evaluated in <i>Chapter 5</i> . This analysis fulfills the requirement for a comprehensive,

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
				programmatic review of nation-wide pit production activities.
3-c	Lack of Tribal/Section 106 consultation	28	Commenters state that NNSA has not adequately consulted affected Tribes under Section 106 of the National Historic Preservation Act. They request formal government-to-government consultation and greater inclusion of tribal perspectives in the environmental review process.	NNSA recognizes its government-to-government responsibilities and is committed to ongoing consultation with federally recognized tribes, consistent with Section 106 of the <i>National Historic Preservation Act</i> , DOE Order 144.1A, DOE NEPA Implementing Procedures, and Executive Order 13175. Consultation with affected tribes and pueblos has been initiated and continues throughout the NEPA process to identify and address potential impacts to cultural and historic resources and to incorporate tribal input.
3-d	Procedural and Accessibility	18	Commenters state that the PEIS process failed to provide equitable access for all affected communities, citing the lack of translated materials, inadequate outreach to limited English proficiency populations, and reliance on online participation that excluded rural and low-connectivity areas. They emphasize that meaningful involvement under NEPA requires proactive efforts to reach non-English speakers, tribal nations, and underserved communities. Commenters urge NNSA to expand translation, outreach, and in-person engagement to ensure procedural fairness and compliance with civil rights obligations.	As described in <i>Section 1.7</i> , NNSA conducted public involvement activities consistent with NEPA and DOE NEPA Implementing Procedures to encourage broad participation. Scoping meetings for this PEIS were held virtually to ensure safe and accessible participation and to accommodate a wide geographic area. The virtual presentation had the electronic capability for participants to select the close caption language of their choice. Participants were able to submit comments electronically, by mail, or verbally during virtual scoping meetings. NNSA recognizes the importance of engaging all affected communities, including those with limited internet access or English proficiency. All comments received during the public involvement process were reviewed and included in the Administrative Record for consideration in preparing the Draft PEIS.
3-e	Virtual meeting barriers and public access inequities	7	Commenters express frustration with barriers to public participation in virtual scoping meetings, including technical difficulties, limited internet access in rural areas, and inadequate notice or instructions for joining. They emphasize that these inequities restricted full engagement by affected communities and undermined transparency in the NEPA process. Several commenters urge NNSA to	As described in <i>Section 1.7</i> , public scoping and comment opportunities for this PEIS were conducted virtually in accordance with DOE and NNSA procedures and to reach the broadest audience. NNSA provided advance notice of the meetings, detailed instructions for accessing them, and multiple methods for submitting comments, including electronically and by mail, to allow broad participation. NNSA acknowledges that some participants experienced challenges with virtual access and recognizes that connectivity limitations may affect engagement in certain areas. All comments received during the scoping period,

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
			improve accessibility options and offer in-person participation opportunities to ensure procedural fairness.	including those describing barriers to participation, were reviewed and are included in the Administrative Record for consideration in preparing the Draft PEIS.
<b>4 PEIS Alternatives (101 total)</b>				
4-a	Include reduced operations alternative	21	Commenters recommend that the PEIS include an alternative involving lower pit production rates, such as fewer than 80 ppy. They argue this would reduce environmental impacts and align with potential arms control outcomes.	The range of alternatives considered in this PEIS is described in <i>Chapter 2</i> , including the No-Action ( <i>Section 2.4</i> ), Multi-Site Alternative ( <i>Section 2.5</i> ), and Single-Site Alternative ( <i>Section 2.6</i> ). As explained in these sections, this PEIS evaluates a full range of potential pit production capacities, including 10, 30, and 80 ppy at LANL and 0, 50, 80, and 125 ppy at SRS. The required production rate is established by national policy directives, including those summarized in <i>Sections 1.3.1–1.3.3</i> . The PEIS therefore focuses on evaluating the environmental impacts of the range of potential production levels.
4-b	Include pit reuse or refurbishment alternative	15	Commenters urge consideration of an alternative focused on reusing or refurbishing existing pits. They cite the large number of pits in storage and contend that reuse could meet stockpile needs without new production.	The potential for reusing or refurbishing existing plutonium pits is discussed in <i>Section 2.2</i> , which describes pit disassembly, material recovery, and reuse as part of the overall pit production process. As explained in <i>Section 1.2.1</i> , while many existing pits remain viable for extended periods, uncertainties related to long-term aging and certification necessitate maintaining the capability to produce new pits. An alternative based solely on pit reuse or refurbishment was considered but eliminated from detailed analysis because it would not fully meet the agency's purpose and need for ensuring a sustained and responsive pit production capability, as discussed in <i>Section 2.8</i> . The PEIS evaluates the environmental impacts of production alternatives that incorporate reuse where feasible within the broader national security mission.
4-c	Include true 'no new pit production' alternative	32	Commenters state that the PEIS No-Action Alternative is not a genuine no-production scenario because it assumes continued or expanded operations. They request inclusion of a true "no new pit production" alternative that ceases pit manufacturing.	As described in <i>Section 2.4</i> , the No-Action Alternative reflects continuation of current pit production capabilities and ongoing activities necessary to maintain existing national security requirements. Under NEPA, the No-Action Alternative often represents the continuation of existing conditions or previously approved actions rather than a complete cessation of operations. An alternative involving a full halt to pit production was considered but eliminated from detailed analysis, as explained in <i>Section 2.8</i> , because it

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
				would not meet the agency's purpose and need outlined in <i>Section 1.2</i> for ensuring a safe, secure, and reliable nuclear deterrent. The PEIS evaluates the environmental impacts of the No-Action, Multi-Site, and Single-Site alternatives consistent with these established programmatic requirements.
4-d	Evaluate flexible response to arms control scenarios	19	Commenters recommend that the PEIS include flexibility for changes in global security conditions or new arms control agreements. They suggest modeling scenarios where U.S. pit production requirements decrease in response to future treaties or policy shifts.	As described in <i>Sections 1.2</i> and <i>1.3.1–1.3.3</i> , this PEIS is based on current national security directives and planning assumptions established by the President and Congress, which define the required pit production capability. The analytical framework and planning basis for these assumptions are provided in <i>Section 2.3</i> . While NNSA recognizes that future arms control agreements or policy decisions could affect national requirements, such changes are beyond the scope of this PEIS. However, this PEIS evaluates a full range of potential pit production capacities, including 10, 30, and 80 ppy at LANL and 0, 50, 80, and 125 ppy at SRS. Should new treaties or directives alter production needs, NNSA would evaluate those changes through the appropriate NEPA process at that time.
4-e	Conversion / Transition Alternative	14	Commenters urge NNSA to include a “conversion” or “just transition” alternative in the PEIS that would repurpose pit production facilities and funding toward nonnuclear missions such as environmental cleanup, renewable energy research, or community development. They argue this approach would create sustainable jobs, reduce long-term environmental harm, and align with national and global disarmament goals. Several commenters emphasize that such an alternative would better serve public interest and fulfill NEPA’s requirement to consider reasonable, less harmful options.	NNSA acknowledges the suggestion to include a “conversion” or “just transition” alternative focused on nonnuclear missions, such as cleanup or renewable energy research. These activities fall outside the scope and purpose of this PEIS, which is to evaluate alternatives for achieving the national requirement to produce plutonium pits. While broader federal programs address environmental remediation and clean energy initiatives, they are not reasonable alternatives for meeting the specific purpose and need of this proposal under NEPA.

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
<b>5 Pit Production and Safety (115 total)</b>				
5-a	Technical feasibility and facility readiness (e.g., LANL, SRS)	16	Commenters question whether LANL and SRS possess the technical expertise and infrastructure necessary for pit production. They note past safety and management challenges and request a full evaluation of facility readiness and technological feasibility.	The technical capabilities, infrastructure, and operational readiness of LANL and SRS to support pit production are described in <i>Sections 3.1.11–3.1.13</i> and <i>4.1.11–4.1.13</i> for LANL, and <i>Sections 3.2.11–3.2.13</i> and <i>4.2.11–4.2.13</i> for SRS. These sections evaluate site infrastructure, waste management, and human health and safety, including consideration of facility upgrades and existing operational controls. The planning assumptions and analytical basis for site capabilities are presented in <i>Section 2.3</i> . NNSA continually assesses the technical feasibility and safety of pit production activities through its design, authorization, and readiness review processes, which are conducted under separate regulatory and safety frameworks outside the scope of this PEIS.
5-b	Worker safety, radiological risk, and DNFSB concerns	23	Commenters express concern about worker safety and radiological exposure at pit production facilities. They reference findings by the DNFSB and request that NNSA address these issues through engineering upgrades and operational controls.	Worker safety, radiation protection, and facility safety programs are addressed in <i>Sections 3.1.13, 4.1.13, and 4.1.14</i> (LANL) and <i>Sections 3.2.13, 4.2.13, and 4.2.14</i> (SRS), and <i>Appendix D</i> . DNFSB findings and recommendations are addressed through NNSA's established safety management processes, which are implemented under DOE nuclear safety regulations.
5-c	Costs, delays, and schedule uncertainty	18	Commenters question the cost-effectiveness of the proposed program, citing large budget increases and schedule slippages. They request that NNSA disclose updated cost estimates, project timelines, and the potential implications of funding shortfalls.	Cost, schedule, and program management considerations are not elements required under NEPA and are therefore outside the scope of this PEIS. However, each would be a consideration when NNSA prepares a record of decision. As explained in <i>Section 2.3</i> , the planning assumptions and analytical basis for the environmental analysis focus on bounding the potential environmental impacts of implementing the pit production alternatives, not on financial projections. Funding levels and budget allocations are determined through separate congressional and Executive Branch processes. The PEIS evaluates the environmental consequences of the No-Action, Multi-Site, and Single-Site alternatives in <i>Chapter 4</i> based on reasonable planning parameters that reflect the scope and scale of operations necessary to meet the purpose and need defined in <i>Section 1.2</i> .

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
5-d	National network of facilities and transportation issues	19	Commenters emphasize that pit production involves multiple DOE sites and extensive transportation of nuclear materials. They request a detailed analysis of the risks, logistics, and cumulative impacts of these interconnected operations.	Transportation and interconnected site operations are addressed throughout this PEIS. <i>Section 2.2.6</i> describes transportation activities associated with pit production; site-specific transportation baselines and impacts are presented for LANL in <i>Sections 3.1.10 and 4.1.10</i> and for SRS in <i>Sections 3.2.10 and 4.2.10</i> , with related waste and materials management in <i>Sections 3.1.12/4.1.12 and 3.2.12/4.2.12</i> , respectively. Combined, program-level effects for the Multi-Site Alternative, including radiological transportation ( <i>Section 4.3.1</i> ) and waste management ( <i>Section 4.3.2</i> ), are evaluated to capture cross-site logistics and interactions. <i>Chapter 5</i> provides the analysis of reasonably foreseeable cumulative effects, including WIPP-related considerations.
5-e	Local community impacts and workforce considerations	12	Commenters raise concerns about local community impacts, including potential exposure risks, economic shifts, and emergency preparedness. They urge NNSA to work closely with host communities and ensure equitable distribution of benefits and burdens.	Potential community impacts, including public exposure, socioeconomic changes, and emergency preparedness, are evaluated in <i>Sections 3.1.9/4.1.9 and 3.1.13/4.1.13</i> (LANL) and <i>Sections 3.2.9/4.2.9 and 3.2.13/4.2.13</i> (SRS). These sections assess potential effects on employment, housing, public services, and local economies, as well as radiological and nonradiological health impacts. Emergency management and safety procedures are described as part of the human health and accident analyses.
5-f	Climate and Natural Disaster Risks	15	Commenters express concern that the PEIS would not adequately assess risks from climate change and natural disasters such as wildfires, flooding, and seismic events at pit production sites. They note that facilities like LANL and SRS are increasingly vulnerable to these hazards, which could exacerbate radioactive releases and threaten surrounding communities. Commenters urge NNSA to incorporate climate resilience, long-term risk modeling, and adaptive mitigation measures into the analysis.	Potential impacts from natural hazards and climate-related risks are addressed in multiple sections of this PEIS. Geology and seismic hazards are discussed in <i>Sections 3.1.3 and 4.1.3</i> (LANL) and <i>3.2.3 and 4.2.3</i> (SRS), while flooding, stormwater, and water-related impacts are covered in <i>Sections 3.1.4/4.1.4</i> (LANL) and <i>3.2.4/4.2.4</i> (SRS). Air quality, wildfire potential, and climate change considerations are analyzed in <i>Sections 4.1.5/4.1.14</i> (LANL) and <i>4.2.5/4.2.14</i> (SRS). Cumulative and long-term effects are evaluated in <i>Chapter 5</i> . Broader, national climate policy or adaptation planning is outside the scope of this PEIS.

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
5-g	Facility legacy risks and cumulative contamination	9	Commenters highlight the long history of contamination at nuclear sites such as LANL, SRS, and Rocky Flats, warning that new pit production would compound unresolved pollution and safety issues. They urge NNSA to fully assess legacy waste, cumulative radiological impacts, and ongoing cleanup failures before expanding operations.	Cumulative effects of past, present, and reasonably foreseeable actions, including legacy waste and remediation, are evaluated in <i>Chapter 5</i> . NNSA's pit production activities are coordinated with DOE's Office of Environmental Management, which is responsible for legacy waste cleanup under separate regulatory and NEPA processes.
5-h	Cybersecurity and physical security risks	3	Commenters raise concerns about cybersecurity vulnerabilities and physical security risks associated with transporting and storing plutonium materials. They warn that expanded pit production could increase the threat of theft, sabotage, or accidents, urging NNSA to strengthen safeguards and disclose how these risks will be mitigated.	NNSA acknowledges the comments regarding cybersecurity and physical security risks associated with the transport and storage of plutonium materials. Security measures for plutonium operations, including safeguards against theft, sabotage, and accidents, are governed by established DOE and NNSA directives and are not publicly detailed for security reasons. The 2020 SRS EIS and the 2026 LANL SWEIS describe relevant analyses of security and emergency management, including discussions of accidents and intentional destructive acts, which remain applicable to this PEIS. NNSA will continue to implement and update security and emergency preparedness measures consistent with federal requirements to ensure the protection of workers, the public, and the environment.
<b>6 Distinct Resource Analyses (124 total)</b>				
6-a	Land Use and Aesthetic and Scenic Resources	5	Commenters request evaluation of land use compatibility and potential visual impacts from facility expansion or new construction.	Information related to land use and aesthetics and scenic resources is included in <i>Sections 3.1.1, 3.1.2, 3.2.1, and 3.2.2</i> (affected environment) and <i>Sections 4.1.1, 4.1.2, 4.2.1, and 4.2.2</i> (potential impacts).
6-b	Geology and Soils	6	Commenters ask for analysis of seismic stability, soil contamination risks, and the potential for erosion or subsidence at production sites.	Information related to geology and soils is included in <i>Sections 3.1.3 and 3.2.3</i> (affected environment) and <i>Sections 4.1.3 and 4.2.3</i> (potential impacts).
6-c	Water Resources	17	Commenters express concern about water consumption, groundwater contamination, and the adequacy of protective measures for nearby waterbodies.	Information related to water resources is included in <i>Sections 3.1.4 and 3.2.4</i> (affected environment) and <i>Sections 4.1.4 and 4.2.4</i> (potential impacts).

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
6-d	Climate and Air Quality	9	Commenters request assessment of radiological and nonradiological air emissions, including greenhouse gases and potential cumulative impacts on regional air quality.	Information related to climate and air quality is included in <i>Sections 3.1.5</i> and <i>3.2.5</i> (affected environment) and <i>Sections 4.1.5</i> and <i>4.2.5</i> (potential impacts).
6-e	Noise	3	Commenters request analysis of construction and operational noise, particularly effects on nearby communities and wildlife.	Information related to noise is included in <i>Sections 3.1.6</i> and <i>3.2.6</i> (affected environment) and <i>Sections 4.1.6</i> and <i>4.2.6</i> (potential impacts).
6-f	Biological Resources	10	Commenters ask that NNSA evaluate impacts on plant and animal species, critical habitats, and ecosystem connectivity.	Information related to biological resources is included in <i>Sections 3.1.7</i> and <i>3.2.7</i> (affected environment) and <i>Sections 4.1.7</i> and <i>4.2.7</i> (potential impacts).
6-g	Cultural and Paleontological Resources	7	Commenters emphasize the need to identify and protect archaeological, cultural, and paleontological resources potentially affected by project activities.	Information related to cultural and paleontological resources is included in <i>Sections 3.1.8</i> and <i>3.2.8</i> (affected environment) and <i>Sections 4.1.8</i> and <i>4.2.8</i> (potential impacts).
6-h	Socioeconomics	19	Commenters request evaluation of demographic, employment, housing, and regional economic impacts associated with pit production.	Information related to socioeconomics is included in <i>Sections 3.1.9</i> and <i>3.2.9</i> (affected environment) and <i>Sections 4.1.9</i> and <i>4.2.9</i> (potential impacts).
6-i	Traffic and Transportation	12	Commenters raise concerns about increased traffic, transportation safety, and potential accidents involving hazardous materials shipments.	Information related to traffic and transportation is included in <i>Sections 3.1.10</i> and <i>3.2.10</i> (affected environment) and <i>Sections 4.1.10</i> and <i>4.2.10</i> (potential impacts).
6-j	Infrastructure	8	Commenters ask for analysis of the sufficiency of utilities, energy supply, and site infrastructure to support expanded operations.	Information related to infrastructure is included in <i>Sections 3.1.11</i> and <i>3.2.11</i> (affected environment) and <i>Sections 4.1.11</i> and <i>4.2.11</i> (potential impacts).
6-k	Waste and Materials Management	10	Commenters request assessment of waste generation, storage, and disposal practices, including low-level and transuranic (TRU) waste streams.	Information related to waste and materials management is included in <i>Sections 3.1.12</i> and <i>3.2.12</i> (affected environment) and <i>Sections 4.1.12</i> and <i>4.2.12</i> (potential impacts).

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
6-l	Human Health and Safety	18	Commenters express concern about radiation exposure and other health effects on workers and nearby populations.	Information related to human health and safety is included in <i>Sections 3.1.13</i> and <i>3.2.13</i> (affected environment) and <i>Sections 4.1.13</i> and <i>4.2.13</i> (potential impacts).
<b>7 WIPP / Waste Disposal (36 total)</b>				
7-a	Disposal capacity and long-term viability	15	Commenters question whether WIPP has sufficient capacity to accept waste from expanded pit production and request long-term planning for disposal availability.	Waste management and TRU waste disposition, including the use of WIPP, are addressed in <i>Sections 3.1.12</i> and <i>4.1.12</i> (LANL) and <i>3.2.12</i> and <i>4.2.12</i> (SRS). The combined waste management impacts of producing pits at SRS and LANL under the Multi-Site Alternative are addressed in <i>Section 4.3.2</i> . The potential cumulative effects of TRU waste disposal across DOE sites, including capacity considerations for WIPP, are evaluated in <i>Chapter 5</i> .
7-b	TRU waste prioritization and licensing compliance	5	Commenters ask that NNSA ensure that WIPP prioritizes legacy waste cleanup as required by state permits and complies with licensing and capacity limits.	The management and disposal of TRU waste, including compliance with WIPP's state permits and regulatory limits, are discussed in <i>Chapter 5</i> . NNSA coordinates with DOE's Office of Environmental Management, which is responsible for WIPP operations and compliance with applicable state and federal requirements, including prioritization of legacy waste cleanup.
7-c	Transportation and shipping safety	9	Commenters express concern about safety and environmental risks associated with transporting TRU waste to WIPP.	Transportation of TRU waste to WIPP is evaluated in <i>Sections 3.1.10</i> and <i>4.1.10</i> (LANL), <i>3.2.10</i> and <i>4.2.10</i> (SRS), and within the Multi-Site Alternative discussion in <i>Section 4.3.1</i> .
7-d	Contingency planning for WIPP closure or failure	7	Commenters request analysis of alternative waste disposal strategies should WIPP reach capacity or experience operational failure.	As discussed in <i>Chapter 5</i> , the PEIS evaluates the potential cumulative effects of TRU waste disposal at WIPP based on its current regulatory capacity and operating assumptions. This analysis provides bounding estimates for foreseeable pit production activities under existing waste management frameworks.
<b>8 Environmental Remediation (80 total)</b>				
8-a	Legacy waste management adequacy	22	Commenters question the adequacy of cleanup programs for historical contamination at DOE sites and request prioritization of remediation before new production.	Environmental remediation and legacy cleanup activities are outside the scope of this PEIS, which focuses on NNSA's Proposed Action to produce plutonium pits in support of national security missions. Cleanup at LANL was evaluated in the 2025 LANL SWEIS. At SRS, cleanup activities are reviewed under separate NEPA documents as proposals are identified. While remediation efforts inform the

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
				environmental baseline used in this PEIS, decisions regarding legacy waste cleanup are managed by DOE's Office of Environmental Management under independent regulatory processes.
8-b	Cleanup funding and prioritization	17	Commenters express concern that funding for environmental cleanup may be insufficient and request that DOE allocate greater resources to legacy waste remediation.	Environmental cleanup funding decisions are outside the scope of this PEIS and are determined through separate DOE, Executive Branch, and congressional budget processes. This PEIS focuses on evaluating potential environmental impacts of pit production alternatives consistent with the purpose and need for national security missions. Cleanup and remediation activities are managed separately by DOE's Office of Environmental Management and are evaluated under separate NEPA reviews.
8-c	Groundwater and soil contamination	14	Commenters urge NNSA to address existing contamination issues and evaluate how new operations could exacerbate soil or groundwater pollution.	Existing contamination conditions and the potential for additional soil or groundwater impacts from proposed pit production activities are analyzed in <i>Sections 3.1.3 and 4.1.3</i> (LANL) and <i>Sections 3.2.3 and 4.2.3</i> (SRS) for geology and soils, and in <i>Sections 3.1.4/4.1.4</i> (LANL) and <i>Sections 3.2.4/4.2.4</i> (SRS) for water resources. These analyses describe baseline contamination, identify applicable regulatory controls, and evaluate how new operations would avoid or minimize further impacts through best management practices and compliance measures. Cleanup of legacy contamination is managed under separate DOE programs and NEPA reviews and is outside the scope of this PEIS.
<b>9 General Support (16 total)</b>				
9-a	Support for pit production or NNSA mission	6	Commenters support pit production, stating it is necessary to ensure the safety and reliability of the U.S. nuclear deterrent.	NNSA acknowledges receipt of these comments.
9-b	Support for national defense or modernization efforts	4	Commenters express support for modernization of the nuclear complex as vital to national defense and maintaining strategic stability.	NNSA acknowledges receipt of these comments.

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
9-c	Support for workforce and local economic benefits	5	Commenters note that pit production and related modernization projects will create high-quality jobs and strengthen local and regional economies. They emphasize the importance of stable, long-term employment and view these activities as an economic driver for host communities.	NNSA acknowledges receipt of these comments.
<b>10 General Opposition (45 total)</b>				
10-a	Opposition to pit production or new nuclear weapons	89	Commenters oppose expanded pit production, asserting it would perpetuate reliance on nuclear weapons and increase global insecurity.	NNSA acknowledges receipt of these comments.
10-b	Moral or ethical opposition to nuclear programs	37	Commenters express moral or ethical objections to nuclear weapons, viewing their production as contrary to humanitarian principles.	NNSA acknowledges receipt of these comments.
10-c	Environmental and human health opposition arguments	22	Commenters oppose pit production on environmental and health grounds, citing potential contamination, worker exposure, and long-term public risks.	NNSA acknowledges receipt of these comments.
10-d	Greenwashing critiques	5	Commenters criticize NNSA and DOE for engaging in “greenwashing” by portraying plutonium pit production as environmentally responsible or sustainable. They argue that claims of safety, modernization, or clean operations mislead the public and obscure the long-term environmental and health harms of nuclear weapons production. Commenters urge greater honesty and transparency in describing the true ecological and moral costs of the program.	NNSA acknowledges receipt of these comments.

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
10-e	Arms race and global instability (escalation and proliferation concerns)	33	Commenters warn that expanded plutonium pit production would fuel a renewed global arms race and heighten geopolitical instability. They argue that increasing U.S. nuclear capabilities undermines nonproliferation efforts, encourages other nations to expand their arsenals, and increases the risk of nuclear confrontation. Many urge NNSA to prioritize arms control, diplomacy, and disarmament commitments instead of escalating weapons production.	NNSA acknowledges receipt of these comments.
10-f	Moral / intergenerational responsibility (risks to children, future generations)	28	Commenters emphasize the moral and intergenerational consequences of renewed pit production, warning that radioactive contamination and nuclear escalation would endanger children and future generations. They argue that producing weapons capable of mass destruction violates ethical obligations to protect life and the environment. Several commenters urge NNSA to adopt policies guided by long-term stewardship, compassion, and responsibility to humanity's future.	NNSA acknowledges receipt of these comments.
10-g	Economic burden and fiscal waste	18	Commenters argue that expanded pit production represents a major fiscal burden and misuse of public funds, diverting resources from pressing social, environmental, and infrastructure needs. They cite cost overruns, schedule delays, and inefficiencies in past nuclear projects as evidence that the program would waste taxpayer money. Several commenters urge NNSA to evaluate the full economic cost of pit production and consider redirection of funds toward	NNSA acknowledges receipt of these comments.

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
			cleanup, renewable energy, or public welfare initiatives.	
<b>11 Miscellaneous (12 total)</b>				
11-a	Miscellaneous	12	Miscellaneous comments include those unrelated to the scope of the PEIS or general statements not addressing specific environmental issues. A small subset of comments did not align clearly with any specific NEPA category or subcategory but were nonetheless relevant to the broader public engagement process. These included personal reflections, statements of moral or emotional concern, expressions of gratitude for the opportunity to comment, or general appeals for peace and responsible governance. A number of commenters requested to be added to the mailing list to receive future notifications about the PEIS. Several commenters used the PEIS process to share personal stories or family histories connected to nuclear testing, military service, or environmental contamination without specific requests for analysis. Others provided tangential remarks on government transparency or unrelated DOE programs.	NNSA acknowledges receipt of these comments.
<b>12 Out of Scope (10 total)</b>				
12-a	Out of Scope	10	Out-of-scope comments comprised submissions that did not pertain directly to the scope of the Plutonium Pit Production PEIS or NEPA analysis. Many addressed unrelated political issues, global conflicts, general anti-war or anti-government sentiments, or speculative topics not connected to the Proposed Action. Some expressed	NNSA acknowledges receipt of these comments.

Issue/Subcategory		No of Comments	Comment Summary	NNSA Response
			frustration with government spending or referenced other federal policies without connection to pit production or environmental review. A few comments included rhetorical or philosophical objections to nuclear weapons on moral or spiritual grounds, but without specific recommendations for the PEIS.	
<b>TOTAL COMMENTS</b>				<b>1,146</b>

DNFSB = Defense Nuclear Facilities Safety Board; DOE = U.S. Department of Energy; EIS = environmental impact statement; LANL = Los Alamos National Laboratory; NEPA = National Environmental Policy Act; NNSA = National Nuclear Security Administration; NPT = Nuclear Non-Proliferation Treaty; PEIS = Plutonium Pit Production Programmatic Environmental Impact Statement; ppy = pits per year; SALT = Strategic Arms Limitation Talks; SRS = Savannah River Site; START = Strategic Arms Reduction Treaty; SWEIS = Site-Wide Environmental Impact Statement; TRU – transuranic; U.S. = United States; WIPP = Waste Isolation Pilot Plant

### B.3 References

90 FR 19706. “Notice of Intent To Prepare a Programmatic Environmental Impact Statement for Plutonium Pit Production.” *Federal Register*. National Nuclear Security Administration. May 9, 2025. Available online: <https://www.govinfo.gov/content/pkg/FR-2025-05-09/pdf/2025-08140.pdf>

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APPENDIX C  
Affected Environment

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## ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
2020 SRS Pit Production EIS	Final Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina
2026 LANL SWEIS	Final Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory
AADT	annual average daily traffic
ACHP	Advisory Council on History Preservation
AEI	Area of Environmental Interest
BEA	Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
C&D	construction and demolition
CAA	Clean Air Act
CAP	Climate Action Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
Ci	curies
CSWTF	Central Sanitary Wastewater Treatment Facility
CY	calendar year
DART	days away, restricted time
DCS	derived concentration standard
DD&D	decontamination, decommissioning, and demolition
DNL	day-night average sound levels
DOE	U.S. Department of Energy
DOE-EM	DOE Office of Environmental Management
DWPF	Defense Waste Processing Facility
ECA	Electric Coordination Agreement
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPCU	Electrical Power Capacity Upgrade
ES&H	environment, safety, and health
ESA	Endangered Species Act
ETF	Effluent Treatment Facility
FAA	Federal Aviation Administration
FAMS	F Area Materials Storage
FEMA	Federal Emergency Management Agency
FR	Federal Register
FTF	F-Tank Farm
HAP	hazardous air pollutant
HE	high explosive
HLW	high-level radioactive waste
HMP	Habitat Management Plan

ISPS	Industrial and Sanitary Point Source
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LAPP	Los Alamos Power Pool
LCF	latent cancer fatality
LLW	low-level radioactive waste
LOS	level-of-service
MBTA	Migratory Bird Treaty Act
MEI	maximally exposed individual
MFFF	Mixed-Oxide Fuel Fabrication Facility
MLLW	mixed low-level radioactive waste
NAAQS	National Ambient Air Quality Standards
NEEWC	National Energetic and Engineering Weapons Complex
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NL	Norton Line
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMSW	New Mexico Special Waste
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Sites
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyls
PEIS	Programmatic Environmental Impact Statement
PFAS	Per- and polyfluoroalkyl substances
PGA	peak ground acceleration
PM	particulate matter
PMOA	Programmatic Memorandum of Agreement
PNM	Public Service Company of New Mexico
PSHA	Probabilistic Seismic Hazard Analysis
RCRA	Resource Conservation and Recovery Act
RL	Reeves Line
RLWTF	Radioactive Liquid Waste Treatment Facility
ROI	Regions of Influence
SC	South Carolina
SCDES	South Carolina Department of Environmental Services
SCDHEC	South Carolina Department of Health and Environmental Control
SCSHPO	South Carolina State Historic Preservation Office
SDF	Saltstone Disposal Facility
SERF	Sanitary Effluent Reclamation Facility
SHPO	State Historic Preservation Office

SNM	special nuclear material
SPF	Saltstone Production Facility
SREL	Savannah River Ecology Laboratory
SRPPF	Savannah River Plutonium Processing Facility
SRS	Savannah River Site
SWEIS	site-wide environmental impact statement
SWMU	solid waste management unit
SWWS	Sanitary Wastewater System
TA	technical area
TRC	total recordable cases
TRU	transuranic (waste)
TSCA	Toxic Substances Control Act of 1976
TSD	treatment, storage, and disposal
UNF	used nuclear fuel
UNM	University of New Mexico
U.S.	United States
U.S.C.	United States Code
USCB	U.S. Census Bureau
USDOT	U.S. Department of Transportation
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VDC	volcanic design category
VOC	volatile organic compounds
VRM	Visual Resource Management
WBGT	wet bulb globe temperature
WCS	Waste Control Specialists LLC
WIPP	Waste Isolation Pilot Plant

## C AFFECTED ENVIRONMENT SUPPLEMENTAL INFORMATION

This appendix describes the human and natural environment (the affected environment) to support NNSA’s analysis of environmental impacts presented in Chapter 4. Concise summaries of the information in this appendix are presented in Chapter 3. Additional details provided in this appendix serve as reference points for evaluating any environmental changes that could result from implementing the alternatives. The existing conditions for the environmental resource area were developed from information provided in previous environmental studies and other reports and databases.

This PEIS evaluates the environmental impacts of the alternatives that affect each site within defined regions of influence (ROIs). The ROIs are specific to the type of effect evaluated and encompass geographic areas within which any significant impact would be expected to occur. For example, human health risks to the general public from exposure to airborne contaminant emissions are assessed for an area within a 50-mile radius centered on the pit production facility (e.g., PF-4 at LANL).

The methodologies used to evaluate impacts for each resource area are the same as those used in the LANL SWEIS (NNSA 2026) and the SRS Pit Production EIS (NNSA 2020a). These methodologies are described in Appendix C of the LANL SWEIS (NNSA 2026) and Appendix A of the SRS Pit Production EIS (NNSA 2020a).

### C.1 Los Alamos National Laboratory

Sections C.1.1 through C.1.13 provide information related to the affected environment for each environmental resource area within the ROIs for the LANL site. The LANL ROIs are presented in Chapter 3, Table 3.1-1.

#### C.1.1 Land Use

Land use describes the human use of land. It represents current use and plans and programs that guide the future use and development of an area. Categories of land use include agricultural, commercial, industrial, military, mixed-use, natural, recreational, and residential.

Land uses in the vicinity of LANL are identified through a review of existing federal, tribal, state, county, and community-level land use plans. There are no comprehensive federal regulations that address all land use categories. Communities limit allowable land uses in certain areas by implementing general plans and zoning codes. Land use planning ensures compatible land uses and predictable future development. City or county organizations have no planning jurisdiction at the Laboratory because it is a federal facility owned by DOE. Nevertheless, the Laboratory does consider and engage in local planning policies, to the extent practicable, in its land use decisions to promote common land use goals and to resolve cross-jurisdictional issues.

This section analyzes the existing onsite land uses at LANL, with a particular focus on the Pajarito Corridor where pit production would occur (in TA-55). This section also addresses adopted land use designations, ownership, and management of the surrounding areas on- and offsite. Owners and managers of land within the LANL ROI include federal, tribal, and local governments as well as private organizations and individuals.

### C.1.1.1 Location and Setting

LANL is sited on the Pajarito Plateau, part of the Jemez Mountains – the southernmost reach of the Rocky Mountains. The Pajarito Plateau features a series of mesas separated by deep, east-to-west-trending canyons. Development of LANL is concentrated on the flat mesa tops with onsite elevations ranging from approximately 6,200 to 7,800 feet above sea level. LANL is physically bounded to the west by the Sierra de los Valles range of the Jemez Mountains and to the east by White Rock Canyon, containing the Rio Grande (NNSA 2026).

LANL encompasses approximately 40 square miles (25,536 acres) across both Los Alamos and Santa Fe counties and is divided into TAs (Figure C.1.1-1). Portions of Sandoval County border the site. LANL is surrounded by land managed by other federal agencies, including the National Park Service (NPS), the United States Forest Service (USFS), and U.S. Bureau of Land Management (BLM), as well as the Pueblo de San Ildefonso. The towns of Los Alamos and White Rock border the site to the north and east, respectively (NNSA 2026).

### C.1.1.2 Existing Onsite Land Uses

At the end of 2023 LANL operations comprised 899 buildings containing about 8,500,000 square feet of space.<sup>1</sup> The breakdown of structures as of 2023 is 765 permanent structures, 135 temporary structures (e.g., trailers, transportables, and transportainers), and 47 buildings and trailers offsite within Los Alamos County, Santa Fe County, and Carlsbad, New Mexico (NNSA 2026).

The locations and spacing of the built environment at LANL reflect the Laboratory's historical development patterns, regional topography, and functional relationships. LANL's development is essential but geographically constrained, with rugged terrain limiting growth to a few key areas. Nearly 71 percent of LANL's land is classified as unbuildable, placing physical constraints on future expansion. There are no agricultural activities on LANL, nor are there any prime farmlands in the nearby vicinity (NNSA 2026).

### C.1.1.3 Planning and Technical Areas

The Laboratory is divided into 50 TAs. The onsite TAs are grouped into five major planning areas based on aggregated capabilities and physical location: (1) Core Area; (2) Pajarito Corridor; (3) National Energetic and Engineering Weapons Complex (NEEWC); (4) Los Alamos Neutron Science Center (LANSCE); and (5) Balance of Site. As discussed above, pit production activities are primarily located in the Pajarito Corridor. These five planning areas are highlighted below in Figure C.1.1-2 (NNSA 2026).

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<sup>1</sup> This value is subject to annual variation due to the dynamic nature of the site's infrastructure. As facilities reach the end of their operational lifecycles, the Laboratory implements decontamination, decommissioning, and demolition activities to remove such structures, followed by the construction of replacement facilities as necessary to support ongoing mission requirements.

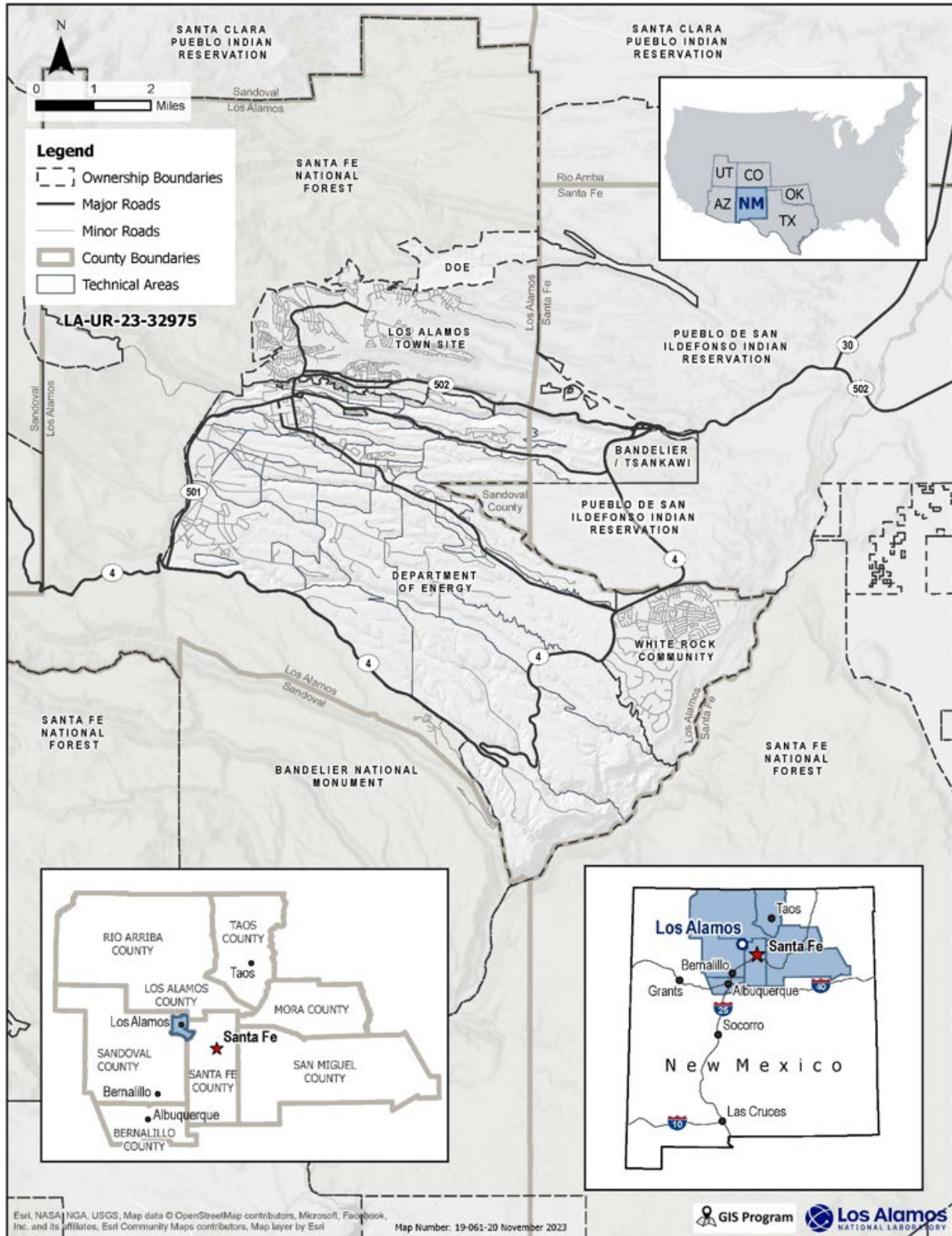
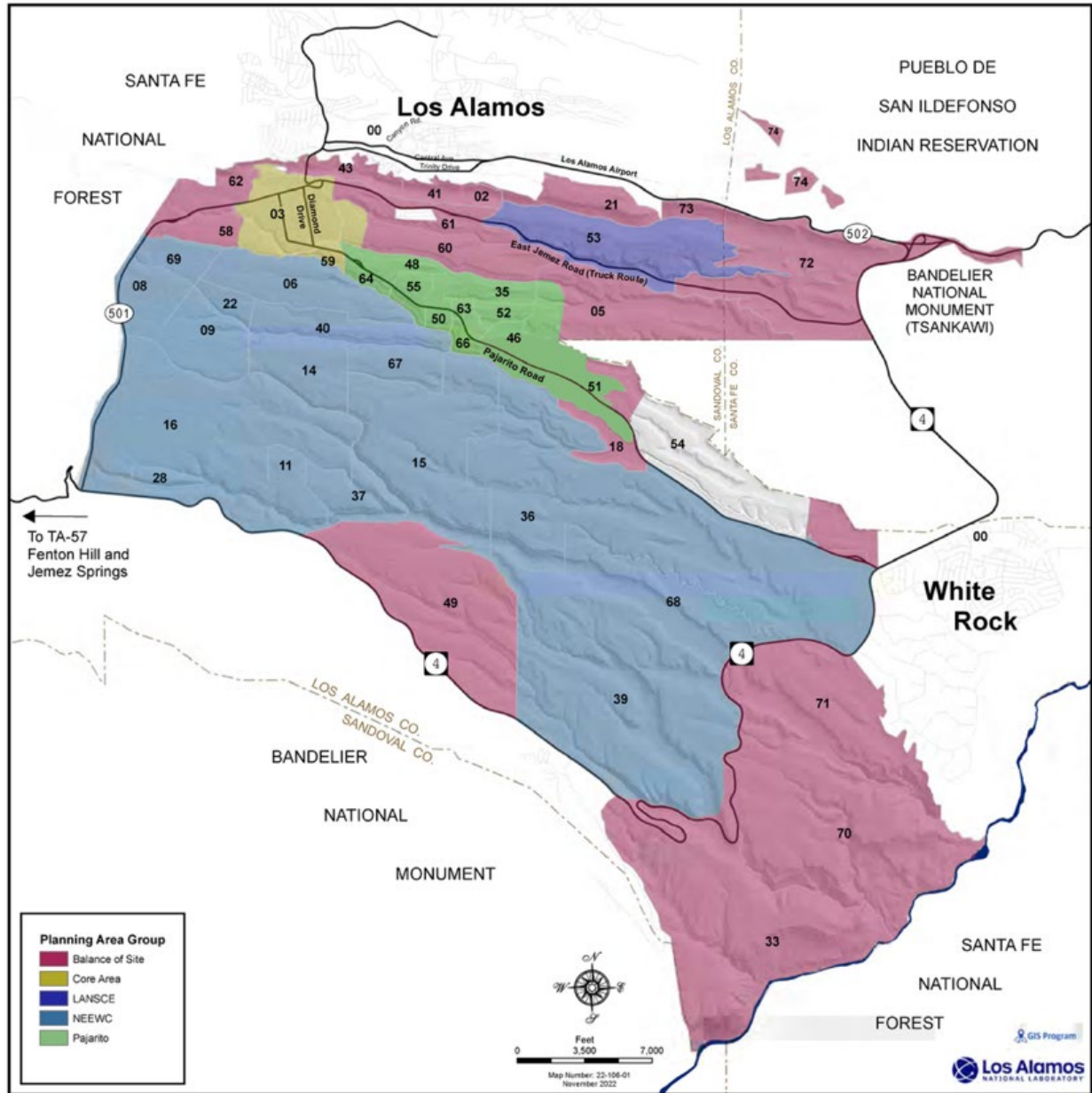


Figure C.1.1-1 Location of the Los Alamos National Laboratory Site



Source: NNSA 2026

**Figure C.1.1-2 LANL Planning and Technical Areas**

Table C.1.1-1 outlines each planning area by total land area, buildable land area, and developed land area. This data shows the overall size of each planning area, and also how much of that land is considered developable, primarily based on topography as much of LANL features steep slopes not conducive to the large facilities and infrastructure needed to support NNSA’s mission. While the primary actions associated with pit production would occur in the Pajarito Corridor, the other planning areas are provided in Table C.1.1-1 to provide a perspective of Pajarito Corridor relative to the site as a whole.

**Table C.1.1-1 LANL Planning Area Development Footprint (acres)**

Planning Area	Technical Area <sup>a</sup>	Total Land Area	Buildable Land Area <sup>b</sup>	Developed Land Area	Percent of Buildable Developed
Core Area	3, <u>43</u> , <u>58</u> , <u>59</u> , <u>60</u> , <u>61</u> , <u>62</u>	564	382	354	93%
<b>Pajarito Corridor</b>	<b>35, 46, 48, 50, 51, 52, 55, 59, 63, 64, 66</b>	<b>1,148</b>	<b>616</b>	<b>383</b>	<b>62%</b>
NEEWC	6, 8, 9, 11, 14, 15, 16, 22, 28, <u>36</u> , 37, 39, 40, 67, 68, 69	11,438	3,685	1,366	37%
LANSCE	53	751	272	224	82%
Balance of Site	2, 5, 18, 21, 33, <u>36</u> , 41, <u>43</u> , 49, 54, 57, <u>58</u> , <u>60</u> , <u>61</u> , <u>62</u> , 70, 71, 72, 73, 74	11,635	2,351	959	41%
<b>TOTALS</b>		<b>25,536</b>	<b>7,305</b>	<b>3,286</b>	<b>45%</b>

LANSCE = Los Alamos Neutron Science Center; NEEWC = National Energetic and Engineering Weapons Complex

a Underlined text indicates technical areas that are split between two planning areas.

b The amount of buildable area was determined using geographic information system data and represents areas with minimal constraints to development (e.g., areas of less than 20-percent slope).

Source: NNSA 2026

Table C.1.1-2 presents each planning area by gross square footage and development density. Development density, defined as the gross square footage of facilities per acre of buildable land, provides a measure of the physical intensity of land use in each planning area.

**Table C.1.1-2 LANL Development Density by Planning Area**

Planning Area	Gross Square Feet	Development Density (GSF/buildable acre)
Core Area	3,778,321	9,891
<b>Pajarito Corridor</b>	<b>1,891,642</b>	<b>3,071</b>
NEEWC	1,098,553	298
LANSCE	926,703	3,407
Balance of Site	242,128	103
Off Site	607,933	(a)
<b>TOTALS</b>	<b>8,545,280</b>	<b>1,170</b>

GSF = gross square feet; LANSCE = Los Alamos Neutron Science Center; NEEWC = National Energetic and Engineering Weapons Campus

a Development density does not apply to offsite facilities since their locations are not limited by defined geographical boundaries.

Source: NNSA 2026

**Pajarito Corridor.** Situated near the geographic center of LANL, the Pajarito Corridor Planning Area (identified in green in Figure C.1.1-2) also functions as the principal hub for nuclear research and production. The area contains mission-critical facilities supporting weapons production, testing, verification, and scientific operations. It also accommodates research and development functions involving radiological hot cells, high-energy experimental laboratories, and precision

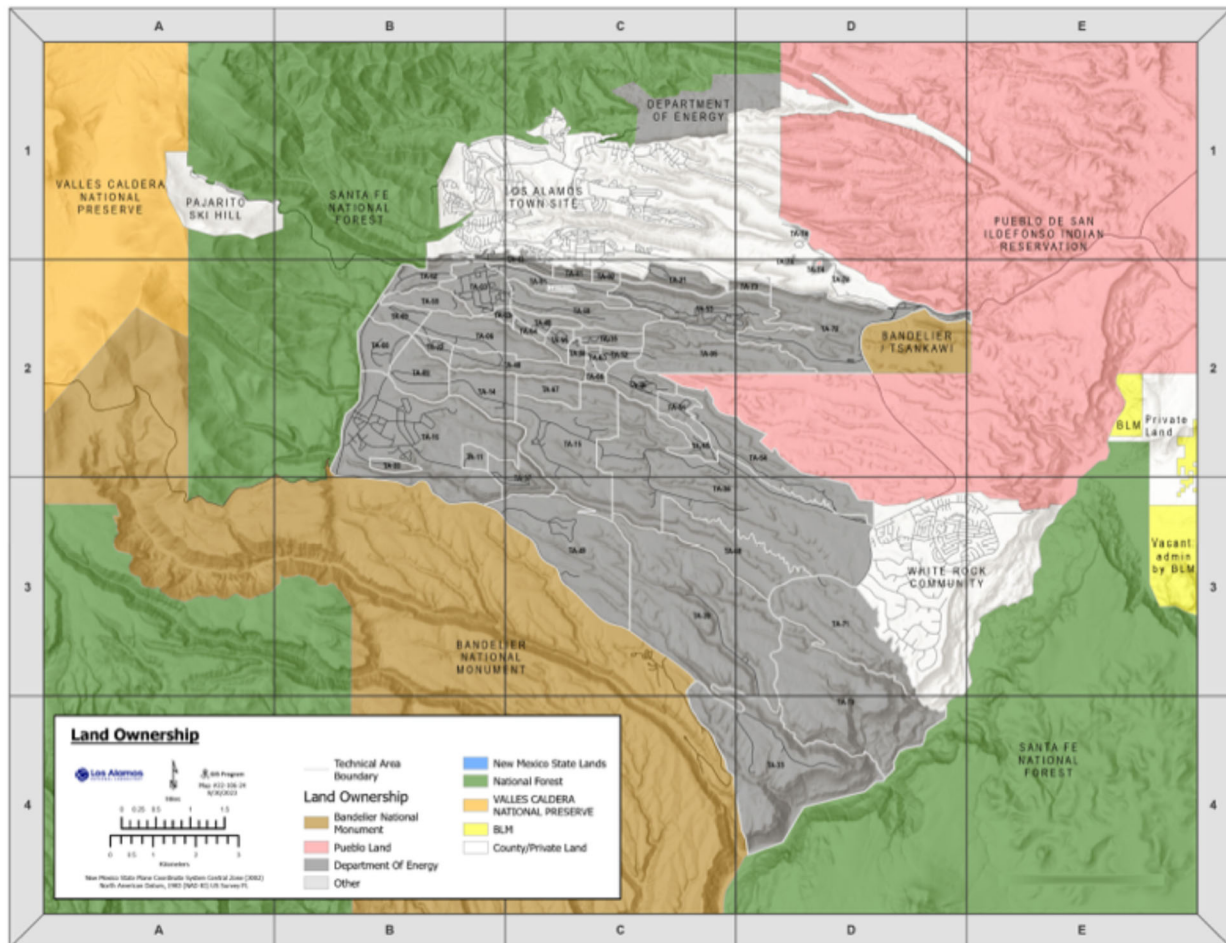
fabrication capabilities. The built environment within the corridor includes warehousing, administrative offices, and light laboratory spaces essential to LANL’s core missions.

Future development potential within the corridor may be limited by site topography, existing utility infrastructure, and constraints within the transportation network (NNSA 2026).

**C.1.1.4 Surrounding Land Uses**

As illustrated in Figure C.1.1-3, lands in the vicinity of LANL are largely undeveloped and left in a natural state. These are categorized into three classes:

- **Private Land** – including the population centers of Los Alamos and White Rock;
- **Pueblo Lands (i.e., Indian reservations)** – Pueblo de San Ildefonso (abutting LANL) and Pueblo of Santa Clara (noncontiguous to LANL but nearby) are shown on the figure. Pueblo de Cochiti and Pueblo of Jemez, also Accord Pueblos (see Section 3.1.8), are outside of the figure boundaries to the south and southwest, respectively; and
- **Federal Land** – Santa Fe National Forest, managed by USFS, and Bandelier National Monument, managed by the NPS.



**Figure C.1.1-3 LANL Location and Surrounding Ownership**

Los Alamos and White Rock, located within Los Alamos County, are the county’s primary population centers.<sup>2</sup> Of the county’s 109 square miles, approximately 94 square miles (86 percent) are federally owned (Table C.1.1-3). Land use within the two communities is governed by the Comprehensive Plan – Los Alamos County, which emphasizes housing and growth, development/redevelopment, and downtown/open space/mobility. The county also adopted the Los Alamos Downtown Master Plan and White Rock Town Center Master Plan in October 2021 to address projected economic and population growth (LAC 2021a, 2021a).

**Table C.1.1-3 Land Ownership within Los Alamos County**

<b>Ownership/ Management Type</b>	<b>Area (square miles)</b>	<b>Area (acres)</b>	<b>Percentage of County</b>
U.S. Forest Service	45.25	28,960	41.4
U.S. Department of Energy	38.31	24,518	35.0
National Park Service	10.41	6,662	9.5
Indian/Tribal	0.06	38	0.1
Private	15.29	9,786	14.0
County Open Space <sup>a</sup>	~6.25	4,000	5.7
<b>TOTALS<sup>b</sup></b>	<b>109.32</b>	<b>69,965</b>	<b>100.0</b>

a Falls under “Private” ownership and is not counted again in Totals row calculations.

b Totals may differ due to rounding.

Source: NNSA 2026

The lands of the Pueblo de San Ildefonso are located immediately east of LANL (*see* Figure C.1.1-3). As neighbors of LANL, the Pueblo has a continuing interest in the site and its impact on Pueblo lands. The Pueblo owns or has use of more than 60,000 acres of land and is home to approximately 1,500 residents. Pueblo land use is a mixture of residential, gardening and farming, cattle grazing, hunting, fishing, food and medicinal plant gathering, and firewood production, along with general cultural and resource preservation. Most of the inhabitants of Pueblo de San Ildefonso live along New Mexico Highway 30 in Santa Fe County, about 3 miles northeast of the LANL boundary. The Pueblo de San Ildefonso has not adopted a formal land use plan (NNSA 2026).

Federal lands surrounding LANL include the Santa Fe National Forest, Bandelier National Monument, and Valles Caldera National Preserve. The U.S. Forest Service manages the 1.6-million-acre Santa Fe National Forest. The National Forest supports uses such as logging, grazing, recreation, and also contains over 300,000 acres of Wilderness where natural processes are federally protected. The NPS manages Bandelier National Monument, established in 1916, which includes the 32,937-acre Main Unit (immediately south of LANL) and the 826-acre Tsankawi Unit (northeast of LANL). Approximately 71 percent of the Main Unit is designated Wilderness; Tsankawi remains undeveloped (NNSA 2026).

Valles Caldera National Preserve, located roughly 20 miles west of LANL, protects a 13-mile-wide caldera formed by a volcanic eruption 1.25 million years ago. In 2000, the Federal Government acquired the 89,000-acre Baca Ranch, and the area was designated a unit of the

<sup>2</sup> A private mobile home community, Elk Ridge, is located within the LANL boundary at 2025 East Jemez Road (TA-61). It includes 299 home lots but is excluded from LANL planning areas as it is privately owned land. The community is about 3,000 feet north of TA-55.

National Park System in 2014. NPS assumed management from the Valles Caldera Trust in 2015 (NNSA 2026).

### C.1.2 Aesthetic and Scenic Resources

To rate the scenic quality of LANL, SRS and their respective surrounding areas, NNSA uses the BLM Visual Resource Management (VRM) Classification System. Although this classification system is designed for undeveloped and open land managed by BLM, this system is valid in the analysis of visual resources management and planning activities. NNSA selected the VRM system as the basis for this analysis because it is a proven and established means for determining visual values based on a set of objectives. The system is frequently used for environmental analysis and reporting across the DOE complex. Table C.1.2-1 outlines the objectives of the four VRM classes.

The degree to which development affects the aesthetic quality of a landscape depends on the contrast created between the project elements and the existing landscape. This SWEIS uses the BLM’s degree of contrast criteria to assess the level of contrast between the proposed or existing element and the landscape in which it sits (*see* Table C.1.2-2). The four levels of contrast (i.e., none, weak, moderate, and strong) correspond to the VRM class objectives, I, II, III, and IV, respectively. For example, a “moderate” contrast rating is generally acceptable in a Class III area but may also meet the VRM objectives for a Class IV area when there are accumulating elements.

A sensitivity level analysis is an important component of the VRM. Sensitivity levels are a measure of public concern, and lands are assigned high, medium, or low sensitivity levels. A sensitivity analysis is conducted by evaluating the following factors: types of users, amount of use, public interest, adjacent land use, special areas, distance zones (foreground to midground, background, and seldom seen), and other dynamics.

**Table C.1.2-1 Bureau of Land Management Visual Resource Management Class Objectives**

Class	Objective	Change Allowed (relative level)	Relationship to the Casual Observer
I	Preserves the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity.	Very Low	Activities should not be visible and must not attract attention.
II	Retains the existing character of the landscape. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.	Low	Activities may be visible but should not attract attention.
III	Partially retains the existing character of the landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.	Moderate	Activities may attract attention but should not dominate the view.

Class	Objective	Change Allowed (relative level)	Relationship to the Casual Observer
IV	Provides for management activities which require major modification of the existing character of the landscape. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.	High	Activities may attract attention, may dominate the view but are still mitigated.

Source: BLM 1986

**Table C.1.2-2 Bureau of Land Management Degree of Contrast Criteria**

Degree of Contrast	Criteria
None	The element contrast is not visible or perceived.
Weak	The element contrast can be seen but does not attract attention.
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

Source: BLM 1986

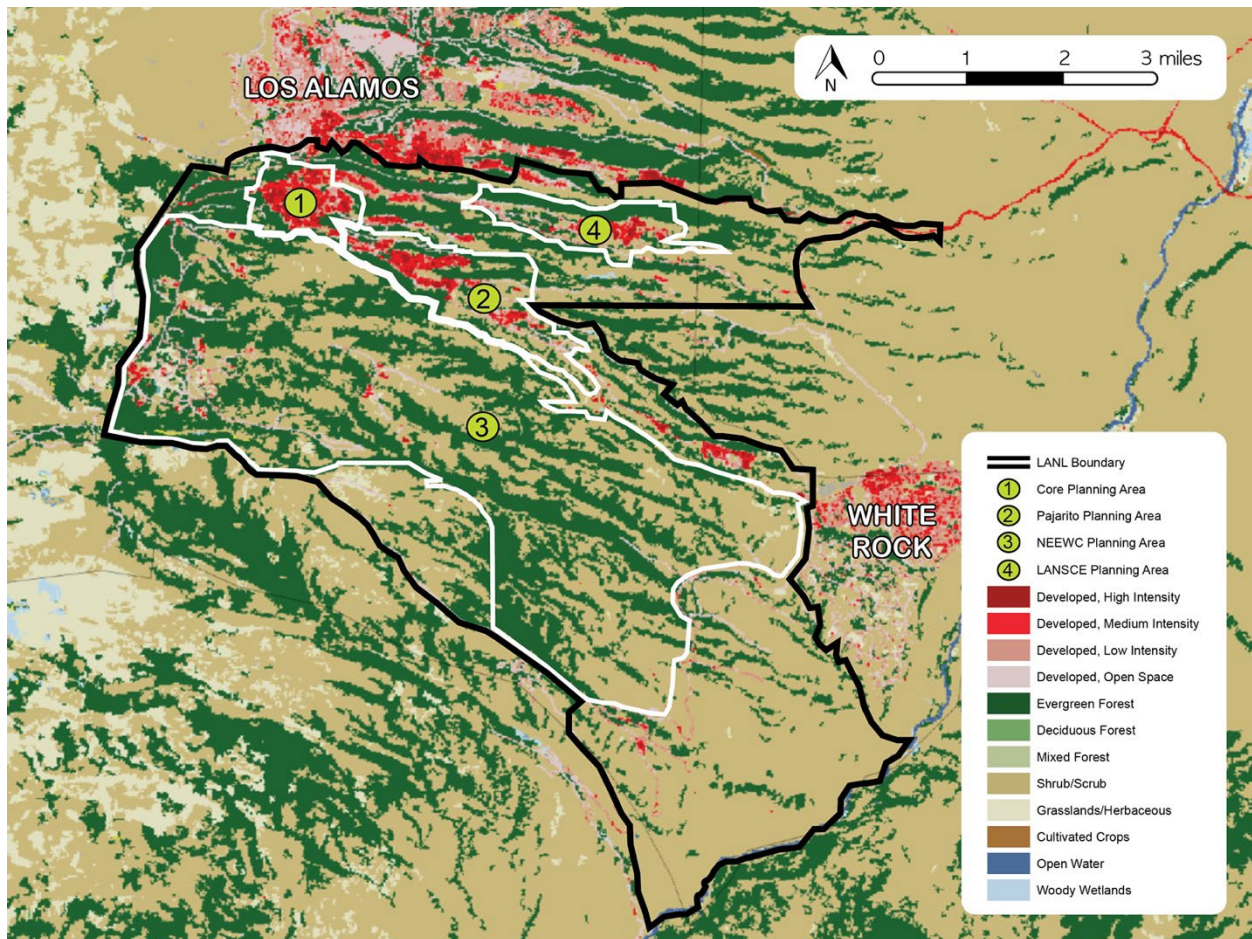
Because LANL is not a BLM-administered site, there are no BLM classifications for LANL. The VRM class designations in the following sections were assigned using the methods and criteria described above.

The proposed actions at LANL would be primarily located onsite chiefly in the Pajarito Corridor. The visual ROI is the location of the actions outlined in Chapter 2 and views of the facilities from onsite and public viewpoints from offsite. Special consideration is given to actions within visually sensitive locations and viewpoints from visually sensitive locations.

### C.1.2.1 Onsite Visual Environment

NNSA's mission at LANL necessitates the presence of developed areas and significant alterations to the natural landscape. This development is primarily concentrated within the Core, Pajarito, and LANSCE planning areas. The harsh topography and largely undisturbed lands to the south of the Core and Pajarito planning areas function as buffer zones, providing separation between LANL operations and adjacent lands to the northwest, southwest, and southeast. These established development patterns are illustrated in Figure C.1.2-1.

Given LANL's immense land area and diverse development patterns, a single VRM class rating would not be appropriate; instead, a rating was assigned to each distinct planning area. The existing VRM classes range from I to IV. The bulk of land at LANL is largely undeveloped and isolated, consistent with a VRM Class I or II rating. The developed areas present a high level of contrast between the mountainous landscape and the physical improvements to the land and are more consistent with VRM Classes III and IV.



Note: Areas within the LANL boundary but not within a labeled planning area are included in the Balance of Site.  
Source: MRLC 2025

**Figure C.1.2-1 Land Cover Types on LANL and Surrounding Areas**

**Pajarito Corridor.** The Pajarito Corridor Planning Area (labeled 2 on Figure C.1.2-1) is characterized by high- and medium-intensity development and substantial alterations to the natural landscape, making it one of the most developed areas within LANL. Development within the Pajarito Corridor dominates the visual landscape of the area. Situated within the interior of LANL, the corridor is generally screened from offsite public viewpoints due to its distance from the Laboratory’s boundaries, intervening topography, and generally hazy atmospheric conditions. However, with the opening of Pajarito Road to public access, individuals traveling through the corridor by motor vehicle are now exposed to the development and operational activities occurring within this planning area. The Pajarito Corridor has been assigned a VRM Class IV designation. Figure C.1.2-2 presents a representative photograph depicting the existing visual conditions within a portion of the Pajarito Corridor Planning Area.

**NEEWC.** The NEEWC planning area (labeled 3 on Figure C.1.2-1) serves as LANL’s high explosive, engineering, and environmental testing site. Covering about 18 square miles, it is the second largest planning area. Its size reflects its use for testing and the security needs that limit dense development. Most of the landscape remains natural, with scattered facilities producing moderate visual contrast. The NEEWC is assigned a VRM Class II designation. This planning area

is included because it could host one of the transuranic (TRU) waste staging areas (*see* Chapter 2, Section 2.4).

**Balance of Site.** The Balance of Site Planning Area consists mainly of undeveloped buffer lands of forests, shrublands, open space, and research areas, including the White Rock Canyon Reserve. Although remediation at TA-21 and TA-54 is locally visible, the area remains largely natural with minimal disturbance. The Balance of Site is designated VRM Class I.



Source: NNSA 2023

**Figure C.1.2-2 Aerial View of a Portion of the Pajarito Corridor**

### **C.1.2.2 Offsite Visual Environment**

The visual environment surrounding LANL is an extension of the onsite landscape. Neighboring properties include the Bandelier National Monument, Pueblo de San Ildefonso, Santa Fe National Forest, and the communities of Los Alamos and White Rock. Topography and vegetation throughout the viewshed generally constrain sightlines, although there are vantage points with sweeping vistas.

Of the identified neighboring properties, Bandelier National Monument, Pueblo de San Ildefonso, and the Santa Fe National Forest are considered visually sensitive locations for the purposes of this analysis. Bandelier National Monument has two units: the Main Unit along LANL's southern boundary and the Tsankawi Unit to the east. The Main Unit borders natural buffer zones in the Balance of Site Planning Area. There are few adverse visual effects from LANL's built environment to visitors of Bandelier's Main Unit. The Tsankawi Unit is located physically closer to the three heavily developed planning areas (Core Area, Pajarito Corridor, and LANSCE) in comparison to the Main Unit. While LANL infrastructure is physically closer, the Tsankawi Unit sits at a lower elevation and views are mostly restricted by topography.

Santa Fe National Forest is contiguous to LANL on both its northwestern and southeastern boundaries (*see* Figure C.1.1-3). The portion along LANL's southeastern boundary runs adjacent to the White Rock Canyon Reserve with few adverse visual impacts. The northwestern section sits closer to the Jemez Mountains at a higher elevation. Views to the east from this northwestern district are sweeping with obvious views of the LANL's infrastructure.

Pueblo de San Ildefonso lands wrap around Bandelier's Tsankawi Unit and are bounded to the west by LANL property. The Pueblo's lands between NM-4 and the Pajarito Corridor are adjacent to some of the highest-developed areas of LANL. There are no permanent residential developments in this section of the Pueblo and vehicular access is controlled from NM-4. Although

there are no permanent residents in this portion of Pueblo land, it is a significant area of cultural importance from a visual environment perspective. The Pueblo's developed areas are located several miles farther from the LANL site along NM-30 and NM-502. As such, current Laboratory operations do not adversely affect the visual landscape from the Pueblo's residences.

### **C.1.3 Geology and Soils**

#### **C.1.3.1 Geologic and Topographic Setting**

The geology of the LANL region is a product of approximately 35 million years of complex faulting, sedimentation, volcanism, and erosion. LANL is situated on the Pajarito Plateau, a landform composed of volcanic tuffs (fused volcanic ash) from ancient eruptions originating in the Jemez Mountains to the west. This plateau is heavily incised, featuring numerous mesas separated by deep canyons. These canyons contain streams that flow eastward and southeastward across the plateau, ultimately draining into the Rio Grande (LANL 2022a).

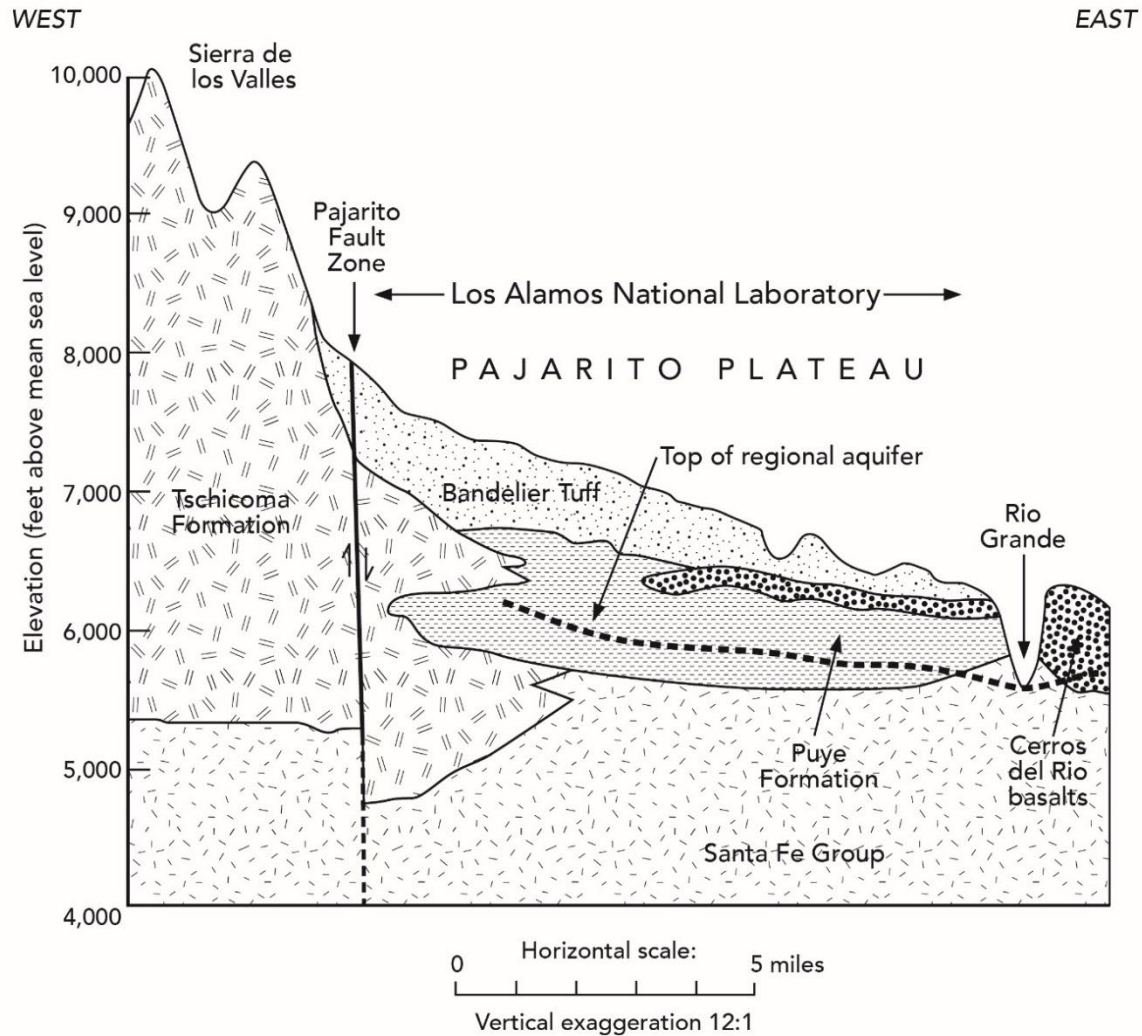
#### **C.1.3.2 LANL Stratigraphy**

The geologic strata beneath LANL are illustrated in Figure C.1.3-1, which identifies a sequence of rock layers exposed in the area's deep canyons. These canyons, ranging from 600 to 1,000 feet deep with steep sides, are cut into the Pajarito Plateau, revealing the varying properties of the underlying layers. Softer, lighter-colored formations tend to form slopes, while harder, darker units create prominent vertical cliffs.

At the deepest point of this sedimentary sequence lies the Santa Fe Group. These formations, stretching between the Jemez and Sangre de Cristo mountains, can be over 3,300 feet thick in certain locations. Above the Santa Fe Group, the Puye Formation is found. This formation, which is thicker under the western and central parts of the Pajarito Plateau and thins out towards the eastern plateau, is composed of coalesced alluvial fans. These fans were deposited as material eroded eastward from the volcanic domes and flows of the Jemez Mountains (DOE 2011).

The uppermost rock layer on the Pajarito Plateau, and the one that underlies most LANL facilities, is the Bandelier Tuff. This unit is prominently visible in the canyon walls and can reach thicknesses exceeding 1,000 feet in the western plateau, gradually reducing to about 260 feet thick near the Rio Grande on the eastern edge. Most LANL facility foundations are built on or within the upper member of the Bandelier Tuff, which is characterized by various recognizable subunits with distinct physical and weathering properties. Finally, scattered across the LANL site are localized, surficial deposits of unconsolidated Quaternary sediments. These newer deposits primarily consist of colluvium and alluvium, made up of gravels, sands, and clays (DOE 2011).

For a more in-depth discussion of the individual subunits within the Bandelier Tuff, refer to Section 4.2.2.1 of the 2008 LANL SWEIS (NNSA 2008).



Source: LANL 2024a

**Figure C.1.3-1 Generalized Cross Section of the LANL Area**

### C.1.3.3 Volcanism

The Valles Caldera within the Jemez Mountains to the west of LANL has erupted 34 times since forming 1.2 million years ago. While resurgence periods (74,000–42,000 years ago) averaged one eruption every 5,500 years (Nasholds and Zimmerer 2022), eruption timing is highly irregular, making simple predictions unrealistic (NMBGMR 2010). Volcanic event return periods are thousands of years, which exceed DOE facility hazard goals (DOE 2011). Estimates of recurrence rates at LANL were updated with new chronology data to  $1.46 \times 10^{-5}$  events per year (LANL 2025a). In accordance with DOE-STD-1020-2016, the hazard return periods for different structure, system, and component category structural designs, which include volcanic design category (VDC)-1, VDC-2, and VDC-3 at LANL, were calculated and determined to be zero because of the low recurrence rate for volcanism at the site (LANL 2025a). The last explosive eruption (El Cajete pumice) was 74,000 years ago (Zimmerer et al. 2016), and the youngest lava flow (Banco Bonito) was 40,000 years ago. Most volcanologists classify the Valles Caldera complex as dormant (NMBGMR 2010).

### C.1.3.4 Faulting and Seismicity

The Pajarito Fault system located along the western boundary of the LANL site poses the primary seismic risk to LANL due to its proximity and seismic activity (LANL 2007). This 31-mile-long, north-south trending system includes the Pajarito, North Pajarito, Rendija Canyon, Guaje Mountain, and Sawyer Canyon faults. These are interconnected normal faults, with the Pajarito being the longest and most potentially impactful, defining the Pajarito Plateau and Jemez Mountains boundary (NNSA 2011). This fault system and others are depicted in Figure C.1.3-2.

Paleoseismic studies indicate the Pajarito Fault last ruptured under 1,700 years ago, Guaje Mountain between 4,200 and 6,500 years ago, and Rendija Canyon before 9,000 years ago. No single fault trace shows multiple Holocene (less than 11,700 years before present) ruptures, making precise earthquake numbers and characteristics difficult (Lettis et al. 2019). While no large historical earthquakes have occurred since LANL's inception, geologic evidence points to the system's capability of producing Richter magnitude (M)<sup>3</sup> 6.5 to 7.3 surface-faulting earthquakes (DOE 2011). Early Quaternary displacement reaches 650 feet, with compelling evidence of repeated late Quaternary faulting (LANL 2007; Lewis et al. 2009).

U.S. Geological Survey (USGS) data shows seven earthquakes with magnitudes greater than 2.5 (the largest was a magnitude 3.5) within 62 miles of TA-55 from 1973-2024; however, none occurred within the LANL site boundary (USGS 2025a). The latest USGS seismic hazard map indicates a maximum probabilistic peak ground acceleration (PGA)<sup>4</sup> of between approximately 0.13g and 0.20g for TA-55, based on a 2-percent exceedance probability in 50 years, corresponding to an annual occurrence probability of about 1 in 2,500 (USGS 2025b).

DOE requires a site-specific Probabilistic Seismic Hazard Analysis (PSHA) for the design of seismic design Category 3–5 facilities as defined in DOE-STD-1020-2016 (DOE 2016). In 2007, a comprehensive update to the 1995 seismic hazard analysis of LANL was completed and incorporated into the 2008 LANL SWEIS (NNSA 2008). The 2007 comprehensive update indicated that the seismic hazard was higher than previously understood from the initial 1995 PSHA. The 2007 seismic hazard study was updated in 2009 to incorporate a new set of ground motion attenuation relationships and to examine potential conservatism in the 2007 study (LANL 2009). LANL is currently engaged in an update to the 2007 PSHA, which is scheduled to be released in early 2026.

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<sup>3</sup> The Richter scale reflects the relative strength or size of an earthquake. The magnitude is based on the logarithmic measurement of the maximum motion recorded by a seismograph. An increase of one unit of magnitude represents a 10-fold increase in wave amplitude on a seismograph.

<sup>4</sup> PGA is the maximum horizontal acceleration of the ground during an earthquake. It's an important parameter in earthquake engineering, representing the intensity of ground shaking at a specific location during an earthquake. PGA is expressed as a percentage or fraction of the acceleration due to gravity (g).

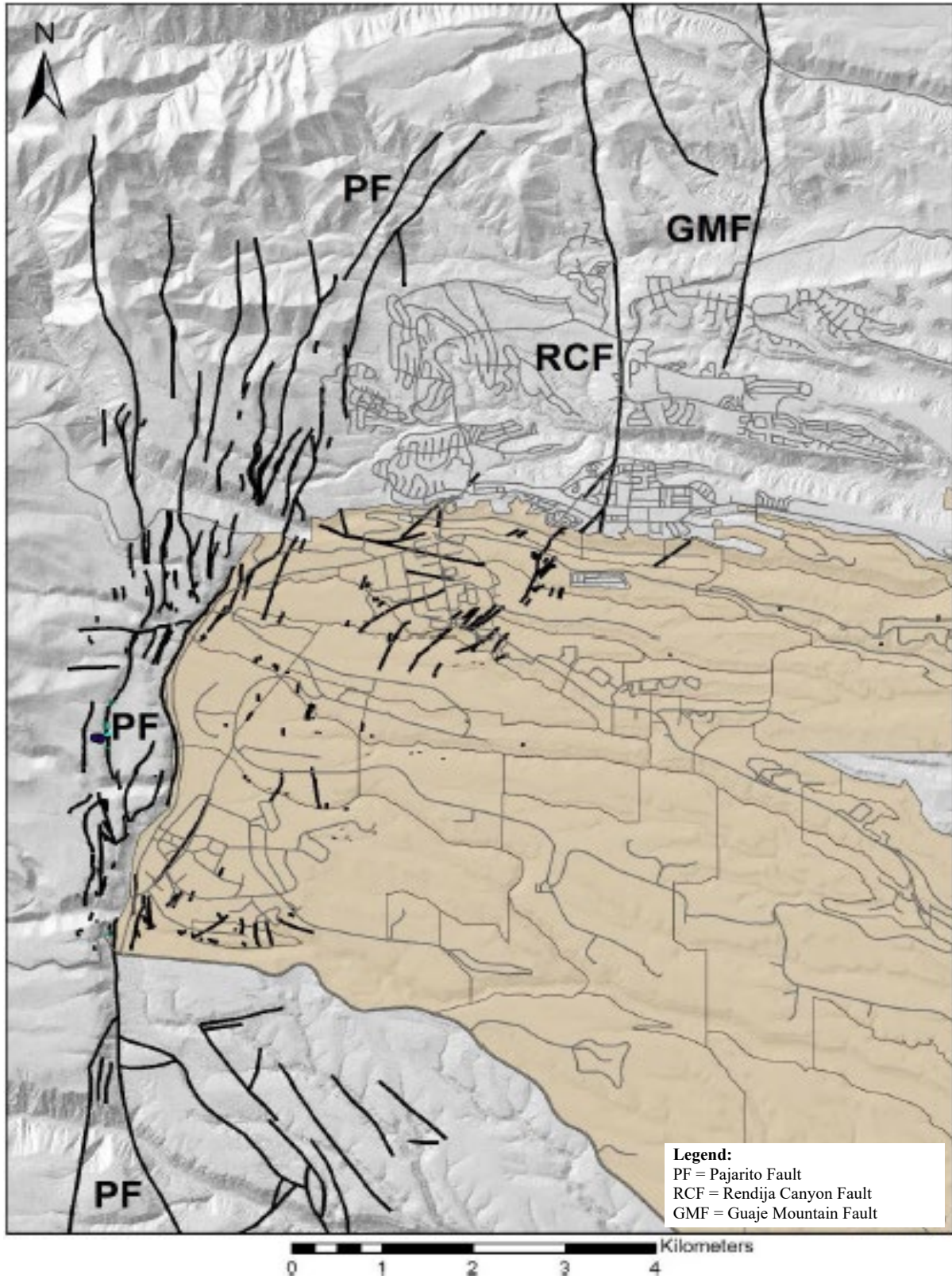


Figure C.1.3-2 Seismic Faults in the LANL Area

### C.1.3.5 Soils and Foundation Stability

Los Alamos County features diverse soils, formed by the interaction of bedrock, topography, and climate on decomposed volcanic and sedimentary rocks. These soils range in texture from clay to gravel. Soils on the Pajarito Plateau mesa tops are well drained and vary from very shallow (0–10 inches) to moderately deep (20–40 inches). The underlying Bandelier Tuff is typically found at depths of 40–60 inches (DOE 1999a). The LANL site's general soil map unit includes approximately 52-percent rock outcrop on mesa edges and sides (NRCS 2008). Soils in canyon settings can be significantly thicker than those on mesa tops. Most surface soils in developed areas within the LANL site have been disturbed by construction activities for buildings, parking lots, and roadways.

TA-55 is underlain by rock outcrop soils, which consist of barren or nearly barren areas of bedrock, as benches, ledges, and escarpments, with areas of very shallow to deep, well-drained, sandy loam, formed from tuff and pumice on 1 to 8 percent slopes. These soils are characterized by slow to moderate permeability, very low water capacity, high shrink-swell potential, and very high runoff (NRCS 2008).

Soil erosion rates on the LANL site vary considerably due to the topography of the mesas and canyons in the area. The highest erosion occurs in drainage channels and on steep slopes. Wildfires in 2000 and 2011, and a major flooding event in 2013, significantly increased erosion by removing vegetation and causing channel and bank erosion (NNSA 2026, Section 4.4.3). Roads, structures, and paved parking lots concentrate runoff, leading to increased erosion adjacent to these features. Other factors contributing to high erosion rates include past logging, livestock grazing, loss of vegetative cover, and decreased precipitation. The lowest erosion rates are found on the gently sloping central portions of the mesas, away from drainage channels. LANL monitors and evaluates mesa and canyon erosion through its wildland fire, forest health, and stormwater management programs (NNSA 2018).

Soils at LANL are suitable for standard construction techniques (NNSA 2003). Los Alamos County has no designated prime farmland soils (USDA 2021). The nearest prime farmland areas are approximately 7.5 miles east and 10 miles south of LANL, adjacent to the Rio Grande (NRCS 2011).

The potential for seismically induced land subsidence at LANL is considered to be low and, for soil liquefaction, negligible (NNSA 2003).

#### **Soils Monitoring**

Surface soil samples are collected every three years as part of an institutional program, supplementing annual soil data gathered for specific projects when needed. Sediment monitoring and sampling for watersheds, rivers, and reservoirs are detailed in Section 3.1.4 of this PEIS.

Most institutional soil-sampling stations are on undisturbed mesa tops, often near and downwind from major LANL facilities. In 2021, the institutional monitoring program collected surface soil and vegetation samples from 16 onsite, 14 perimeter, and 6 regional background locations. Nearly all perimeter stations are within 2.5 miles of the LANL site boundary, primarily in inhabited or publicly accessible areas north and east of the Laboratory. Many of these locations have been monitored for radionuclides since the early 1970s (LANL 2022a).

The 2021 LANL Annual Site Environmental Report and its data tables provide detailed information on soil-sampling locations and monitoring results. This report presents soil monitoring

results from 36 sites for the latest institutional evaluation period (LANL 2022a). The analysis includes data for:

- Radionuclides
- Inorganic elements
- Dioxin and furan
- Polychlorinated biphenyls (PCBs)
- Semi-volatile organic compounds (SVOCs)
- Volatile organic compounds (VOCs)
- High explosives (HE)
- Per- and polyfluoroalkyl substances (PFAS)

Constituent levels in soil samples collected at or near LANL are compared to regional statistical reference levels. The regional statistical reference level for a chemical or radionuclide in soil is calculated using results from all the soil samples collected at regional background locations during the previous 10 years. The regional statistical reference level is the level below which precisely 99 percent of the results from regional background soil samples fall. Levels of constituents in soil and sediment are also compared with ecological screening levels for soil.

General observations from the 2021 institutional soil monitoring program are summarized as follows:

- The majority of radionuclides were below regional statistical reference levels, and all were below ecological screening levels.
- Uranium isotope concentrations varied among locations with onsite results having higher concentrations from both naturally occurring background and potential human-made sources.
- Most inorganic elements were detected and were below the regional statistical reference levels.
- Lead concentrations exceeded the regional statistical reference levels and the no-effect ecological screening levels at six locations and are similar to previous results.
- The majority of inorganic elements were not changing over time, and several elements had higher concentrations in soil samples collected from locations containing naturally occurring background constituents contained in the soil.
- The most toxic dioxin compound (tetrachlorodibenzodioxin-2,3,7,8) was only detected in one soil sample collected at TA-63 near the Transuranic Waste Facility, which exceeded the no-effect ecological screening level.
- Minor chemical constituents of PCBs were detected in the majority of soil samples, and all were below ecological screening levels.
- The majority of semi-VOCs were not detected.
- No VOCs were detected in soil samples.
- HEs were only detected in two samples on the LANL site; the Minie firing site on Three-Mile Mesa and the TA-16 burn grounds.
- The majority of PFAS chemicals were not detected in soil samples.

The most recent triennial institutional soil monitoring program results were published in *the 2024 LANL Annual Site Environmental Report*, which was after the data cutoff for the baseline data for

this PEIS (LANL 2025b). The results of the 2024 report were reviewed during preparation of this PEIS and found to reflect similar results.

#### **C.1.3.6 Mineral Resources**

LANL's potential mineral resources primarily consist of rock and soil used for backfill, borrow material, or waste unit covers. Sand and gravel are mainly for road building, while pumice is used for landscaping. The only active onsite borrow pit is the 2.5-acre East Jemez Road Borrow Pit in TA-61. This pit, carved into the upper Bandelier Tuff, also serves for storing asphalt milling material, soil, and rubble. For additional materials, LANL relies on 11 commercial, offsite borrow pits and quarries within 30 miles, which is considered the economically viable hauling limit. These nearby sources primarily provide sand and gravel (NNSA 2026). LANL also has a concrete and asphalt recycling program. Materials from demolition are collected, stored, and then reused as engineered foundation fill for new construction and upgrade projects.

#### **C.1.4 Water Resources**

This section describes surface water, groundwater, sediments, and floodplains located on the LANL site and on adjacent properties within the ROI. Wetlands are discussed in Section C.1.7 of this PEIS as part of biological resources. Water resources in the LANL region are used for human consumption, traditional and ceremonial uses by Native Americans, aquatic and wildlife habitat, domestic livestock watering, irrigation, industry, and commercial purposes. Water resources in proximity to LANL may be affected by water withdrawals, effluent discharges, waste disposal, spills and unplanned releases, soil erosion, or stormwater runoff from LANL operations. The LANL area contains all or parts of seven watersheds that drain into the Rio Grande basin. The watersheds are named for the canyons that receive their runoff (Figure C.1.4-1) (LANL 2024a). The consumption of domestic water at the LANL site is addressed in Section C.1.11 as an element of infrastructure.

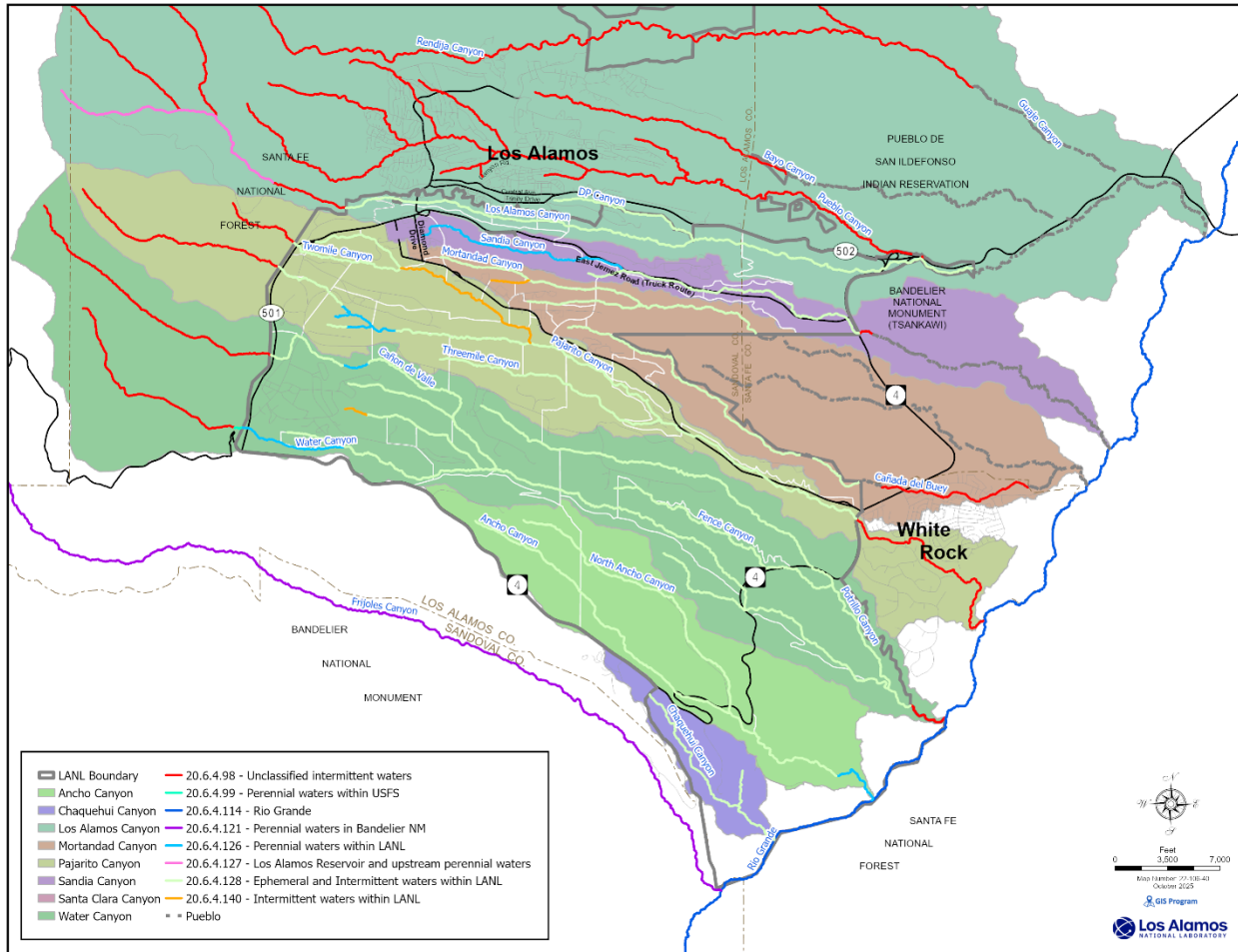


Figure C.1.4-1 Stream Reaches and Watersheds Within and Around LANL

### C.1.4.1 Surface Water

Surface water has the potential to be affected when streams and springs receive industrial effluents discharged from the Laboratory, stormwater flows over the site, and sediments are mobilized by stormwater runoff. At certain times of the year and under certain precipitation and flow conditions, surface water flowing through and from the LANL site can reach the Rio Grande, where contaminants could flow downstream. Streams that drain the LANL site area are dry for most of the year, and the area’s surface water flows primarily in intermittent streams in response to local precipitation or snowmelt (LANL 2025c).

Some of the surface water at the LANL site comes from shallow groundwater discharging as springs into canyons. Surface waters on and off site provide recharge to subsurface groundwater via infiltration to alluvial groundwater, intermediate-perched groundwater, and the regional aquifer. Surface water is not a source of municipal, industrial, irrigation, or recreational water, though it is used by wildlife. While there is minimal direct use of the surface water within the LANL site, flows may extend beyond the site boundaries, where there is more potential use of the water. Certain stream flows extend onto Pueblo de San Ildefonso land and may be used by the community for traditional or ceremonial purposes, including ingestion or direct contact.

TA-55 is located on a narrow mesa between Two-mile Canyon to the south (a tributary to Pajarito Canyon) and the Mortandad Canyon Complex to the north. The southern portion of the TA-55 area lies within the Pajarito watershed, although the majority of the TA-55 buildings lie within the Mortandad watershed (LANL 2008, 2013). The northern portion of TA-55 drains to Effluent Canyon, a tributary to Mortandad Canyon.

The 10.4-square mile Mortandad watershed originates on LANL property, extends 10 miles across the LANL site and San Ildefonso Pueblo, and joins the Rio Grande at an elevation of 5,450 feet above sea level (LANL 2006a). No perennial springs or stream reaches exist in the Mortandad watershed, and no significant snowmelt runoff occurs in the watershed (LANL 2006a).

### **Surface Water Quality**

The New Mexico Environment Department (NMED) assessed DOE's surface water data during the decision-making process for listing and delisting causes of impairment of the state's stream reaches (delineated as assessment units) under Section 303(d) of the *Clean Water Act*. Within the boundaries of LANL, NMED identified 39 assessment units: 35 are impaired for one or more designated uses. Some of the constituents (i.e., gross alpha activity<sup>5</sup> and aluminum) causing the impairment can be attributed to natural background sources and from developed areas on the LANL site not necessarily associated with historical operations. Most samples of 200 possible constituents have concentrations far below regulatory standards or risk-based advisory levels. Water resources are regulated by federal standards (including the *Clean Water Act*, 33 U.S.C. § 1251 et seq., and the *Safe Drinking Water Act*,<sup>6</sup> 42 U.S.C. Chapter 6A, Subchapter XII), DOE-derived concentration guides, and the New Mexico state regulations, including Title 20, Chapter 6, Part 2 of the *New Mexico Administrative Code* (20.6.2 NMAC), "Ground and Surface Water Protection," administered by the New Mexico Water Quality Control Commission. As New Mexico stream water quality standards have become more stringent, LANL programs are emphasizing improved management of the site's stormwater runoff (NNSA 2018).

Laboratory personnel routinely monitor surface water, stormwater, and sediments as part of the Laboratory's ongoing environmental monitoring and surveillance program. Most surface water within the LANL site is designated for use as wildlife habitat, livestock watering, and aquatic life habitat. Some reaches have aquatic life designations. Impairment causes are generally related to levels of gross alpha, aluminum, copper, mercury, polychlorinated biphenyls (PCBs), and selenium, further detailed in the LANL annual site environmental reports (LANL 2025c).

Two-mile Canyon in TA-55 is impaired by aluminum, copper, PCBs, and gross alpha; Pajarito Canyon below Two-mile Canyon is impaired by these contaminants, as well as cyanide. Mortandad Canyon in TA-55 is impaired by PCBs and gross alpha (LANL 2025c). The Rio Grande River from Cochiti Reservoir to the San Ildefonso boundary, which includes the stretch of the river along the LANL site boundary, is impaired by gross alpha, aluminum, mercury, PCBs, temperature, and turbidity; a fish consumption advisory is in effect for the reservoir and this reach of the river (NMED 2022, NMSWQB 2024).

Laboratory personnel recognize and manage the following sources that have the potential to impact local surface water resources:

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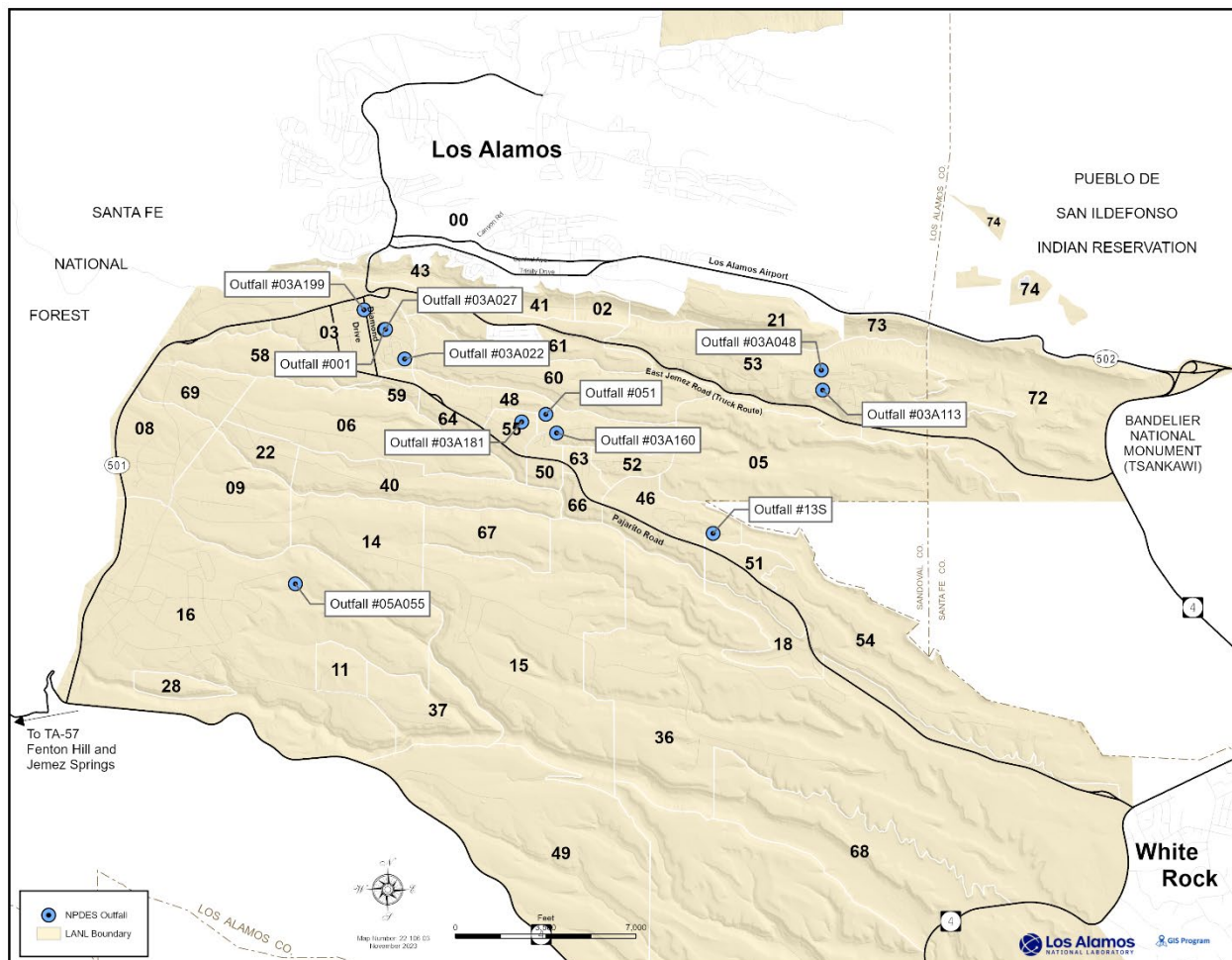
<sup>5</sup> Gross alpha activity is the sum of the radioactivity from alpha particle emissions from radioactive materials.

<sup>6</sup> Also referred to as the *Safety of Public Water Systems* (42 U.S.C. § 300f).

- Industrial effluents discharged under the National Pollutant Discharge Elimination System (NPDES) Industrial and Sanitary Point Source (ISPS) Outfall Permit NM002835. This source includes point-source discharges from LANL wastewater treatment plants and cooling towers;
- Stormwater runoff, including stormwater runoff from certain industrial activities, construction activities, and solid waste management units (SWMUs);
- Dredge and fill activities or other work within perennial, intermittent, or ephemeral water courses; and
- Sediment transport.

**Industrial Effluents**

Liquid effluents from LANL’s industrial and sanitary outfalls are permitted under the NPDES ISPS Outfall Permit NM002835 (Figure C.1.4-2). This LANL-wide permit requires routine monitoring of discharges and reporting of sampling results. The permit specifies the parameters to be measured and the sampling frequency (NNSA 2018). Table C.1.4-1 provides NPDES ISPS Outfall Permit Annual Discharges.



NPDES = National Pollutant Discharge Elimination System; TA = technical area

**Figure C.1.4-2 NPDES Industrial and Sanitary Point-Source Permitted Outfalls**

Table C.1.4-1 NPDES ISPS Outfall Permit Annual Discharges

Outfall No.	Building No.	Description	Canyon Receiving Discharge	2023 Discharge (gallons)
03A048	53-963/978	Los Alamos Neutron Science Center cooling tower	Los Alamos	21,297,810
051	50-1	Technical Area 50 Radioactive Liquid Waste Treatment Facility	Mortandad	80,788
03A022 <sup>a</sup>	3-2238	Sigma emergency cooling system	Mortandad	1,086,048
03A160	35-124	National High Magnetic Field Laboratory cooling tower	Mortandad	0
03A181	55-6	Plutonium Facility cooling tower	Mortandad	1,463,725
13S	46-347	Sanitary wastewater system plant	Canada del Buey	0
001	3-22	Power plant (includes treated effluent from sanitary wastewater system plant)	Sandia	76,538,300
03A027	3-2327	Strategic Computing Complex cooling tower	Sandia	0
03A113	53-293/952	Los Alamos Neutron Science Center cooling tower	Sandia	117,570
03A199	3-1837	Laboratory Data Communications Center	Sandia	11,940,390
05A055	16-1508	High Explosives Wastewater Treatment Facility	Water	0
<b>2023 TOTAL</b>				112,524,631

ISPS = Industrial and Sanitary Point Source; NPDES = National Pollutant Discharge Elimination System

a This outfall's designation was changed back to 03A022 from 04A022 in the March 2022 permit renewal to reflect cooling water, emergency cooling water, and roof drain/storm water discharges to the outfall (cooling-tower blowdown was diverted to the sanitary wastewater system plant).

Source: LANL 2025c

The current NPDES ISPS NM0028355 permit includes 11 outfalls (10 industrial outfalls and 1 sanitary outfall) that discharge effluent from seven technical areas distributed across the entire LANL site. Based on Laboratory discharge monitoring reports, seven permitted outfalls recorded flows in 2023, totaling approximately 112.5 million gallons (LANL 2025d). In calendar year (CY) 2023, the majority of effluent discharged to the environment came from TA-3 (Outfall 001 at 68 percent) and LANSCE (Outfall 03A048 at 18.9 percent).

LANL has three principal wastewater treatment facilities: the Sanitary Wastewater System (SWWS) Plant (TA-46), which discharges to Outfall 001 in Sandia Canyon, the Radioactive Liquid Waste Treatment Facility (RLWTF) (TA-50), which discharges to Outfall 051 in Mortandad Canyon, and the High Explosives Wastewater Treatment Facility (HEWTF) (TA-16), which discharges to Cañon de Valle.

Within TA-55, two permitted outfalls discharged to the Mortandad watershed in 2023 (LANL 2024b). The largest discharge (about 1.5 million gal in 2023 from outfall 03A181) was from the TA-55 PF-4 cooling tower. The TA-50 RLWTF outfall 051 discharged about 0.08 million gal in 2023 (LANL 2025c).

Laboratory personnel sample liquid effluents discharged to the environment from the outfalls as specified in the permit and report the results to the U.S. Environmental Protection Agency (EPA) and the NMED every month. In 2023, Laboratory personnel collected 801 samples. Ten of these 801 samples exceeded the permit limit. Laboratory personnel addressed each exceedance immediately by correcting the cause or ceasing the discharge until corrective actions could be implemented (LANL 2025c).

### **Stormwater Runoff**

During New Mexico’s summer monsoon season, there can be a large volume of stormwater runoff flowing over facilities and construction areas on the LANL site, potentially picking up sediment and pollutants. The most common pollutants transported in stormwater flows are radionuclides, PCBs, and metals. The LANL site continues to benefit from ongoing program improvements resulting from changes in the EPA NPDES stormwater permitting program, increased regulatory attention on stormwater flows from SWMUs, and programmatic changes to monitoring activities and implementation of best management practices and/or stormwater control measures for stormwater pollution prevention.

The Laboratory maintains several permits related to stormwater runoff. The permits include the:

- Multi-Sector General Permit, which regulates stormwater runoff from the industrial activities and sites on the LANL site;
- Individual Permit, which authorizes discharges of stormwater from certain SWMUs and areas of concern (hereinafter site monitoring areas [SMAs]) at the Laboratory; and
- Construction General Permit, which requires all site-wide construction activities and projects that disturb 1 acre or more of land to be permitted.

If the Laboratory is not in compliance with permit requirements, corrective action measures are implemented as required by the permit.

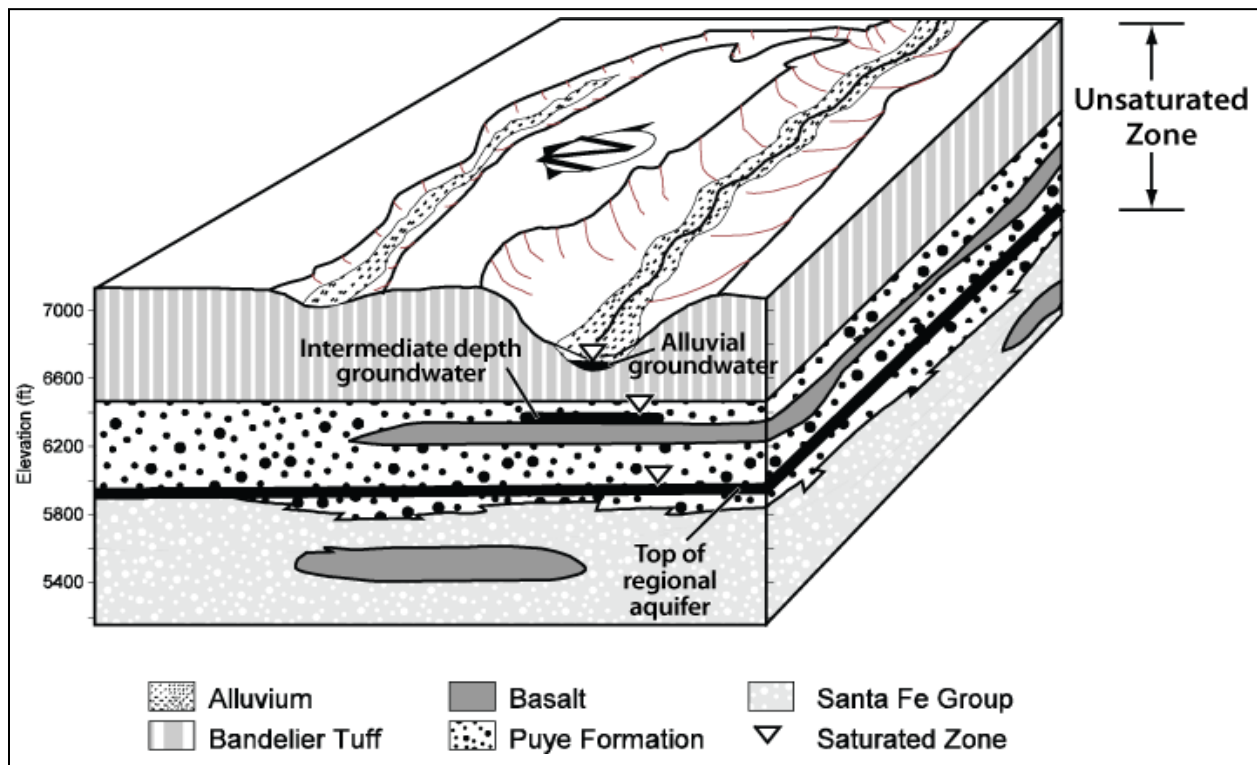
### **Surface Water and Sediment Monitoring**

DOE monitors watersheds and sediments on site, off site, and at regional locations. Sediments are sampled from all major canyons that cross LANL (on site and off site), as well as from the Rio Grande and area reservoirs, along tributary canyons, in major canyons upstream and downstream of LANL, and at watercourse junctions with the Rio Grande. Environmental monitoring data is analyzed to confirm that the following conceptual model is accurate: sediment transported by storm water runoff in Laboratory canyons generally results in the same or lower levels of LANL-released substances in new sediment deposits than previously existed in each reach. Through the surveillance program, LANL tracks the movement and concentration of contaminants in sediment over time and can take appropriate action to mitigate or slow sediment transport where needed. The results of the stormwater, base flow, and sediment data from samples collected in 2023 support the finding that the risk assessments presented in the canyons’ investigation reports represent an upper bound of potential human and ecological health risks in the canyons for the foreseeable future. Through the human health risk assessments in the canyons’ investigation reports and the biota dose assessment and human health risk assessment in the 2023 Annual Site Environmental Report, LANL concludes that levels of chemicals and radionuclides present in stormwater, base flow, and sediment are below levels that would impact human or biota health (LANL 2025c).

### C.1.4.2 Groundwater

Groundwater in the LANL region occurs in three characteristic locations: (1) perched alluvial groundwater in canyon-bottom sediments, (2) zones of intermediate-depth perched groundwater whose location is controlled by availability of recharge and by changes in rock permeability, and (3) the regional aquifer beneath the Pajarito Plateau (Figure C.1.4-3). In wet canyons, stream runoff percolates through the alluvium until downward flow is impeded by less-permeable layers of tuff, maintaining shallow bodies of perched groundwater within the alluvium. If not impeded by less-permeable layers, surface water will eventually reach the regional aquifer.

Perched groundwater occurs in alluvium (sediment deposited by streams), found in the canyon bottoms, or at greater depths in the Bandelier Tuff or Puye Formation. The zones of perched water are typically not continuous but are created where rock layers with low permeability impede downward water movement. These rock layers vary greatly in their ability to transmit water in saturated and unsaturated states. None of these perched water zones (shallow or intermediate) provide enough water to be a source for municipal drinking water.



Source: LANL 2024a

**Figure C.1.4-3 Geologic and Hydrologic Relationships on the Pajarito Plateau**

Underneath portions of Pueblo, Los Alamos, Mortandad, and Sandia canyons, intermediate-perched groundwater occurs within the lower part of the Bandelier Tuff and within the underlying Puye Formation and Cerros del Rio Basalt. These intermediate-depth groundwater bodies are formed in part by recharge from the overlying perched alluvial groundwater. Intermediate groundwater occurrence is controlled by availability of recharge and variations in permeability of the rocks underlying the plateau. Depths of the intermediate-perched groundwater vary. For example, intermediate-perched groundwater has been found as shallow as 120 feet in Pueblo

Canyon and as deep as 750 feet in Mortandad Canyon. About 350–620 feet of unsaturated tuff, basalt, and low moisture content sediments separate the alluvial and perched groundwater zones and the regional aquifer (LANL 2022a).

The regional aquifer of the Los Alamos area occurs at a depth of approximately 1,200 feet along the western edge of the Pajarito Plateau and about 600 feet along the eastern edge. The regional aquifer lies about 1,000 feet beneath the mesa tops in the central part of the plateau. Water in the aquifer flows generally east or southeast toward the Rio Grande, and groundwater model studies indicate that underflow of groundwater from the Sierra de los Valles in the Jemez Mountains is the main source of recharge for the regional aquifer. Groundwater flow from the Sierra de los Valles to the Pajarito Plateau may be affected by the Pajarito Fault.

The regional aquifer is the only aquifer in the area capable of serving as a municipal water supply; the regional aquifer supplies various customers including LANL, Los Alamos County, and others located in parts of Santa Fe and Rio Arriba counties. The EPA has designated this aquifer as a sole-source aquifer (73 FR 3723, January 22, 2008), indicating that the aquifer supplies at least 50 percent of the drinking water for its service area and there are no reasonably available alternative drinking water sources if the aquifer becomes contaminated (LANL 2022b).

### **Groundwater Flow and Transport**

The Bandelier Tuff is an important rock formation due to its resistance to downward flow and its ability to capture and hold contamination. The tuff is a complex of several volcanic ash and pumice falls that occurred at different periods during the history of the region (*see* Section C.1.3).

Volcanic glass in the tuff captures some contaminants by chemically attaching them to mineral surfaces (adsorbing) or by taking them into the structure of the minerals themselves (absorbing). As a result, large volumes of contaminants can be trapped, some permanently and some temporarily. The combination of these physical and chemical processes in the unsaturated tuff slows the movement of some contaminants toward the regional groundwater table (NNSA 2008).

Most of the alluvium in the canyon channels is composed of weathered tuff and pumice fragments that strongly hold some of the contaminants. Some of the contaminants introduced to the canyons by LANL outfalls during historical operations are held in these perched water zones by adsorption to the sediments. Lateral movement of contaminants in the canyon channels and movement of contaminants downward into local perched water bodies underlying the canyon channels are being monitored.

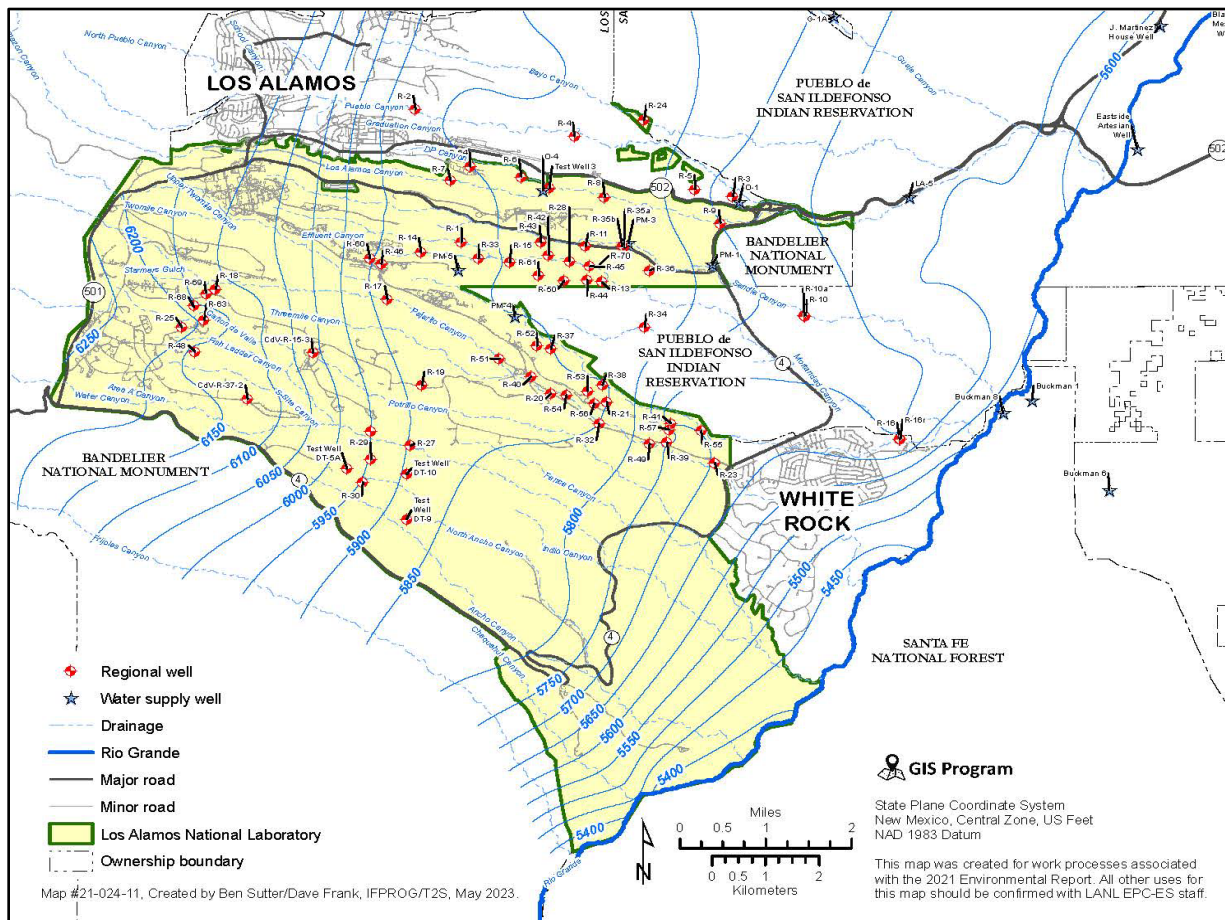
Groundwater near the water table generally flows eastward toward the Rio Grande, with local northeast or southeast flows observed (Figure C.1.4-4). The speed of groundwater flow varies but is typically around 30 feet per year. The regional aquifer is separated from alluvial and perched-intermediate groundwater by layers of unsaturated tuff, basalt, and sediment. The limited extent of the alluvial and intermediate groundwater bodies, along with unsaturated rock and sediment that underlies them, restricts their contribution to recharging the regional aquifer, although locally they are important parts of the complete hydrologic pathway to the regional aquifer. Water from the Sierra de los Valles range is the main source of recharge for the regional aquifer (LANL 2022c).

### **Groundwater Quality**

Groundwater chemistry varies with some general properties of the groundwater environment, such as the acidity of the water and the chemistry of local rock. Uranium, silicon, sodium, arsenic, and other chemical constituents that are common in the volcanic rocks of the LANL area appear as

natural constituents in the groundwater of the Jemez Mountains region. Of interest for regional groundwater quality are levels of contaminants larger than those expected from naturally occurring groundwater constituents (LANL 2024a).

Since the 1940s, liquid effluent disposal by the Laboratory has degraded water quality in the shallow perched groundwater that lies beneath the floor of several canyons (NNSA 2008). Treatments to reduce contaminants in these effluents began in the 1950s. Effluent discharges at LANL have been conducted under permits from regulatory agencies since 1978. These water quality impacts extend, in a few cases, to perched groundwater at depths of a few hundred feet beneath these canyons. Recharge to the regional aquifer from the shallow contaminated perched groundwater bodies occurs slowly (over a period of decades) because the perched water is separated from the regional aquifer by hundreds of feet of unsaturated rock. As a result, little contamination reaches the regional aquifer from the shallow perched groundwater bodies, and water quality impacts on the regional aquifer, although present, are small (LANL 2024a).



**Figure C.1.4-4 Contour Map of Average Water Table Elevations for the Regional Aquifer**

Drainages that received some Laboratory effluents in the past include Mortandad Canyon, Pueblo Canyon from its tributary Acid Canyon, and Los Alamos Canyon from its tributary DP Canyon. Water Canyon and its tributary Cañon de Valle received effluents produced by HE processing and experimentation. Sandia Canyon received discharges of power plant cooling water, other cooling-

tower water, and water from the Laboratory's SWWS Plant. Over the years, Los Alamos County has operated several SWWS plants in the area and currently operates one in Pueblo Canyon (LANL 2022c).

Since the early 1990s, the Laboratory has significantly reduced both the number of industrial outfalls and the volume of water discharged (*see* Section C.1.4.1.2). The remaining discharge amounts have been reduced through treatment process upgrades so that they meet applicable standards (LANL 2022c).

The annual Interim Facility-Wide Groundwater Monitoring Plan identifies the monitoring locations, frequency of monitoring, and substances to be monitored. LANL monitors water quality and other characteristics by taking samples from wells in alluvial groundwater, perched-intermediate groundwater, and the regional aquifer; springs that discharge perched-intermediate and regional aquifer groundwater; and streams that maintain perennial base flow. Some wells have multiple screens (entry points for water) at different depths (LANL 2024a). Groundwater standards and screening levels are set by three regulatory agencies. DOE has authority under the *Atomic Energy Act of 1954*, as amended to set standards for certain nuclear materials. The EPA and the New Mexico Water Quality Control Commission set screening levels and standards for other constituents (LANL 2022a).

The main source of contaminants in Mortandad Canyon has been discharge from the TA-50 RLWTF into Effluent Canyon. Historically, the largest amount of contamination and radionuclides released to the Mortandad watershed has come from the RLWTF outfall (051), which began operations in July 1963, and water treatment continues today (LANL 2006b, 2025c). Advanced treatment technologies and stricter regulatory requirements have resulted in reduced contaminant concentrations in effluent. In 2023, all sample results from treated effluent discharges from the RLWTF were less than the applicable groundwater standards or screening levels. Groundwater monitoring well samples, collected as part of this permitted discharge, met groundwater quality standards and screening levels except for detections of nitrate, perchlorate, chromium, and 1,4-dioxane at MCOI-6 (LANL 2025d).

Within Mortandad Canyon, the total per- and polyfluoroalkyl substances level was above the screening level at one alluvial well location (MCO-7) in 2023 (LANL 2025c). For Mortandad Canyon samples obtained from the regional aquifer general surveillance wells in 2023, no constituents exceeded the screening levels (LANL 2025c).

Monitoring in 2023 showed that hexavalent chromium (originating from releases in Sandia Canyon) exceeded the groundwater standard in intermediate-depth perched and regional aquifer wells in Mortandad Canyon (LANL 2025c). Data show the chromium plume continuing to evolve, with increasing concentrations in some wells. The data indicate that the ongoing interim measures to control the chromium plume (extraction of contaminated groundwater and reinjection after treatment) may be reducing concentrations along the downgradient edge of the plume (LANL 2025c). Additional investigations are underway to determine the vertical extent of chromium contamination where it occurs at depths greater than 1,000 ft in the regional aquifer (LANL 2022a). At the direction of the NMED, injection of treated water was suspended on April 1, 2023, due to questions about the configuration of injection wells. This effectively shut down the chromium interim measure treatment system. The DOE-EM-LA and NMED have been negotiating the terms of restart of the system (LANL 2025c).

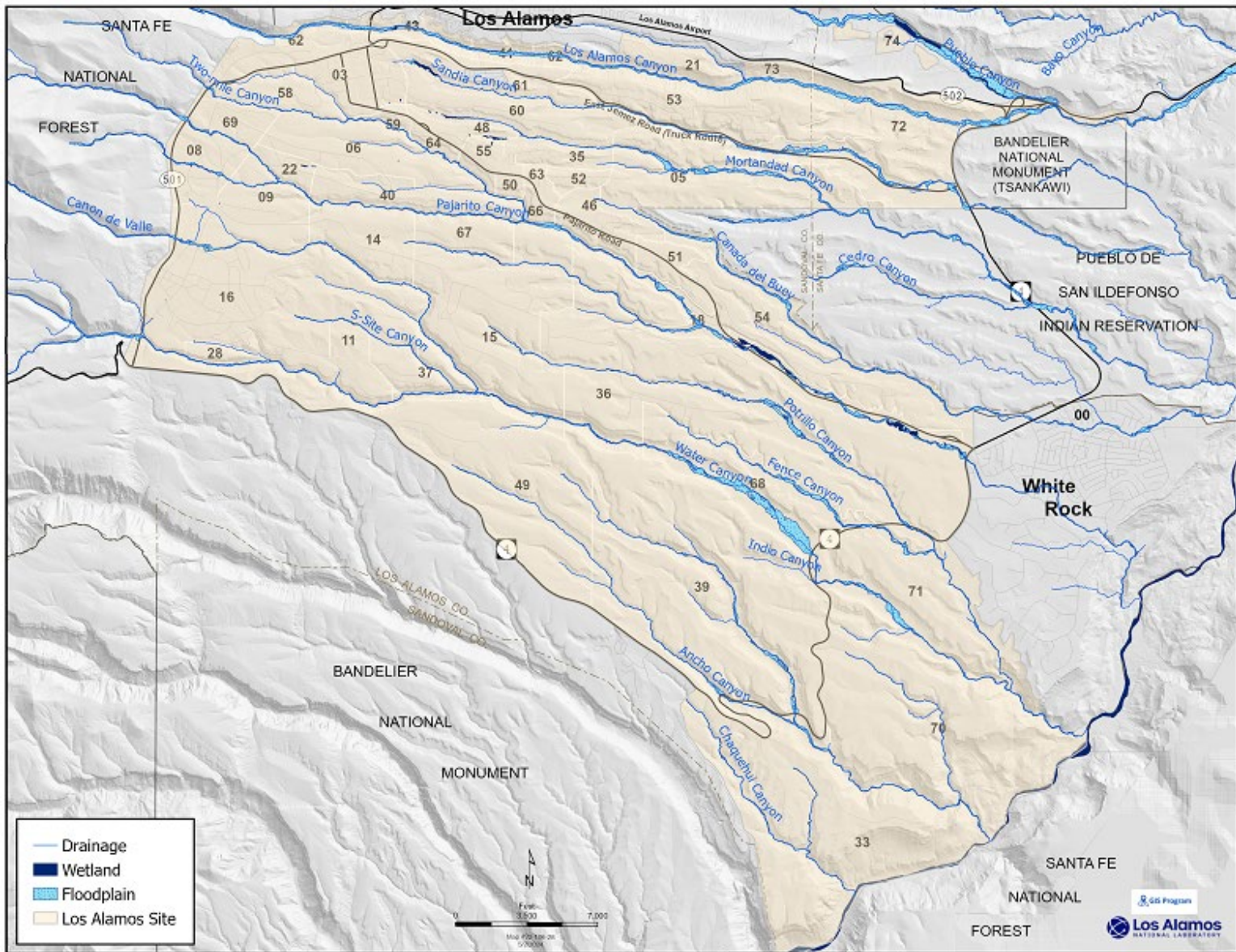
Plutonium has negligible solubility in water under typical environmental conditions (Reilly et al. 2016) but could be transported as an oxide precipitated on or adsorbed to soil particles. LANL includes plutonium isotope analyses in selected groundwater monitoring. This has yielded mostly non-detects (samples where contaminants were not detected) and no exceedances of screening levels or water quality standards (Intellus 2025). Plutonium-239/240 was detected at one alluvial well (MCOI-6 in Mortandad Canyon, TA-05) in 2024 at an activity of 0.0186 pCi/L (Intellus 2025), well below the derived concentration standard (400 pCi/L) (LANL 2025c).

### **Groundwater Use**

The LANL potable water supply is provided by the Los Alamos County Department of Public Utilities using water from the regional aquifer. Water quality was monitored in 11 water supply wells located on the Pajarito Plateau (LANL 2025c). No violations of water quality standards were reported for 2023 (LANL 2025c), and no contaminants derived from LANL activities were detected above drinking water standards in samples from the Los Alamos County and Santa Fe water supply wells (LANL 2025c). More details related to historical groundwater quality at LANL are provided in Section A.4.4 of the 2026 LANL SWEIS (NNSA 2026). Although groundwater levels have declined over time in response to pumping, the current pumping rates are likely to be sustainable for many decades (LADPU 2018).

#### **C.1.4.3 Floodplains**

Floodplains are areas adjacent to watercourses that can become inundated with surface waters during high flows from runoff due to precipitation or snowmelt. At LANL, the floodplains are generally located in the canyons that lie between the mesa fingers (Figure C.1.4-5). DOE regulations (10 CFR Part 1022) consider the critical action floodplain to be those areas affected during a 500-year flood (with a 0.2-percent chance of occurrence in any given year). The base floodplain is defined as the 100-year floodplain, which has a 1.0-percent chance of flooding in any year. The *Resource Conservation and Recovery Act* (RCRA) permit for LANL also utilizes the 100-year floodplain definition (NNSA 2018). There are no floodplains that could be affected by the PEIS Proposed Action. Since issuance of the 2008 LANL SWEIS, significant work within floodplains has occurred in DP, Mortandad, Pueblo, Los Alamos, Sandia, and Water canyons as part of the 2016 Consent Order (as modified) implementation and to mitigate the impacts of 2013 flooding. Grade-control structures were constructed in DP, Pueblo, and Sandia canyons, and sediment traps were cleaned out and improved in Mortandad Canyon. Additional background on LANL floodplains can be found in the 2026 LANL SWEIS (NNSA 2026).



Source: LANL 2024c

Figure C.1.4-5 Wetlands and 100-Year Floodplains at LANL

## C.1.5 Climate and Air Quality

### C.1.5.1 Climate and Meteorology

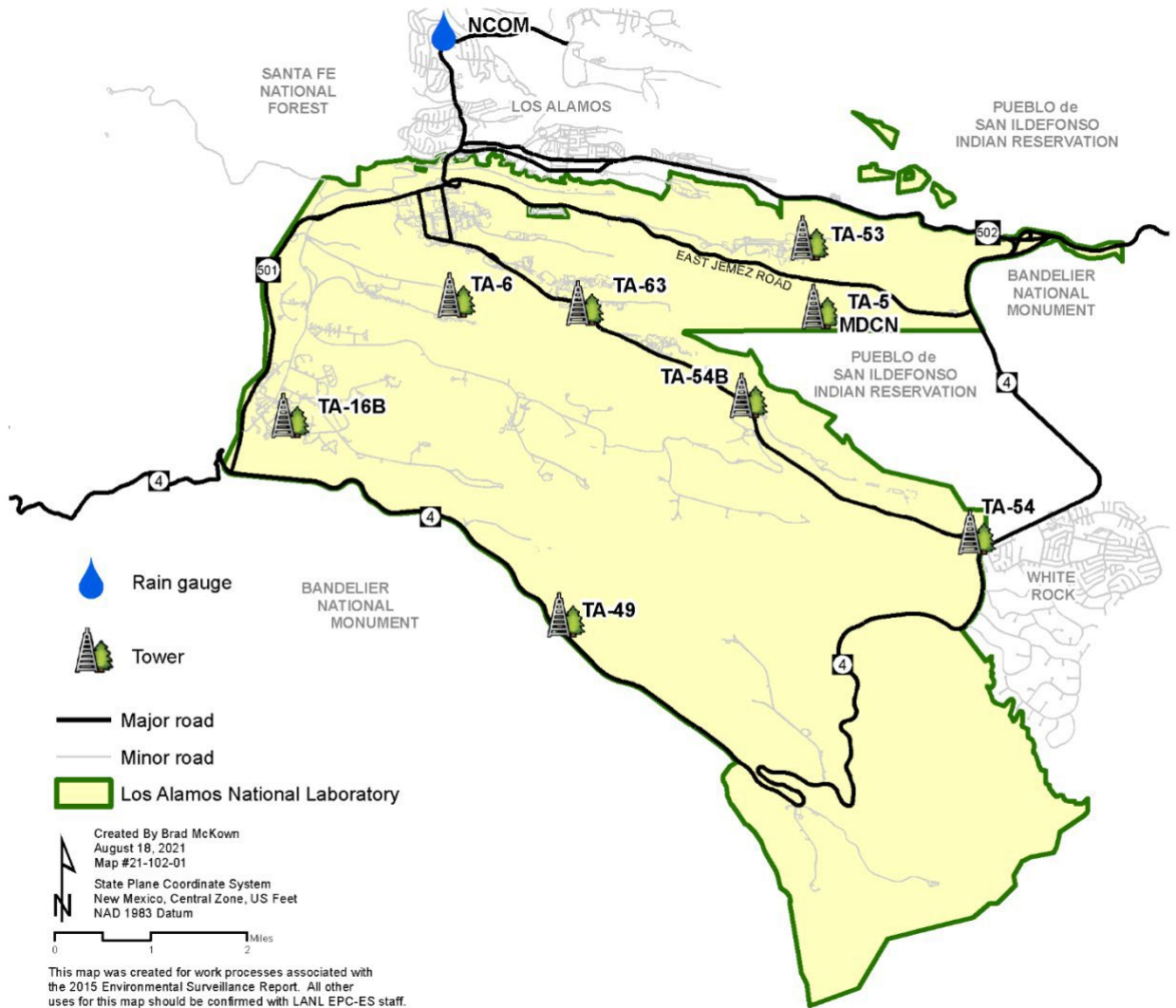
The climate of the LANL area is characterized as semi-arid. The region experiences seasonal variability in rainfall, temperature, and wind, which are critical factors for understanding air quality dynamics. Annual average (water equivalent) precipitation is about 17 inches and daily air temperatures range from 30 degrees Fahrenheit (°F) in the winter to near 90°F in the summer.

The Laboratory monitors meteorological conditions (e.g., wind speed and direction, temperature, atmospheric pressure, relative humidity, dew point, precipitation, and solar and terrestrial radiation) from eight onsite locations and rainfall from a gauge in the Los Alamos townsite (Figure C.1.5-1) (LANL 2025c). Weather data from each station is available at <https://weather.lanl.gov/>. Site-wide meteorological conditions are discussed in the 2026 LANL SWEIS and incorporated by reference in this PEIS.

Weather data relevant to TA-55 is collected from the TA-6 meteorological tower, the official reporting station for LANL that is most appropriate for TA-55 (Figure C.1.5-1) (LANL 2025c). As the official reporting station, weather data presented in annual site-wide environmental reports are consistent with measured data at TA-06. Extreme precipitation years, since 2000, with annual precipitation values as low as 10 inches were in 2003 and 2012. The highest precipitation year was 2015 (nearly 23 inches). The maximum daily air temperature recorded at the TA-06 tower was 97°F in July 2020. The minimum daily air temperatures dip below 0°F; the lowest temperatures were measured in February 2011. Maximum wind gusts recorded at the TA-06 tower range from nearly 68 to 80 miles per hour (mph) (LANL 2025e).

Wind patterns play a crucial role in assessing air quality and pollutant dispersion in the Los Alamos County area. Daytime winds are characterized by up-slope airflow that develops in the morning and transitions to prevailing south winds by noon, which enhances pollutant dispersion. In contrast, nighttime conditions are dominated by cold air drainage from the surrounding mountains, resulting in predominantly weak drainage winds that may hinder the dispersion of pollutants.

Light winds and stable atmospheric conditions can lead to the formation of surface inversions, particularly during autumn and winter. These inversions restrict the dispersion of air pollutants and can trap them near the surface, potentially exacerbating air quality issues. Observations at LANL indicate that daytime winds primarily originate from the south and southwest, while nighttime winds come from the west and northwest. Figure C-1.5-2 illustrates 2023 wind roses based on 15-minute average wind observations at four mesa-top stations (TA-06, -49, -53, and -54). They show the percentage of time that wind blows from each of 16 cardinal compass point directions and the distribution of wind speed for each direction.



**Figure C.1.5-1 Locations of Nine LANL Meteorological Monitoring Stations**

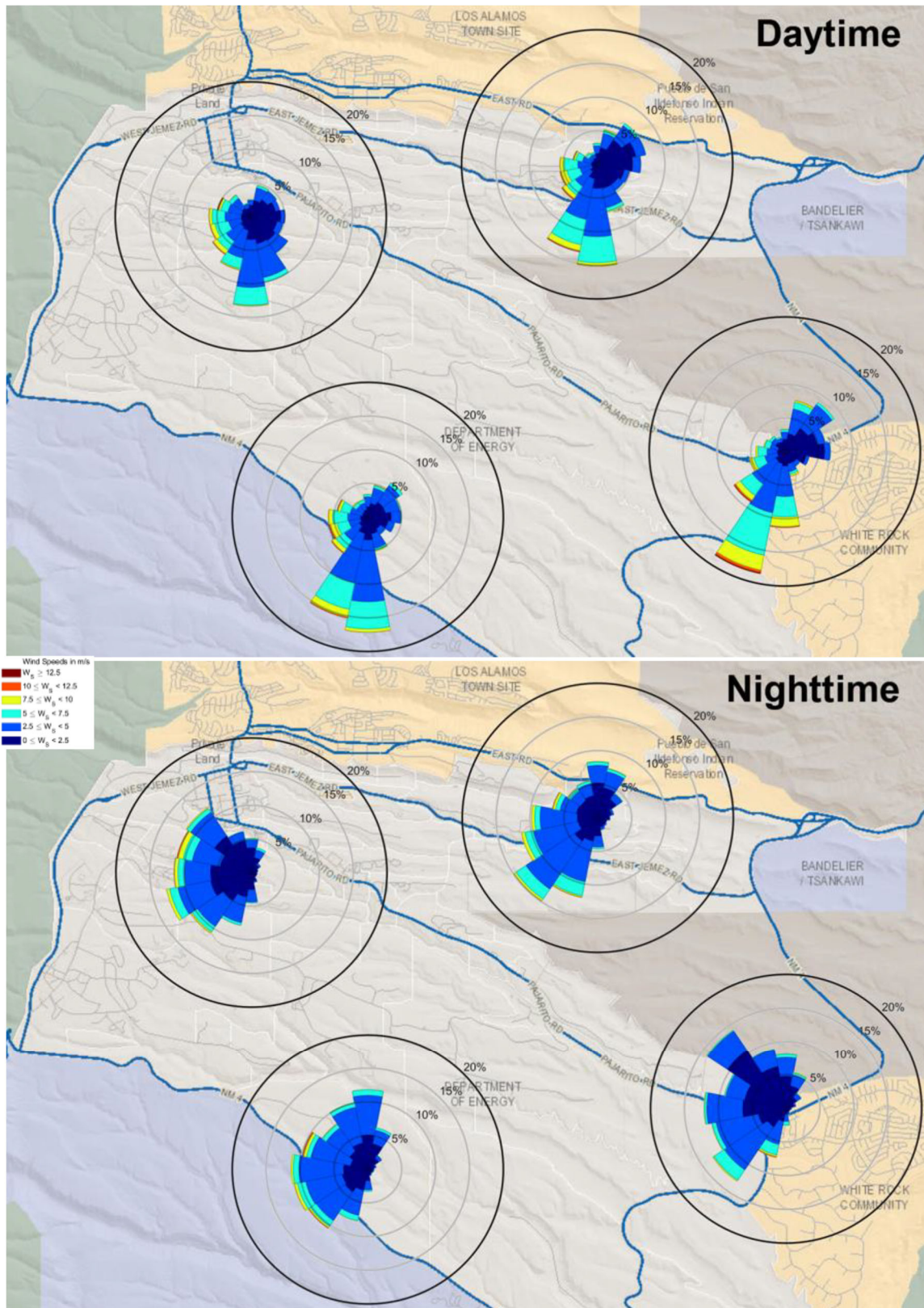


Figure C.1.5-2 Wind Roses for 2023 at Four Mesa-Top Meteorological Towers

Severe weather events that can cause destructive effects in Los Alamos County include thunderstorms, tornadoes, and hail. No tornado activity has been reported in Los Alamos County since 1883 (NWS 2023). Thunderstorms, particularly in the summer, often bring lightning, with LANL experiencing a high local lightning density of approximately 15 strikes per square mile, one of the highest densities in the U.S. Afternoon thunderstorms form as moist air from the Gulf of California and the Gulf of Mexico is convectively or orographically lifted by the Jemez Mountains. The thunderstorms yield short, heavy downpours and abundant lightning.

Additionally, less severe weather conditions can lead to destructive outcomes when combined. The National Weather Service Issues Red Flag Warnings during periods of warm temperatures, low humidity, and strong winds, which create conditions that increase the risk of wildland fires (LANL 2025c).

### C.1.5.2 Air Quality

Air quality describes the level of contaminants in the air. Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, and/or harming human or animal health. The *Clean Air Act* (CAA; 42 U.S.C. §7401 et seq.), as amended, is the basis for most federal air pollution control programs.

**Ambient Air Quality Standards.** The EPA Region 6 and NMED regulate air quality in New Mexico. New Mexico has adopted many of the EPA established primary and secondary National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) in compliance with the CAA. These federal standards set limits for key pollutants such as ozone (O<sub>3</sub>), particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), and lead (Pb). Short-term NAAQS (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term NAAQS (annual averages) have been established for pollutants contributing to chronic health effects. NAAQS define criteria for six pollutants: particulate matter (measured as both particulate matter less than 10 microns in diameter [PM<sub>10</sub>] and particulate matter less than 2.5 microns in diameter [PM<sub>2.5</sub>]), sulfur dioxide, carbon monoxide, nitrogen dioxide (presented as nitrogen oxides), ozone, and lead. NMED has established state-level standards for sulfur compounds, carbon monoxide, nitrogen dioxide and adopted the NAAQS for the remaining pollutants (NMAC 2025). Table C.1.5-1 lists the criteria pollutant standards.

Federal regulations designate regions in violation of the NAAQS as nonattainment areas and regions with levels less than the NAAQS as attainment areas. The EPA's General Conformity Rule ensures that federal actions do not cause new violations of the CAA in nonattainment areas.

**Nonradiological Air Quality.** Emissions of criteria and hazardous air pollutants (HAPs) from activities at LANL are regulated under the Title V Operating Permit (Permit No. P100-R2M5, revised October 2, 2023), issued by the NMED Air Quality Bureau. This permit establishes federally enforceable emission limits, operational requirements, and reporting obligations for all regulated sources at LANL, including limits on visible emissions (LANL 2024d). Notably, stationary standby generators were removed from the Title V permit starting with Revision P100-R2 and are no longer included as permitted emission sources. This permit framework ensures LANL's air emissions remain within regulatory limits to protect regional air quality (LANL 2024b).

Table C.1.5-1 Air Quality Criteria Pollutant Standards

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon monoxide		Primary	8-hour	8.7 ppm <sup>a</sup>	Maximum allowable
			1-hour	13.1 ppm <sup>a</sup>	
Lead		Primary and Secondary	Rolling 3- month average	0.15 µg/m <sup>3</sup>	Not to be exceeded
Nitrogen dioxide		Primary	24-hour	0.10 ppm <sup>a</sup>	Maximum allowable 24-hour average
		Primary and Secondary	Annual	0.05 ppm <sup>a</sup>	Maximum allowable annual arithmetic average
Ozone		Primary and Secondary	8-hour	0.070 ppm	Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years
Particulate matter	(PM <sub>2.5</sub> )	Primary	Annual	9 µg/m <sup>3</sup>	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m <sup>3</sup>	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 µg/m <sup>3</sup>	98 <sup>th</sup> percentile, averaged over 3 years
	(PM <sub>10</sub> )	Primary and Secondary	24-hour	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year on average over 3 years
Sulfur dioxide		Primary	24-hour	0.10 ppm <sup>b</sup>	99 <sup>th</sup> percentile of 1-hour daily maximum concentrations, averaged over 3 years
			Annual	0.02 ppm <sup>b</sup>	Not to be exceeded more than once per year
Hydrogen sulfide		Primary	1-hour	0.010 ppm <sup>b</sup>	Maximum allowable 1-hour average, not to be exceeded more than once per year
Total sulfur		Primary	0.5-hour	0.003 ppm <sup>b</sup>	Maximum allowable one-half hour average

µg/m<sup>3</sup> = microgram per cubic meter; PM<sub>2.5</sub> = particulate matter less than 2.5 microns in diameter; PM<sub>10</sub> = particulate matter less than 10 microns in diameter; ppm = parts per million

NOTE: National Ambient Air Quality Standards (40 CFR Part 50) unless otherwise noted.

a New Mexico Administrative Code 20.2.3.111.

b New Mexico Administrative Code 20.2.3.110.

LANL reports emissions subject to the air operating permit on an annual and semiannual basis to the NMED to document compliance with permit limits. Emissions primarily arise from combustion sources, including boilers and emergency generators, with vehicle emissions considered part of background concentrations. Emission data from LANL operations indicate fluctuations, with notable increases during specific activities such as construction and fire mitigation efforts (LANL 2019a, 2020, 2021a, 2022b, 2023, 2024b, 2025d).

The permit limits are derived from various standards. Title V Operating Permit emissions in TA-55 for criteria pollutants, HAPs, and VOCs are presented in Table C.1.5-2. Site-wide conditions are discussed in the 2026 LANL SWEIS and incorporated by reference in this PEIS.

**Table C.1.5-2 Operating Permit Emission Limits (tons per year)**

Facility	NO <sub>x</sub>	CO	VOC	SO <sub>2</sub>	PM <sup>a</sup>	HAP
Facility-wide	245	225	200	150	120 total, 120 PM <sub>10</sub> , 120 PM <sub>2.5</sub>	24 total, 8 individual
<b>Plutonium Facility (TA-55-PF4)</b>						
Machining operation	NA	NA	NA	NA	Beryllium • 0.12 gram/24 hours • 2.99 grams/year Aluminum • 0.12 gram/24 hours • 2.99 grams/year	NA
Foundry operation	NA	NA	NA	NA	Beryllium • $3.49 \times 10^{-5}$ gram/24 hours • $8.73 \times 10^{-4}$ gram/year Aluminum • $3.49 \times 10^{-5}$ gram/24 hours • $8.73 \times 10^{-4}$ gram/year	NA
<b>External Combustion</b>						
Combined annual emissions <sup>b</sup>	80	80	50	50	50 total, 50 PM <sub>10</sub>	NA
Chemical usage (TA-55-400)	NA	NA	See facility-wide emissions	NA	3.75 (included within facility-wide emissions)	NA
<b>Degreasers</b>						
TA-55-DG-1	NA	NA	See facility-wide emissions	NA	See facility-wide emissions	NA

CO = carbon monoxide; HAP = hazardous air pollutant; NA = not applicable; NO<sub>x</sub> = nitrogen oxides; PM = particulate matter; PM<sub>10</sub> = particulate matter less than 10 microns in diameter; PM<sub>2.5</sub> = particulate matter less than 2.5 microns in diameter; SO<sub>2</sub> = sulfur dioxide; TA = technical area; VOC = volatile organic compound

a Criteria pollutants are reported in tons per year unless otherwise noted. Greenhouse gas emissions are reported in metric tons.

b External combustion emissions are permitted for two facilities in TA-16, two facilities in TA-53, and six facilities in TA-55.

Source: NMED 2019

Examples of standards specific to TA-55 include:

- New Source Performance Standard for Small Industrial-Commercial-Institutional Steam Generating Units (40 CFR Part 60, Subpart Dc), which applies to two TA-55 boilers;
- National Emission Standards for Stationary Compression Ignition Reciprocating Internal Combustion Engines (40 CFR Part 60, Subpart III), which applies to generators in TA-55;

- National Emission Standards for Hazardous Air Pollutants for Beryllium (40 CFR Part 61, Subpart C), which applies to beryllium operations at TA-55;
- National Emission Standards for Hazardous Air Pollutants for Radon Emissions from DOE Facilities (40 CFR Part 61, Subpart Q);
- National Emission Standards for Hazardous Air Pollutants for Radionuclides other than Radon from DOE Facilities (40 CFR Part 61, Subpart H); and
- National Emissions Standards for Halogenated Solvent Cleaning (40 CFR Part 63, Subpart T), which applies to certain activities at TA-55 and specifies applicable controls (NMED 2019).

**Greenhouse Gases.** Greenhouse gases include water vapor, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) trap heat and regulate Earth’s temperature by absorbing infrared radiation re-emitted from the surface. These emissions, expressed as carbon dioxide equivalent (CO<sub>2</sub>e), account for the different warming potentials of each gas and contribute to the greenhouse effect, which raises temperatures in the lower atmosphere (NNSA 2026).

The 2026 LANL SWEIS (Appendix H, Section H.2) includes discussions on greenhouse gas emissions, climate policy (locally, nationally, and globally), climate change, and the relationship between extreme weather and public health (NNSA 2026).

**Radiological Air Quality.** Individuals are continuously exposed to airborne radioactive materials, primarily derived from natural resources globally, such as the short-lived decay products of radon. In addition to natural sources, artificial operations, particularly those conducted in laboratory settings, may result in the release of radioactive materials into the atmosphere. Emissions can occur from point sources, including stacks or vents, as well as from nonpoint sources, such as radioactive materials present in contaminated soils.

The two largest contributors to radioactive air emissions are typically tritium from the Weapons Engineering Tritium Facility and LANSCE. For the period 2017–2023, the radioactive air emissions from monitored stacks at LANL averaged about 61 curies (Ci) of tritium, 168 Ci of gaseous mixed activation products, and trace amounts of other radionuclides (e.g., plutonium, americium, uranium). Diffuse emissions (not monitored from facility exhausts) of radioactive air emissions are also present at LANL. In most years, diffuse emissions are generally small compared with stack emissions. In 2023, diffuse emissions totaled approximately 5 Ci (LANL 2025c). Radiological air quality assessments are based on data collected from 2017 to 2023 (Table C.1.5-3). Site-wide conditions are discussed in the 2026 LANL SWEIS and incorporated by reference in this PEIS (NNSA 2026).

**Table C.1.5-3 Range of Annual Radiological Emissions (tons per year), 2017–2023**

Technical Area/ Building Number	Tritium	Americium-241	Plutonium	Uranium	Thorium	Particulate Matter plus Vapor Activation Products	Gaseous Mixed Activation Products
Facility-Wide	1–82	2.8×10 <sup>-8</sup> to 8.9×10 <sup>-6</sup>	2.9×10 <sup>-11</sup> to 1.9×10 <sup>-5</sup>	3.8×10 <sup>-10</sup> to 5.2×10 <sup>-6</sup>	2.4×10 <sup>-10</sup> to 6.1×10 <sup>-7</sup>	2.1×10 <sup>-8</sup> to 8.6×10 <sup>-1</sup>	6–251
TA-55	0.0–13	ND	3.0×10 <sup>-10</sup> to 1.5×10 <sup>-6</sup>	1.8×10 <sup>-8</sup> to 2.2×10 <sup>-7</sup>	7.1×10 <sup>-9</sup> to 4.5×10 <sup>-8</sup>	8.9×10 <sup>-8</sup> to 1.5×10 <sup>-4</sup>	ND

ND = no data; TA = technical area

Source: LANL 2019a, 2020, 2021a, 2022b, 2023, 2024b, 2025d

### C.1.5.3 Visibility

Visibility is defined as the degree to which an individual can observe a scene quantified using the deciview metric, a unitless measure of haze that is proportional to the logarithm of light extinction (IMPROVE 2022). The CAA established a national visibility goal aimed at preventing future impairments and remedying existing visibility issues to protect air quality and scenic views in national parks and national wilderness areas. Visibility at the Bandelier National Monument has been monitored since 1988, revealing average visibility ranges from 79 to 113 miles between 1993 and 2002. Recent data indicates a trend of improved visibility at the monument since 2000 (IMPROVE 2022).

### C.1.6 Noise

Noise is unwanted sound that can disrupt activities, degrade environmental quality, or cause discomfort and hearing loss. Human perception of noise varies based on distance, terrain, atmospheric conditions, and barriers. Sensitive receptors include residences, schools, hospitals, wilderness areas, and endangered wildlife. The closest sensitive receptors are about 1,000 meters (0.62 mile) from TA-55. These residences are in the Elk Ridge mobile home community. Other sensitive receptors are more than a mile from TA-55.

Existing noise levels at LANL arise from various sources, including onsite transport, HE tests, and firearms practice (NNSA 2026). Air blasts, which accompany explosive detonations, are audible to both workers and the public. These blasts consist of high-frequency air pressure waves, while lower-frequency waves may create secondary noises within testing structures. Most noise and vibrations at LANL result from aboveground explosives research that does not occur in TA-55. Noise outside of TA-55 controlled facilities is limited to commuter traffic and waste transport operations as described in the 2026 LANL SWEIS (NNSA 2026).

### C.1.7 Biological Resources

This section discusses biological resources by habitat type (terrestrial and aquatic/wetland) and status (threatened, endangered or other special designation).

#### C.1.7.1 Terrestrial Resources

The LANL ROI includes five vegetation zones. These vegetation zones include oneseed juniper (*Juniperus monosperma*) savannas; pinyon pine (*Pinus edulis*)-juniper woodlands; grasslands; Ponderosa pine (*Pinus ponderosa*) forests; and mixed-conifer forests (Douglas fir [*Pseudotsuga menziesii*], ponderosa pine, and white fir [*Abies concolor*]) (LANL 2022d). This general classification does not reflect the complexity of the vegetation communities present within LANL created by the effects of topography, past human disturbances, wildland fires, and climate. Hansen et al. published an updated classification which reflects effects of local topography and changes in vegetation since 2003 from factors such as widespread tree mortality from bark beetle outbreaks and drought, wildland fire, and human activity (Hansen et al. 2019).

The classification of vegetation cover types based on dominant species and physiognomy (e.g., growth form, density, and canopy cover) represents important differences in potential habitat suitability for wildlife species. The five most abundant cover types on the LANL site, in order of decreasing area, are dense juniper woodland (27.9 percent), ponderosa pine woodland (14.5 percent), sparse juniper woodland (14.5 percent), mixed-conifer (10.1 percent), and developed areas (6.1 percent). These cover types account for 73.1 percent of the land cover. Juniper woodland (both dense and sparse stands) is the dominant vegetation cover on the LANL site, comprising

about 42.4 percent of the land area. Juniper woodland occurs primarily at lower elevations and extends from the eastern boundary along the Rio Grande to about 7,500 feet in elevation into the central part of LANL. Ponderosa pine woodland is the dominant land cover on the western part of LANL extending from about 6,200 feet in elevation to about 8,500 feet. Mixed-conifer vegetation found along north-facing canyon slopes, which have cooler and moister microclimates, consists of ponderosa pine and other conifer species such as Douglas fir, limber pine, and white fir, which typically occur at higher elevations. Developed areas include buildings, structures, parking lots, and cleared areas. Each of the remaining vegetation cover types comprise less than 5 percent of the land cover and together comprise 26.9 percent of the site. Some of the vegetation cover types are a result of vegetation recovery from the 2000 Cerro Grande and 2011 Las Conchas wildland fires, effects of insect outbreaks, and tree mortality from drought. Between 2002 and 2005, more than 90 percent of the mature piñon trees in the Los Alamos area died from a combination of drought stress and bark beetle infestation (Breshears et al. 2005).

Pit production at LANL occurs in PF-4, located in TA-55, which encompasses about 40 acres. Most of TA-55 is situated inside the perimeter intrusion detection and assessment system and is highly developed (DOE 2008). Vegetation in TA-55 is limited to small areas of mowed grass and shrubs.

The diversity of vegetation, topographic features, and range of elevations on the LANL site provides habitat for a diversity of wildlife. Large mammals include elk and mule deer that are either year-round residents or winter migrants from higher elevations, especially in years of higher snowfall (Bennett et al. 2014). Studies have documented large game movement corridors across LANL and onto Pueblo de San Ildefonso at lower elevations east of LANL, especially during the fall, spring, and winter months (Bennett et al. 2014; Abeyta and Hathcock 2020). Large-mammal vehicle collisions have occurred on LANL (Bennett et al. 2014; Gadek et al. 2023). Bighorn sheep may occur along the Rio Grande on cliffs and open areas above White Rock Canyon. The presence of feral cattle (*Bos taurus*) on LANL property has been documented in White Rock Canyon in TA-33 and TA-70 (Sanchez 2021). Based on photographic evidence, the cattle have damaged areas of the riparian zone that may provide habitat for the federally listed southwestern willow flycatcher (*Empidonax traillii extimus*) and the yellow-billed cuckoo (*Coccyzus americanus*).

Mammalian carnivores are represented by black bears (*Ursus americanus*), mountain lions (*Puma concolor*), coyotes (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), and a variety of smaller carnivore species such as skunks, weasels, raccoons, ringtails, and badgers. Approximately 15 species of bats have been documented. Cottontail rabbits (*Sylvilagus* spp.) and a wide variety of smaller mammalian species, primarily rodents, occur throughout LANL and vary in occurrence and abundance according to habitat preferences and requirements. Smaller mammalian species represent the major component in the prey base that supports larger mammalian and avian predators. TA-55 is highly developed and does not support habitat that attracts a wide variety of wildlife.

### **C.1.7.2 Aquatic Resources**

Aquatic resources include the aquatic environment and the plants and animals that inhabit it for all or part of its lifecycle.

Wetlands on the LANL site are associated with canyon stream channels that cross the site from west to east. The majority (73 percent) of wetlands are less than 0.3 acre. The largest wetlands are in Pajarito Canyon (8.3 acres). Dominant wetland plants include reed canary grass (*Phalaris*

*arundinacea*), narrow-leaf cattail (*Typha angustifolia*), coyote willow (*Salix exigua*), Baltic rush (*Juncus balticus*), wooly sedge (*Carex lanuginose*), American speedwell (*Veronica americana*), common spike rush (*Eleocharis macrostachya*), and curly dock (*Rumex crispus*) (USACE 2005). Wetlands within the LANL ROI provide habitat for reptiles, amphibians, and invertebrates, and contribute to the overall habitat requirements of a number of species. In September 2013, the Pueblo Canyon wetlands were severely eroded during an unusually large monsoon rainfall and flooding event (LANL 2014). Restoration efforts were designed to stabilize erosion and encourage deposition of sediment by installing water control structures and replanting native floodplain and wetland vegetation (Hathcock 2014). Most of the land that formerly comprised TA-74, including the Pueblo Canyon wetlands (11.9 acres), have been conveyed to Los Alamos County (LANL 2022d).

Approximately 22 acres of wetlands occur within LANL boundaries. Wetlands on the LANL site are associated with canyon stream channels that cross the site from west to east (NNSA 2026). The majority of the wetland acreage (16 acres) is located within the NEEWC Planning Area, with most occurring in Pajarito Canyon (LANL 2022d). The NEEWC covers much of the southern part of LANL. The Core Planning Area contains about 3 acres of wetlands, nearly all within Sandia Canyon. The Balance of Site and LANSCE Planning Area contain about 0.27 and 0.01 acre of wetlands, respectively. The Pajarito Corridor Planning Area, where TA-55 is located, contains 2.4 acres of wetlands, all associated with Mortandad Canyon. While there are no wetlands within the boundaries of TA-55, wetlands do exist along the fenceline on the northern edge of the mesa (NNSA 2026; LANL 2025f). The wetlands cover approximately 0.13 acre.

Aquatic resources on LANL property are limited. The Rio Grande and Rito de los Frijoles in Bandelier National Monument are the only truly perennial streams in the immediate vicinity. The canyons crossing the Pajarito Plateau through LANL drain the Jemez Mountain watersheds to the Rio Grande. Some of the canyon floors contain reaches of perennial surface water, such as the streams draining LANL property from lower Pajarito and Ancho canyons to the Rio Grande. No fish species have been found within LANL boundaries (NNSA 2026). TA-55 is a developed area that contains no aquatic resources or species.

### **C.1.7.3 Threatened, Endangered, or Other Special Designation**

#### **Threatened and Endangered Species**

Sensitive species is a general term often used to refer to species recognized by federal and state natural resources management agencies as species that may be vulnerable to future declines in population status. Terms used for sensitive species may include “threatened and endangered,” “conservation concern,” “sensitive,” and “species of concern.” Sensitive species may not be directly protected by federal or state statutes but may be considered “at-risk” for future protection under the Endangered Species Act (ESA). Species “at-risk” that have the potential to be listed under the ESA may have future impacts on development and operations at LANL because of their federal protections (Ditmanson and Sanchez 2022). It is important to manage “at-risk” species that occur on LANL property to reduce future risk to the mission and promote conservation of declining species. The species considered “sensitive” at LANL are defined in the *Sensitive Species Best Management Practices Source Document* (Berryhill et al. 2020). DOE coordinates with the New Mexico Department of Game and Fish and the U.S. Fish and Wildlife Service (USFWS) to locate and conserve protected and at-risk species.

The Habitat Management Plan (HMP) provides a strategy for compliance with the ESA through site plans for the management of each threatened and endangered species that occurs or has a high probability of occurring on the LANL site. Site plans have been prepared for three federally listed threatened and endangered species that could potentially occur on LANL: Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher, and Jemez Mountains salamander (*Plethodon neomexicanus*) (LANL 2022d).

Suitable habitat for each threatened and endangered species has been designated as a geographic Area of Environmental Interest (AEI). Each AEI consists of core habitat that provides protected areas essential to the persistence of the species including breeding and foraging habitat and areas with necessary microclimatic conditions. A buffer area surrounds the core habitat to protect it from disturbance and habitat degradation. Figure C.1.7-1 shows that TA-55 overlaps with the AEI buffer zone for the Mexican spotted owl (NNSA 2026). The AEIs for southwestern willow flycatcher and Jemez Mountains salamander do not overlap with TA-55. Graphical representation of the other AEIs can be found in Section A.3.5 of the 2026 LANL SWEIS (NNSA 2026).

The USFWS Information for Planning and Consultation tool identified the Suckley's cuckoo bumble bee (*Bombus suckleyi*) and monarch butterfly (*Danaus plexippus*) as potentially overlapping with the TA-55 ROI. Suckley's cuckoo bumble bee was proposed as endangered in December 2024 (89 FR 102074). There is, however, significant uncertainty about the range of Suckley's cuckoo bumble bee and there have been no known sightings in New Mexico through 2022 (USFWS 2024a). TA-55 is highly developed and likely does not have the habitat required for Suckley's cuckoo bumble bee.

The monarch butterfly was proposed as threatened in December 2024 (89 FR 100662). Monarch butterflies are present on LANL and breed from July to October. Monitoring for monarch eggs and caterpillars on milkweed plants has been ongoing since 2018. The presence of monarch butterflies or milkweed plants within TA-55 have not been documented. Monarch caterpillars feed exclusively on milkweed (*Asclepias* spp.). The primary threats to monarchs are milkweed removal and roadside mowing during the breeding season.

Three species that could potentially occur in the surrounding region do not have associated site plans. The black-footed ferret (*Mustela nigripes*) is federally listed as endangered; however, no sightings of black-footed ferrets have been reported in Los Alamos County for more than 90 years. In addition, no large prairie dog towns—prime habitat for black-footed ferrets—have been observed at LANL; therefore, there is no site plan for this species. The USFWS listed the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) as endangered (79 FR 33119, June 10, 2014) and the western distinct population segment of the yellow-billed cuckoo as threatened (79 FR 59992, October 3, 2014) in 2014. Neither species requires a site plan because neither has suitable habitat on LANL property. In 2022, surveys were conducted for the yellow-billed cuckoo along the Rio Grande in potential habitat. The first cuckoo at LANL was detected during a single survey, but it was determined to be using the habitat as stopover habitat during migration (LANL 2024b). No other detections occurred during subsequent surveys. Site plans would be prepared in the future if LANL activities could potentially affect these species (LANL 2022d).

More detailed descriptions of threatened and endangered species management on the LANL site and information on the status of each species can be found in the LANL HMP and the LANL SWEIS (LANL 2022d; NNSA 2026). The following paragraphs provide a brief summary of the current status of the three threatened and endangered species that could potentially occur on the

LANL site. Developed areas occur in the core and/or buffer of all AEIs; however, developed areas do not constitute suitable habitat for federally listed species (LANL 2022d). Current ongoing activities in developed areas constitute a baseline condition for the AEIs and are not restricted.

**Mexican Spotted Owl.** The Mexican spotted owl, listed as threatened, is found in northern Arizona, southeastern Utah, and southwestern Colorado south through New Mexico, west Texas, and into Mexico. The Mexican spotted owl inhabits mixed-conifer, ponderosa pine, and Gambel's oak (*Quercus gambelli*) forests in mountains and canyons. Characteristics of Mexican spotted owl habitat include high canopy closure, high stand diversity, multilayered canopy resulting from an uneven-aged stand, large mature trees, downed logs, snags, and stand decadence as indicated by the presence of mistletoe. Mexican spotted owls in the Jemez Mountains prefer cliff faces in canyons for their nest sites (Johnson and Johnson 1985, as cited in LANL 2022d). The AEIs for the Mexican spotted owl on the LANL site consist of the core habitat area, which is defined as suitable canyon habitat from rim to rim and extending 330 feet out from the canyon rim. The buffer area extends 1,300 feet beyond the core habitat. The core canyon habitat typically is canyon cliffs, mixed-conifer forest on the north-facing canyon slopes, and ponderosa pine woodland/juniper woodland on drier, south-facing slopes with dense or sparse juniper woodland on upland sites. Five Mexican spotted owl AEIs have been mapped on the LANL property centered on the Cañon de Valle, Water, Pajarito, Los Alamos, Sandia, Mortandad, and Three-mile canyons on the western side of LANL (Figure C.1.7-1). The area of suitable breeding habitat to ensure reproductive success for a pair of owls varies by vegetation composition and type and ranges from 500 to 1,350 acres (Ganey et al. 1999, 2005; Willey and van Riper 2007). The diet of Mexican spotted owls that nest in canyons consists primarily of woodrats (*Neotoma spp.*) and deer mice (*Peromyscus spp.*), with fewer numbers of rabbits, birds, reptiles, and arthropods (Willey 2013).

Surveys for breeding Mexican spotted owls have been conducted at LANL since 1994 (Thompson et al. 2021). A nesting territory in Cañon de Valle was occupied from 1995 through 2011 with young fledged in multiple years. Mexican spotted owls have consistently occupied nesting territories and fledged young in multiple years in Three-mile Canyon since 2007 and in the Mortandad Canyon since 2013 (Thompson et al. 2021).

**Southwestern Willow Flycatcher.** The southwestern willow flycatcher is one of four subspecies of the willow flycatcher and is listed as endangered. The historic range of the southwestern willow flycatcher included Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Currently, this flycatcher breeds in riparian habitats from southern California to Arizona and New Mexico, as well as southern Colorado, Utah, Nevada, and far western Texas (LANL 2022d). Southwestern willow flycatchers are present in New Mexico from early May through mid-September and breed from late May through late July (USFWS 2002; Yong and Finch 1997). In winter, this species is found in southern Mexico, Central America, and northern South America (USFWS 2002).

The southwestern willow flycatcher nests only along rivers, streams, and other wetlands. It is found in close association with dense stands of willows (*Salix spp.*), arrowweed (*Pluchea spp.*), buttonbush (*Cephalanthus spp.*), tamarisk (*Tamarix spp.*), Russian olive (*Eleagnus angustifolia*), and other riparian vegetation, often with a scattered overstory of cottonwood (*Populus spp.*) (USFWS 2002). The size of vegetation patches used by southwestern willow flycatchers varies and ranges from as small as 1.9 acres to several hundred acres (Hatten and Paradzick 2003). The southwestern willow flycatcher nests in thickets of trees and shrubs approximately 6–49 feet tall, with a high percentage of canopy cover and dense foliage 0–13 feet above ground. Regardless of

the plant species composition or height, occupied sites always have dense vegetation in the patch interior (Allison et al. 2003; USFWS 2002).

One AEI for the southwestern willow flycatcher has been identified on the LANL site, composed of two core areas, both in Pajarito Canyon. The AEI core areas are located on the east side of LANL adjacent to Pajarito Road and NM-4. The buffer area surrounding the AEI core areas extends 330 feet out from Core Area habitat, typically dense willows. Both AEI core areas are in TA-36 in the NEEWC Planning Area. There are no AEIs for the southwestern willow flycatcher in TA-55. Surveys conducted by LANL biologists have not detected any southwestern willow flycatchers. Willow flycatchers of unknown subspecies have been caught during bird-banding operations since 2010 in the Pajarito and Sandia wetlands (Thompson et al. 2021).

**Jemez Mountains Salamander.** Jemez Mountains salamanders were listed as endangered in 2013 (78 FR 55600, September 10, 2013). The Jemez Mountains salamander is an amphibian endemic to the Jemez Mountains of north-central New Mexico. It is found in Los Alamos, Rio Arriba, and Sandoval counties, and occurs at elevations between 6,988 and 11,254 feet in mixed-conifer forests with greater than 50-percent canopy cover (LANL 2022d). The ground-surface habitat typically has moderate-to-high volumes of large fallen trees (greater than 10 inches in diameter) and other woody debris in varying stages of decay and other structural features, such as rocks, bark, and moss mats, that provide food and cover. The salamander spends most of its time underground, using spaces provided by rocks with fractures or loose rocky soils, rotted tree root channels, or burrows of rodents or large invertebrates (78 FR 9876; February 12, 2013). The Jemez Mountains salamander is completely terrestrial and does not use surface water for any life stage.

The AEIs for the Jemez Mountains salamander consist of sections of north-facing canyon slopes on the western half of LANL where suitable levels of mixed-conifer cover occurs. The core habitat areas have been grouped by canyon systems into AEIs (LANL 2022d). The AEIs contain contiguous and noncontiguous habitat areas. The buffer is 300 feet, extending from the edge of the core habitat. The largest AEI for the Jemez Mountain salamander occurs in Los Alamos Canyon north of the Core Area Planning Area and in part of the Balance of Site Planning Area. It includes TA-43, the very north edge of TA-3, and TA-62. The Two-Mile Canyon AEI is located south and west of the Core Area Planning Area mostly in the Balance of Site Planning Area. The AEI consists of two noncontiguous areas. The Pajarito Canyon AEI for the Jemez Mountains salamander includes four noncontiguous blocks of habitat, all in the NEEWC Planning Area. The Cañon de Valle AEI consists of one block of core habitat, also in the NEEWC Planning Area. A fifth AEI is mapped on the Fenton Hill site (TA-57), 22 miles west of the main LANL site in the Jemez Mountains. There are no AEIs for the Jemez Mountains salamander in TA-55.

Jemez Mountains salamanders are difficult to detect because much of their life is spent underground. Because Jemez Mountains salamanders have been found on LANL, the Laboratory assumes that the AEIs are occupied. However, occupancy surveys are not conducted on a yearly basis unless the site has received sufficient moisture to warrant a survey. The only positive surveys on LANL property have occurred in Los Alamos Canyon in 1985, 2008, and 2015 (Thompson et al. 2021). In 2016, one salamander was found within a planned access route for a paleoseismic trenching study west of LANL on USFS land. The most recent survey on LANL in 2023 was negative.

### **Migratory Birds**

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA), which generally covers the native migratory birds in the U.S. except for some game species that are managed by states. Under the MBTA, it is unlawful by any means or manner to pursue, hunt, take, capture, or kill any migratory bird including any part, nest, or egg of any migratory bird except as permitted per USFWS regulation. LANL manages migratory birds through the *Migratory Bird Management Plan for Los Alamos National Laboratory* (Gadek et al. 2024).

Laboratory biologists have conducted seasonal (breeding and winter) surveys to monitor patterns and trends in resident and migratory bird abundance (Hathcock and Keller 2012; Stanek et al. 2020a; Gadek et al. 2024). Seventy-six bird species were detected during summer (breeding) surveys in four habitat types: mixed-conifer forest, ponderosa pine forest, pinyon-juniper woodland, and riparian/wetland (Hathcock and Keller 2012). Laboratory biologists also participate in an international bird-monitoring program called Monitoring Avian Productivity and Survivorship protocol (Stanek et al. 2020b; Gadek et al. 2024). From 2014 to present day, biologists have captured and banded birds in the Sandia wetlands in TA-60 and TA-61 under this protocol. Fall migration of birds has been monitored through a similar capture and release banding program in the Pajarito wetlands since 2010 (Hathcock et al. 2013; Stanek and Hathcock 2019). Fall banding is typically conducted from August through October.

### **Bald and Golden Eagles**

Bald and golden eagles are currently protected under both the MBTA and the *Bald and Golden Eagle Protection Act* (BGEPA). Migratory eagles are known to occur at LANL during the winter (November 1–March 31), most commonly along the Rio Grande. Golden eagles are not known to nest on LANL but occur regionally in New Mexico. Golden eagles nest on cliffs or large trees in open woodland and typically avoid developed areas such as TA-55 (USFWS 2011).

### **Sensitive or At-Risk Species**

Species classified as sensitive typically are not protected by laws or regulations, although some may be recognized as threatened or endangered under state law. Sensitive species may be on a trajectory to be listed under the ESA in the future. Threatened and endangered species present an uncertainty to LANL because of the potential constraints that a listing action may have on operations and future development. Further discussion on this topic can be found in the 2026 LANL SWEIS, Section 4.6.4.4.

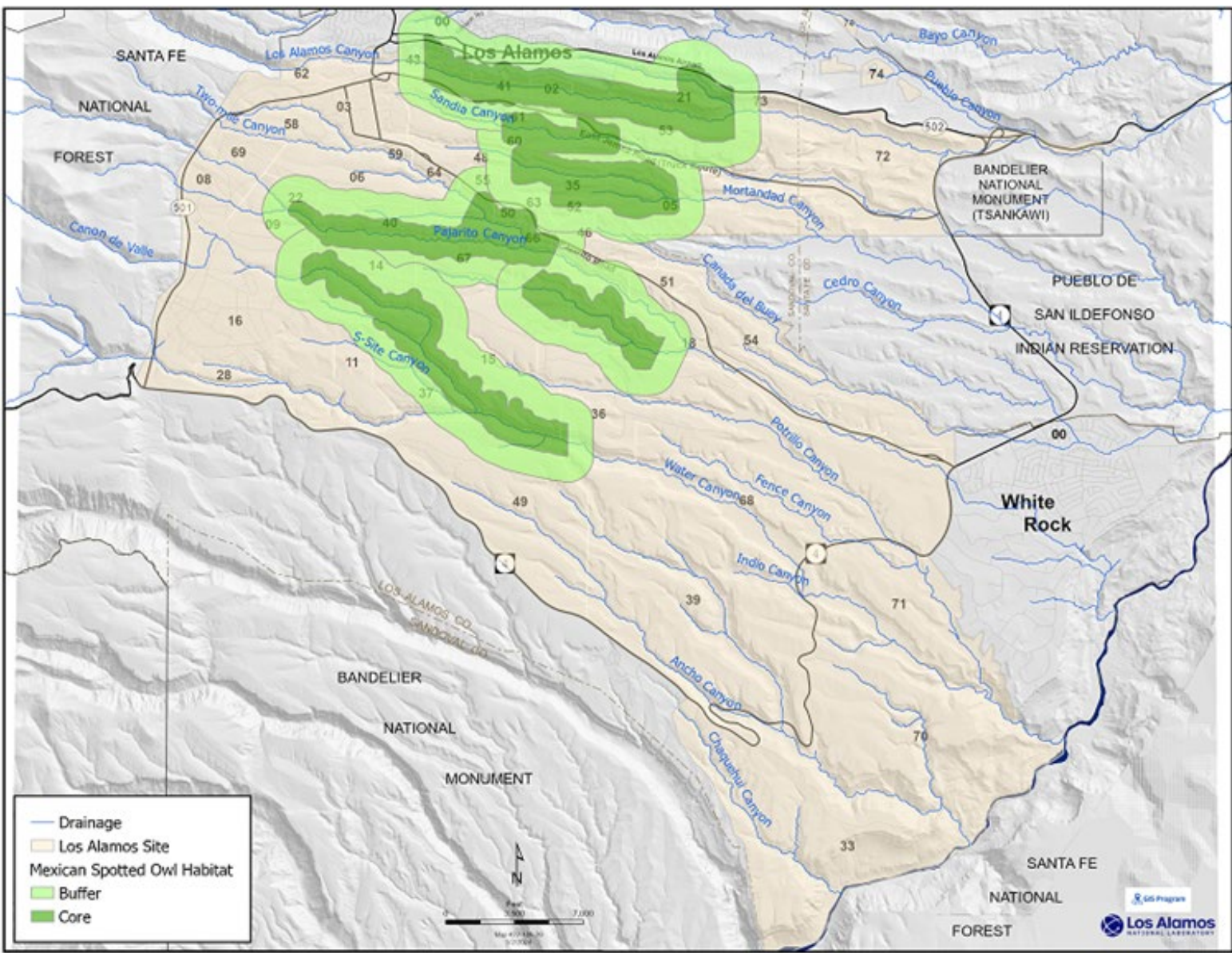


Figure C.1.7-1 Mexican Spotted Owl Habitat and Buffer Zone

### C.1.8 Cultural and Paleontological Resources

Cultural resources are physical manifestations of culture, specifically archaeological sites, architectural properties, ethnographic resources, and other historical resources relating to human activities, society, and cultural institutions that define communities and link them to their surroundings. These resources reflect human culture and history within the physical landscape, including precontact and historic archaeological sites, buildings, structures, objects, and places that are important to culture or community. Cultural resources also include locations of important historic events, areas vital for ongoing traditional cultural practices, and elements of the natural environment, such as natural features of land or biota, that play a role in traditional lifestyles and customs.

The National Historic Preservation Act (NHPA) establishes national policy for protecting significant cultural resources that are defined as “historic properties.” The term “historic property” refers to any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places (NRHP) (36 CFR 800.16).

Paleontology is the study of life in past geological times and the chronology of Earth’s history. Paleontological resources consist of fossilized remains of past life forms, including the preserved remnants of plants, animals, fungi, and bacteria that have been transformed into rock. Fossils also include imprints or traces of organisms preserved in rock, such as impressions, burrows, and trackways, and are typically preserved in sedimentary rocks. Paleontological resources are fragile and nonrenewable scientific records of the life history of Earth, making them a vital part of America's natural heritage. Significant paleontological resources are critical for examining evolutionary relationships, provide insight on the development of and interaction between biological communities, establish time scales for geologic studies, and for many other scientific purposes (SVP 2010).

#### C.1.8.1 Cultural Resources Management

Cultural resources at LANL are managed in accordance with the *Amendment to the Programmatic Agreement among the U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Field Office, the New Mexico State Historic Preservation Office (SHPO) and the Advisory Council on History Preservation (ACHP) Concerning Management of the Historic Properties of Los Alamos National Laboratory, Los Alamos, New Mexico* (LANL Programmatic Agreement; LANL 2022e) and *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico (Cultural Resources Management Plan)* (CRMP; LANL 2019b). These documents address consideration and identification of cultural resources; assessment of potential effects to significant resources (historic properties); and development and implementation of measures to avoid or minimize effects or measures to mitigate effects to historic properties for undertakings at LANL. The CRMP also outlines the responsibilities and requirements for long-term management of the cultural heritage at LANL (LANL 2019b).

NNSA maintains ongoing engagement with tribes and pueblos with traditional and cultural ties to the region encompassing LANL (LANL 2022e). Consultation occurs pursuant to the LANL Programmatic Agreement and federal requirements in NHPA, *Native American Graves Protection and Repatriation Act*, and NEPA. The consultation process involves notifying tribes and pueblos of NNSA’s undertakings and supplying information on proposed actions and known cultural resources in the vicinity. NNSA is consulting with potentially affected tribes and pueblos in

accordance with Section 106 of NHPA (54 U.S.C. § 300101) alongside the development of this PEIS.

For paleontological resources, LANL follows a standard procedure whereby any previously unknown resources identified during ground-disturbing activities, all work is halted. A qualified paleontologist then evaluates the resource to determine its significance, the extent of any adverse effects, and recommends measures to avoid, minimize, or mitigate those effects.

### **C.1.8.2 Cultural Resources at LANL**

Approximately 90 percent of the LANL property has been surveyed at least once, with more than 1,900 archaeological sites identified. Archaeological sites at LANL refer to locations that contain artifacts or physical evidence of human activity. Most of the archaeological sites date prior to the arrival of Europeans in the upper Rio Grande Valley in the mid-17th century. Other sites at LANL correspond to later eras such as the Homestead, Manhattan Project, and Cold War periods, often consisting of scattered refuse and other structural remnants (NNSA 2026).

LANL has more than 450 buildings and structures associated with the Manhattan Project and the Cold War period. These built-environment resources have been evaluated for listing on the NRHP with 162 determined eligible as of December 31, 2023. LANL actively monitors and protects 52 facilities, which are part of the Manhattan Project National Historical Park and/or are considered a LANL Protected Historical Facility (formerly Candidate for Preservation), a DOE Headquarters Heritage Asset, and/or a DOE Headquarters-acknowledged Cold War Signature Facility (NNSA 2026).

The NNSA established cooperative agreements with nearby Pueblo nations, including Cochiti, Jemez, San Ildefonso, and Santa Clara, to strengthen government-to-government relations, address shared concerns, and enhance involvement with project planning and environmental assessments while safeguarding Pueblo rights and resources. In addition, these four Pueblos have Accord agreements with DOE (NNSA 2026).

### **C.1.8.3 Paleontological Resources at LANL**

The potential for paleontological resources is primarily determined by the geological formations present within a given area. These formations dictate the age, type, abundance, and spatial distribution of fossils. Additionally, the topographical characteristics of the region influence accessibility to those formations. Within the LANL boundaries, only one paleontological fossil has been documented (NNSA 2003). The specimen has been identified as a bison bone, with an estimated date range from approximately 50,000 and 100,000 years ago (Drakos et al. 2007). The fossil was recovered from the White Rock-Y area (NNSA 2008). Overall, the likelihood of encountering paleontological materials at LANL is considered low due to the near-surface stratigraphy, which is unfavorable for the preservation of plant and animal remains. The surface layers are composed of volcanic ash and pumice that were extremely hot when deposited, likely vaporizing or burning most carbon-based materials, such as bones or plant remains.

### **C.1.9 Socioeconomics**

Socioeconomics considers the attributes of human social and economic interactions of a proposed action, alternatives, and the impacts such actions may have on a ROI. Socioeconomic impacts are defined in terms of changes to the demographic and economic characteristics within the ROI. The ROI is defined based on the current residential location of LANL full-time employees and encompasses the area in which most of these workers reside and spend a portion of their wages

and salaries. The socioeconomic ROI for this PEIS includes Los Alamos, Santa Fe, Rio Arriba, Bernalillo, and Sandoval counties. Table C.1.9-1 provides the residence information for the LANL employees as of 2023 that reside within the five-county ROI. LANL-affiliated employment includes federal employees, contractor employees, and subcontractors. In 2023, the total direct LANL employment was 16,620 persons. The total number of LANL workers residing in the ROI was approximately 15,496 (LANL 2025g). Within the ROI, the largest percentage of employees reside in Los Alamos County (approximately 5,946 employees). As of December 2023, approximately 4,480 employees reside in Santa Fe County, with the remaining employees residing in the remaining counties. In 2023, direct LANL employment accounted for approximately 3.1 percent of employment in the ROI.

**Table C.1.9-1 Los Alamos National Laboratory Employees by County, 2023**

County	Number of Employees	Percent of Total Site Employment
Los Alamos	5,946	35.8
Santa Fe	4,480	27.0
Rio Arriba	2,771	16.7
Bernalillo	1,474	8.9
Sandoval	825	5.0
Other	1,124	6.8
<b>TOTALS</b>	<b>16,620</b>	<b>100.0</b>

Source: Derived from LANL 2025g

This section discusses regional economic characteristics, population and demographics, housing, and community services as compared to the state population. Data from the U.S. Census Bureau (USCB), 2019–2023 American Community Survey, and state and local government agencies, were used to describe baseline socioeconomic characteristics. Other data sources include the U.S. Bureau of Labor Statistics (BLS), U.S. Bureau of Economic Analysis (BEA), state economic development agencies, local government agencies, chamber of commerce records, and private organizations.

### **C.1.9.1 Regional Income and Economic Characteristics**

The five counties within the ROI show differences in income levels and economic health. Los Alamos County has a median household income more than twice the New Mexico state average and the highest per capita income among the five-county ROI, while Rio Arriba County has the lowest income level and the highest poverty rate. The counties of Santa Fe, Bernalillo, and Sandoval fall between this range with moderate income and poverty figures. Based on the appreciable difference in the number of currently employed people in the five-county ROI, the higher percentage of LANL employees residing in Los Alamos County is consistent with the Laboratory being the primary employer in Los Alamos County. The other counties in the five-county ROI (e.g., Santa Fe, Rio Arriba, Bernalillo, and Sandoval counties) have from 1.5 to over 30 times the number of employable residents than Los Alamos County. Table C.1.9-2 presents detailed income information for the ROI in 2023.

Between 2010 and 2023, the general labor force in the socioeconomic ROI increased by approximately 7.1 percent, rising from 486,596 to 521,067 persons. During the same period, general employment in the ROI grew by 11.9 percent, from 450,001 to 503,747 persons, while the

number of unemployed persons decreased by 51.4 percent, from 35,595 to 17,320. This reflects a significant economic recovery in the region. Correspondingly, the unemployment rate in the ROI declined from 7.3 percent in 2010 to 3.3 percent in 2023 (BLS 2025). Overall, the ROI exhibited strong labor force growth, increased employment, and significant reductions in unemployment and unemployment rates from 2010 to 2023.

**Table C.1.9-2 Income Information for the Five-County Region of Influence, 2023**

County/Area	Median Family Income	Per Capita Personal Income	Percent Below Poverty
Los Alamos	\$143,188	\$72,684	4.1
Santa Fe	\$74,689	48,908	12.2
Rio Arriba	\$53,901	30,548	19.4
Bernalillo	\$66,514	39,234	15.7
Sandoval	\$84,053	39,698	10.0
New Mexico	\$62,125	34,823	17.4

Note: Poverty thresholds are determined by the USCB annually and are dependent on the number and age of persons in the household.

Source: USCB 2023a, 2023b

New Mexico experienced similar trends, with a labor force growth from 928,862 to 968,711, employment increasing from 856,602 to 933,130, unemployment dropping from 72,260 to 35,581, and the unemployment rate decreasing from 7.8 percent to 3.7 percent over the same period. The 15,496 employees who reside in the ROI represent approximately 3.1 percent of total employment in the ROI. Table C.1.9-3 presents the employment profile for the ROI and New Mexico for 2010 and 2023.

**Table C.1.9-3 Employment Profile in the ROI and New Mexico, 2010 and 2023**

County/Area	Labor Force		Employed		Unemployed		Unemployment Rate	
	2010	2023	2010	2023	2010	2023	2010	2023
Los Alamos	9,405	13,188	9,076	12,978	329	210	3.5	1.6
Santa Fe	74,742	73,484	68,957	71,049	4,785	2,435	6.5	3.3
Rio Arriba	17,861	16,033	16,291	15,447	1,570	586	8.8	3.7
Bernalillo	324,142	343,507	300,114	331,954	24,028	11,553	7.4	3.4
Sandoval	60,446	74,855	55,563	72,319	4,883	2,536	8.1	3.4
<b>ROI TOTALS</b>	<b>486,596</b>	<b>521,067</b>	<b>450,001</b>	<b>503,747</b>	<b>35,595</b>	<b>17,320</b>	<b>7.3</b>	<b>3.3</b>
New Mexico	928,862	968,711	856,602	933,130	72,260	35,581	7.8	3.7

Source: BLS 2025

**Los Alamos County.** The median household income in Los Alamos County is \$143,188, with a per capita personal income of \$72,684. The percentage of residents below the poverty line is relatively low at 4.1 percent. Approximately 5,946 LANL employees reside in Los Alamos County, accounting for approximately 45.8 percent of 2023 employment within the county. Between 2010 and 2023, the labor force increased 40.2 percent to 13,188 persons, and the number of unemployed people decreased by 36.2 percent. The unemployment rate declined by 1.9 percentage points, from 3.5 percent to 1.6 percent over that same period.

**Santa Fe County.** The median household income is \$74,689, with a per capita personal income of \$48,908. About 12.2 percent of residents live below the poverty line. Approximately 4,480 LANL employees reside in Santa Fe County, accounting for approximately 6.5 percent of 2023 employment within the county. Between 2010 and 2023, the labor force decreased 1.7 percent to 73,484 persons, and the number of unemployed people decreased by 49.1 percent. The unemployment rate declined by 3.2 percentage points, from 6.5 percent to 3.3 percent over that same period.

**Rio Arriba County.** The median household income is \$53,901, with a per capita personal income of \$30,548. The percentage below poverty is notably higher at 19.4 percent. Approximately 2,771 LANL employees reside in Rio Arriba County, accounting for approximately 18.5 percent of 2023 employment within the county. Between 2010 and 2023, the labor force decreased 10.2 percent to 16,033 persons, and the number of unemployed people decreased by 62.7 percent. The unemployment rate declined by 5.1 percentage points, from 8.8 percent to 3.7 percent over that same period.

**Bernalillo County.** The median household income is \$66,514, with a per capita personal income of \$39,234. About 15.7 percent of residents live below the poverty line. Approximately 1,474 LANL employees reside in Bernalillo County, accounting for approximately 0.4 percent of 2023 employment within the county. Between 2010 and 2023, the labor force increased 6.0 percent to 343,507 persons, and the number of unemployed people decreased by 51.9 percent. The unemployment rate declined by 4.0 percentage points, from 7.4 percent to 3.4 percent over that same period.

**Sandoval County.** The median household income is \$84,053, with a per capita personal income of \$39,698. The poverty rate stands at 10.0 percent. Approximately 825 LANL employees reside in Sandoval County, accounting for approximately 1.1 percent of 2023 employment within the county. Between 2010 and 2023, the labor force increased 23.9 percent to 74,855 persons, and the number of unemployed people decreased by 48.1 percent. The unemployment rate declined by 4.7 percentage points, from 8.1 percent to 3.4 percent over that same period.

### **C.1.9.2 Population and Demographic Characteristics**

This section presents population and information on the population within the five-county ROI. It also includes information on federally recognized tribes and pueblos.

#### **Population**

The population within the ROI in 2023 was 1,040,609, representing steady growth since 2010 at an average annual rate of approximately 0.3 percent. This growth slightly exceeds New Mexico's overall growth rate of approximately 0.27 percent during the same period. New Mexico's population growth has generally leveled off over the past decade compared to national trends and neighboring states, with projections indicating a peak near 2.16 million around 2035 followed by a gradual decline to below 2.1 million by 2050. Similarly, the ROI's population is expected to peak around 1.08 million by 2040 before slightly declining to roughly 1.07 million by 2050 (New Mexico 2024).

Los Alamos County has the smallest population in the ROI, with 19,374 people in 2023. The county has grown slowly but steadily by 7.9 percent since 2010 and is expected to grow by 2.9 percent by 2040. In comparison, Bernalillo County is the largest with over 674,000 people but has experienced modest growth of about 1.7 percent since 2010 and is expected to grow by 3.0 percent

by 2040. Sandoval County, with about 151,500 people, has seen strong growth of 15.1 percent since 2010 and is expected to keep growing quickly by 14.1 percent through 2040. Santa Fe County, which has a similar population size to Sandoval at around 155,000 people, has grown by 7.7 percent since 2010 and is expected to grow by 2.1 percent by 2040. In contrast, Rio Arriba County, with about 40,000 residents, has had a slight drop in population of 0.2 percent since 2010 and is expected to decrease by 14.1 percent by 2040.

Overall, the ROI shows a range of growth rates, with Sandoval County experiencing strong growth, while Bernalillo, Santa Fe, and Los Alamos counties experiencing moderate growth, and Rio Arriba is experiencing a small decrease in its population.

**Table C.1.9-4 Historical and Projected Population within the Five-County ROI and New Mexico**

County	2010	2015	2020	2023	2025	2030	2035	2040	2045	2050
Los Alamos	17,950	17,939	19,419	19,374	19,164	19,501	19,753	19,941	20,793	20,545
Santa Fe	144,170	147,108	154,823	155,175	153,311	155,641	157,291	158,420	167,499	165,656
Rio Arriba	40,246	39,949	40,363	40,165	37,883	36,903	35,752	34,485	40,156	40,130
Bernalillo	662,564	673,943	676,444	674,357	688,329	693,134	694,874	694,327	683,327	681,386
Sandoval	131,561	136,638	148,834	151,538	154,322	161,141	167,281	172,862	169,575	166,753
<b>ROI TOTALS</b>	<b>996,491</b>	<b>1,015,577</b>	<b>1,039,883</b>	<b>1,040,609</b>	<b>1,053,009</b>	<b>1,066,320</b>	<b>1,074,951</b>	<b>1,080,035</b>	<b>1,081,350</b>	<b>1,074,470</b>

ROI = region of influence

Source: USCB 2010a, 2015, 2020, 2023c; New Mexico 2021, 2024

**Los Alamos County.** From 2010 to 2023, Los Alamos experienced moderate growth, with its population rising from 17,950 in 2010 to approximately 19,374 in 2023. The population is projected to slowly increase, reaching about 19,941 by 2040.

**Santa Fe County.** Santa Fe’s population grew steadily from 144,170 in 2010 to 155,175 in 2023. The population is projected to decrease to 153,311 by 2025, followed by a slow rise to approximately 158,420 by 2040.

**Rio Arriba County.** Rio Arriba has remained relatively stable, decreasing slightly from 40,246 in 2010 to 40,165 in 2023. The county’s population is projected to continue to decline to around 34,485 by 2040.

**Bernalillo County.** Bernalillo is the most populous county in the ROI and experienced modest growth from 662,564 in 2010 to 674,357 in 2023. The population is expected to increase to approximately 694,327 by 2040.

**Sandoval County.** Sandoval experienced significant growth, increasing from 131,561 people in 2010 to 151,538 in 2023. The population is expected to increase to approximately 172,862 by 2040.

### **Federally Recognized Tribes and Pueblos**

Regardless of alternatives considered in this PEIS, DOE/NNSA will continue to implement its obligations to tribal nations in accordance with DOE’s trust responsibilities to tribal nations guidance from DOE Order 144.1A, “Department of Energy (DOE) Requirements for Consultation and Engagement with Federally Recognized Indian Tribes and Alaska Native Claims Settlement Act Corporations Pursuant to DOE Policy 144.1”; Executive Order 13175, “Consultation and

Coordination with Indian Tribal Governments”; and the Accord Agreements with the Pueblo de San Ildefonso, Pueblo of Santa Clara, Pueblo de Cochiti, and Pueblo of Jemez.

DOE/NNSA’s trust responsibilities to tribal nations include:

- Consulting, to the greatest extent practicable and to the extent permitted by law, with tribal governments prior to taking actions that affect federally recognized tribal governments.
- Protecting tribal people and their resources—land, air, water, vegetation, wildlife and fisheries—from DOE actions that could harm their health, safety, or sustainability.
- Protecting “reserved” rights (such as hunting and fishing rights that were specified in treaties as retained or reserved even though the lands are not part of the reservation).
- Protecting Indian cultural and religious artifacts and sites on land now managed by DOE/NNSA, and avoiding any unnecessary interference with traditional religious practices, which includes providing appropriate access to sacred sites on DOE lands.
- Protecting the sovereignty of tribal governments.

Sixteen tribes and pueblos are within a 50-mile radius of the LANL site and include the Pueblos of San Ildefonso, Santa Clara, San Juan, Nambe, Pojoaque, Tesuque, Picuris, Taos, Jemez, Zia, Santa Ana, San Felipe, Santa Domingo, Cochiti, Sandia, and part of the Jicarilla Apache Nation.

Figure C.1.9-1 illustrates a 50-mile radius from the LANL site. This is a subset of the ROI for socioeconomics and reflects the region that could be most affected by operations at the Laboratory. These areas include portions or entireties of the counties of Bernalillo, Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos. Additionally, LANL shares a property boundary with the Pueblo de San Ildefonso—one of several sovereign federally recognized tribes with a government-to-government relationship with DOE/NNSA.

### **C.1.9.3 Housing**

Table C.1.9-5 lists the distribution of housing units in the ROI and New Mexico. As of 2023, the ROI had approximately 467,086 total housing units, with an overall occupancy rate of 92.4 percent and a vacancy rate of 7.6 percent (USCB 2023d). Vacant rental units represent about 1.6 percent of the total housing stock, while other vacant units make up approximately 5.9 percent. Vacancy rates vary by county, with Los Alamos County exhibiting the lowest vacancy rate (5.2 percent) and Rio Arriba the highest (24.0 percent) (USCB 2023d, 2023e). Despite growth in total housing units across the ROI, vacancy rates and rental availability indicate a constrained housing market in some areas, particularly in Los Alamos and Santa Fe counties, where demand pressures and limited land availability have spurred interest in higher-density and mixed-use housing developments. Overall, the ROI shows moderate housing stock growth. In comparison, New Mexico as a whole had a vacancy rate of 13.1 percent in 2023, with vacant rental units accounting for 1.8 percent of the housing stock.

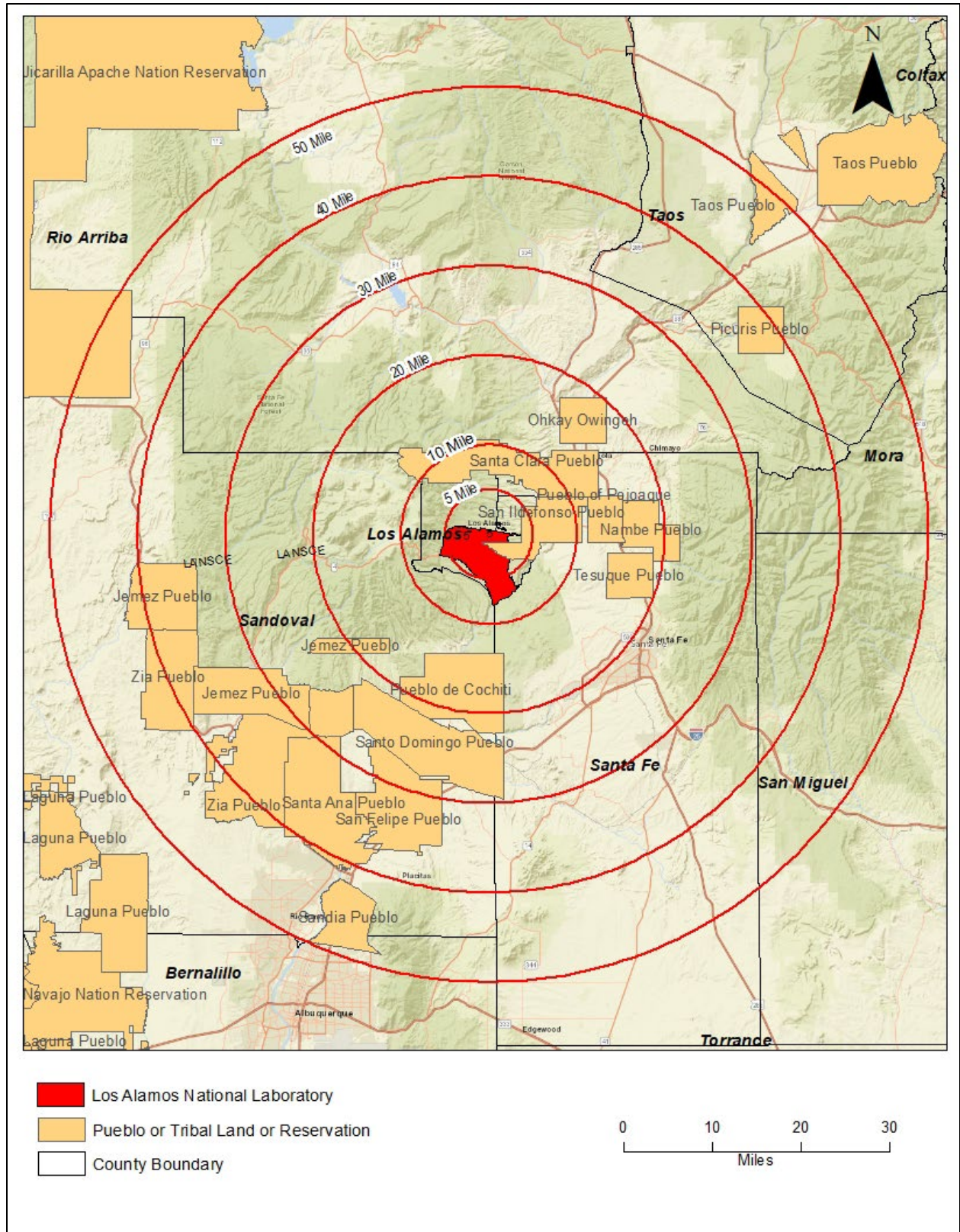


Figure C.1.9-1 Pueblos, Tribal Lands, and Reservations within 50 Miles of LANL

**Table C.1.9-5 Housing Characteristics for the Five-County Region of Influence**

County/Area	2010					2023				
	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Vacant Rental Units	All Other Vacant Units	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Vacant Rental Units	All Other Vacant Units
Los Alamos	8,397	7,566	831	283	548	8,660	8,211	449	23	426
Santa Fe	69,527	60,144	9,383	1,775	7,608	77,686	69,348	8,338	945	7,393
Rio Arriba	19,385	14,934	4,451	398	4,053	19,703	14,980	4,723	180	4,543
Bernalillo	280,435	259,165	21,270	6,523	14,747	301,278	283,609	17,669	5,604	12,065
Sandoval	50,314	44,860	5,454	726	4,728	59,759	55,741	4,018	750	3,268
<b>ROI TOTALS</b>	<b>428,058</b>	<b>386,669</b>	<b>41,389</b>	<b>9,705</b>	<b>31,684</b>	<b>467,086</b>	<b>431,889</b>	<b>35,197</b>	<b>7,502</b>	<b>27,695</b>
New Mexico	887,890	756,112	131,778	21,182	110,596	949,524	825,021	124,503	16,660	107,843

Source: USCB 2010b, 2023d, 2023e

*The Comprehensive Plan – Los Alamos County* (LAC 2016) states that based on known vacancies, including housing and vacant land, Los Alamos County could accommodate a population growth of 2,000 people within its existing development boundaries. However, the study conducted to support the comprehensive plan does not correlate the amount of housing types to demographic distribution, and housing availability and the trends in hiring within the county indicate that there is a projected shortage of some specific types of housing. The Santa Fe Association of Realtors estimates that the recent housing market for Santa Fe has been trending into an undersupply situation, as characterized by the average supply of inventory for sale of 1.9 months (SFAR 2021).

A Los Alamos Housing Program market needs analysis estimated an unmet demand of 1,312 rental units and 388 owner-occupied units (LAC 2019), with the majority of households with unmet needs being commuters who rent outside the county. Limited land for new single-family homes has prompted Los Alamos and White Rock to consider high-density, mixed-use housing developments near town centers, including transit centers servicing the LANL site. Plans include up to 363 units in White Rock and 2,591 units in Los Alamos (LAC 2019, 2021a, 2021b).

**Los Alamos County.** The Los Alamos County housing stock totaled 8,660 units as of 2023. The vacancy rate was 5.2 percent, indicating a low percentage of available housing. The total number of housing units increased by 3.1 percent between 2010 and 2023. The median value of owner-occupied homes (in 2023) in the county was \$452,500.

**Santa Fe County.** The Santa Fe County housing stock totaled 77,686 units as of 2023. The vacancy rate was 10.7 percent, indicating a low percentage of available housing. The total number of housing units increased by 11.7 percent between 2010 and 2023. The median value of owner-occupied homes (in 2023) in the county was \$416,900.

**Rio Arriba County.** The Rio Arriba County housing stock totaled 19,703 units as of 2023. The vacancy rate was 24.0 percent. The total number of housing units increased by 1.6 percent between 2010 and 2023. The median value of owner-occupied homes (in 2023) in the county was \$230,900.

**Bernalillo County.** The Bernalillo County housing stock totaled 301,278 units as of 2022. The vacancy rate was 5.9 percent, indicating a low percentage of available housing. The total number of housing units increased by 7.4 percent between 2010 and 2023. The median value of owner-occupied homes (in 2023) in the county was \$268,500.

**Sandoval County.** The Sandoval County housing stock totaled 59,759 units as of 2023. The vacancy rate was 6.7 percent, indicating a low percentage of available housing. The total number of housing units increased by 18.7 percent between 2010 and 2023. The median value of owner-occupied homes (in 2023) in the county was \$258,100.

#### C.1.9.4 Local Government Finances

LANL has a substantial impact on the economy of New Mexico. If there is a change in employment, employee incomes, or procurement at LANL, these changes would be expected to have a direct effect on city and county revenues, such as the gross receipts tax.

Table C.1.9-6 summarizes the general funds revenues for the five-county ROI. The general funds of these counties support the ongoing operations of their governments as well as community services such as police protection and parks and recreation. In Los Alamos County, the fire department serving LANL and the community is funded through a separate fund derived from DOE contract payments (shown as intergovernmental revenue in the table).

**Table C.1.9-6 General Funds Revenues for the Five-County Region of Influence**

Revenue Source	Los Alamos	Santa Fe	Rio Arriba	Bernalillo	Sandoval
Property taxes	\$8,630,254	\$59,244,749	\$7,050,640	\$153,692,764	\$32,079,197
Gross receipt taxes	\$54,308,489	\$22,416,224	\$5,932,293	\$218,730,329	\$9,761,874
Other taxes	\$1,087,128	\$2,306,487	\$9,027,777	\$6,382,103	\$5,486,492
Licenses and permits	\$359,897	\$1,333,915	\$1,267,644	\$7,365,488	\$0
Intergovernmental	\$34,684,946	\$1,128,066	\$3,666,174	\$2,637,425	\$1,480,382
Charges for services	\$1,198,105	\$1,661,037	\$388,560	\$6,837,262	\$1,135,271
Investment income	\$2,406,068	-\$751,715	\$4,008	\$8,571,234	\$1,904,935
Other revenue	\$10,723,457	\$839,648	\$22,532	\$10,015,463	\$1,416,824
<b>REVENUE TOTALS</b>	<b>\$113,398,344</b>	<b>\$88,178,411</b>	<b>\$27,359,628</b>	<b>\$414,232,068</b>	<b>\$53,264,975</b>

Source: Sandoval County 2023; Bernalillo County 2023a; LAC 2023; Rio Arriba County 2024; Santa Fe County 2023

#### C.1.9.5 Community Services

This section describes the existing capacity and demands on fire protection services, police protection services, public education, and health care within the ROI. Providers of these services in the ROI are fire and police departments, hospitals and clinics, and public school districts.

**Fire Protection.** There are 53 fire districts within the five-county ROI. The Los Alamos County Fire Department (one district) is one of the largest career fire departments in New Mexico and provides fire suppression, medical, rescue, wildland fire suppression, and fire prevention services to both LANL and the Los Alamos County community. There are five manned fire stations with 177 budgeted positions, including 166 uniformed personnel (LAC 2025a). The LANL Fire Department is operated under contract with the Los Alamos County Fire Department that provides personnel and equipment to man Fire Stations 1 and 5 on the LANL site.

Rio Arriba County has 17 fire districts, the greatest number of districts within the ROI, followed by Santa Fe County with 15 districts, Bernalillo County with 12 districts, and Sandoval County with 8 districts (Rio Arriba County 2022; Santa Fe County 2022; Sandoval County 2022; Bernalillo County 2023b).

**Police Protection Services.** Police protection in the ROI is provided by county sheriff's departments and various local police departments. There are approximately 14 police departments

within the ROI employing more than 1,800 officers (FBI 2023). Each department provides law enforcement services in conjunction with other law enforcement agencies, including the New Mexico State Police. The Los Alamos County Police Department has 39 officers, 20 authorized patrol officers including four Sergeants, and 16 detention officers (LAC 2025b).

**Medical Services.** Medical services in the ROI include 23 full-service hospitals and clinics. These facilities provide a wide array of medical services, including physical examinations; treatment of illness; emergency, intensive, and coronary care; internal medicine; x-ray and laboratory; infertility, obstetrics, and gynecology; neonatal intensive care; inpatient and outpatient surgery; pharmaceuticals; optometry; dental; respiratory therapy; and skilled nursing and long-term care.

Los Alamos Medical Center, located in Los Alamos County, is a 47-bed acute-care facility, major health care institution and provides 24-hour emergency care. Los Alamos Medical Center is the only hospital in the community. There are four medical service facilities in Santa Fe County that include the Christus St. Vincent Regional Medical Center, a 203-bed hospital that provides an array of medical services including 24-hour emergency care. Other medical facilities in Santa Fe County include the Christus St. Vincent Physicians Medical Center, the Santa Fe Indian Hospital, and the Presbyterian Santa Fe Medical Center. There are 17 hospitals in Bernalillo County, with a majority located in the vicinity of the city of Albuquerque. Albuquerque is home to University of New Mexico (UNM) Health, a 555-bed facility which operates New Mexico’s only “Level 1” Trauma Center. As a Level 1 Trauma Center, UNM Health offers 24-hour in-house coverage by trauma surgeons, along with immediate availability of specialists in various fields. This facility plays a critical role in serving Albuquerque and the wider region. Presbyterian Hospital, also located in Bernalillo County, is a 716-bed, short-term, major acute-care hospital offering a wide range of medical services, including emergency care, advanced surgical procedures, cardiology, oncology, maternity care, and specialized treatments. Other medical facilities in the vicinity of the ROI include Holy Cross Medical Center in the community of Taos. Holy Cross is a full-service hospital providing a range of medical services including emergency care, surgical services, and inpatient and outpatient care. It serves as a key healthcare provider for Española and the surrounding northern New Mexico communities. In addition to offsite medical facilities, LANL has an onsite medical facility that is available to all Laboratory workers and provides comprehensive services and programs to promote worker physical and mental wellness (AHD 2022).

**School Services.** New Mexico is divided into 153 school districts, 57 of which are within the ROI. For the 2023/2024 school year, total public school enrollment in the ROI was 136,343 students. Total students within the ROI make up approximately 43.8 percent of the state student population. Bernalillo County has the greatest number of schools (205) and the largest student population (87,385), and Los Alamos County has the least number of schools (8) and smallest student population (3,729) within the ROI. The ROI has an average student-to-teacher ratio of 14 to 1. Table C.1.9-7 summarizes school enrollment in the ROI.

### **C.1.10 Traffic and Transportation**

This section presents the primary transportation modes and routes used to transport Laboratory-affiliated employees, commercial shipments, and hazardous and radioactive material shipments. It also includes information regarding transportation packaging, transportation accidents, onsite/offsite traffic volumes, and a description of the Laboratory’s transportation infrastructure, including its onsite parking and roadway configurations.

**Table C.1.9-7 School Enrollment for the Five-County Region of Influence, 2023/2024  
School Year**

County/Area	School Districts	Number of Schools	Number of Students	Student-to-Teacher Ratio
Los Alamos	1	8	3,729	13:1
Santa Fe	14	57	19,344	15:1
Rio Arriba	5	28	4,191	12:1
Bernalillo	29	205	87,385	14:1
Sandoval	8	44	21,694	15:1
<b>ROI TOTALS</b>	<b>57</b>	<b>342</b>	<b>136,343</b>	<b>14:1</b>

Source: NCES 2025

### C.1.10.1 Regional and Site Transportation Routes

The primary means of transportation to LANL is via motor vehicle. The nearest commercial bus terminal is in the city of Santa Fe, approximately 35 miles driving distance from LANL. The nearest commercial rail connection is in Lamy, New Mexico, 52 miles southeast of LANL. There is a rail spur into central Santa Fe used by the Santa Fe Southern Railway. The Laboratory does not currently use rail for commercial shipments.

Commuters use park-and-ride service provided by a commercial corporation in conjunction with the New Mexico Department of Transportation (NMDOT). Details regarding the park-and-ride options were presented in the 2026 LANL SWEIS (NNSA 2026, Section 4.12).

The primary commercial international airport in New Mexico is located in Albuquerque. There are two smaller airports in the Los Alamos vicinity. The Los Alamos County Airport is owned and operated by the County of Los Alamos. The airport runs parallel to East Road at the southern edge of the Los Alamos community. The airport has one runway running east to west at an elevation of 7,150 feet. Takeoffs are predominantly from west to east, and all landings are from east to west. The airport was historically owned by the Federal Government from its inception until October 2008, when it was officially transferred to county ownership and categorized as a public-use facility. The Santa Fe Municipal Airport is located about 20 miles southeast of LANL. This airport has three runway strips at an elevation of 6,350 feet.

Northern New Mexico is bisected by I-25 in a generally northeast-to-southwest direction. This interstate highway connects Santa Fe with Albuquerque. Figures C.1.10-1 and C.1.10-2 show the regional highway system and major roads within the LANL vicinity. Regional transportation routes connecting LANL with Albuquerque and Santa Fe are I-25 to US 84/285 to NM-502; LANL with Española, NM-30 to NM-502; and LANL with Jemez Springs and western communities, NM-4. Hazardous and radioactive material shipments primarily leave or enter LANL from East Jemez Road to NM-4 to NM-502. East Jemez Road, as designated by the State of New Mexico and governed by 49 CFR 177.825, is the primary route for the transportation of hazardous and radioactive materials. Table C.1.10-1 summarizes the average daily traffic flow at LANL's main access points.

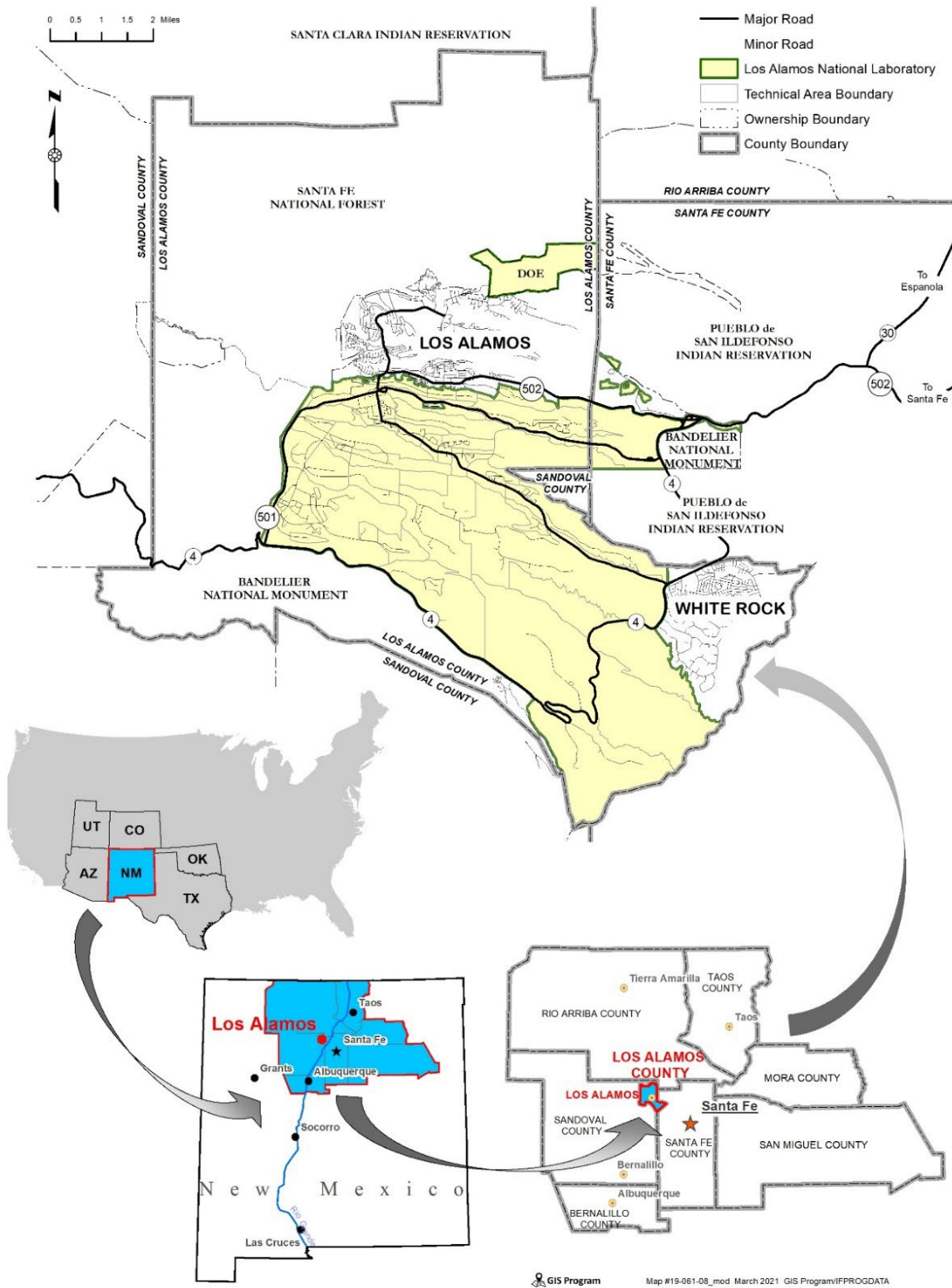


Figure C.1.10-1 LANL Vicinity Regional Roadways, Tribal Lands, and Monuments

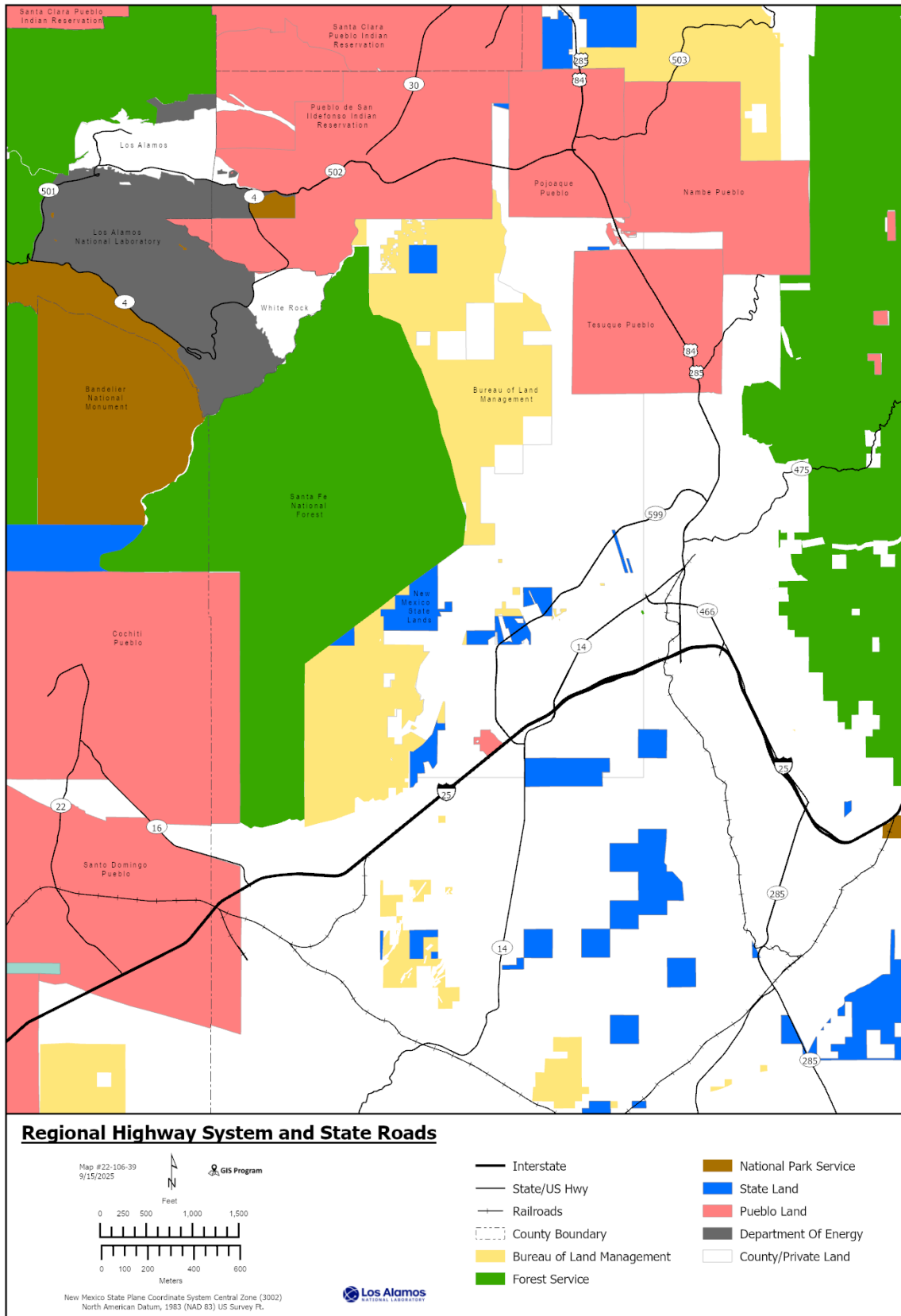


Figure C.1.10-2 LANL Vicinity Regional Highway System and State Roads

**Table C.1.10-1 Annual Average Daily Traffic for Principal LANL Access Routes**

Access Route	AADT 2024 (all vehicles) <sup>a</sup>	AADT 2024 (trucks only) <sup>a</sup>	2024 LOS
NM-4 at Los Alamos County Line to NM-501	329	47	A
NM-4 at Bandelier Park Entrance	1,046	150	A
NM-4 Junction of Pajarito Road – White Rock	11,480	1,652	D
NM-4 at Jemez Road	12,854	1,852	D
NM-501 at Junction of NM-4 and Diamond Drive	2,512	363	D
NM-501 at Junction of Diamond Drive	2,504	146	C
NM-501 at NM-502	18,818	1,092	C
NM-502 at Oppenheimer Drive	15,737	699	C
NM-502 at Los Alamos-Santa Fe County Line	13,585	1,452	A
Pajarito Road between NM-4 and Diamond Drive	13,329	1,919	D
NM-30 between NM-502 and Española	9,018	1,298	A

AADT = Annual Average Daily Traffic; LOS = level of service (*see* definitions in the discussions for “LOS” in the paragraphs below); NM = New Mexico State Road (as in NM-4)

a NMDOT 2024a

Two major roads, NM-502 and NM-4, access Los Alamos County. Los Alamos County traffic volume on these two segments of highway is primarily associated with Laboratory activities. Most commuter traffic originates from Los Alamos County or east of Los Alamos County (Rio Grande Valley and Santa Fe), as the majority of Laboratory employees live in these areas (*see* Section C.1.9, Socioeconomics). A small number of Laboratory employees commute to LANL from the west along NM-4. Table C.1.10-2 summarizes recent NMDOT average weekday traffic volume counts at various points along NM-502 and NM-4.

The site is bounded by NM-4 to the south and east, NM-501 (West Jemez Road) to the northeast, and NM-502 to the north. Approximately 83 miles of paved roads have been developed on the site. The nearest interstate highway is I-25 located in Santa Fe, approximately 39 miles by road via NM-502 (east) and US-84 (south).

Pajarito Road is a principal roadway on LANL used for accessing TA-55 and other major site areas. During CY 2024, the estimated annual average daily traffic for weekday trips anywhere along the length of Pajarito Road between NM-4/White Rock and Diamond Drive was 13,329 (NMDOT 2024a).

**Table C.1.10-2 Average Weekday Traffic Volumes in the Vicinity of NM-502 and NM-4, CY 2024**

Location	Average Daily Vehicle Trip Count
Eastbound on NM 502, east of the NM 502/NM 4 intersection	12,045
Westbound on NM 502, east of the NM 502/NM 4 intersection	11,931
Eastbound on NM 502, west of the NM 502/NM 4 intersection	7,143
Westbound on NM 502, west of the NM 502/NM 4 intersection	6,442
Westbound on NM 4 between E. Jemez Road and NM 502/4	5,528
Eastbound on NM 4 between E. Jemez Road and NM 502/4	7,327
Transition road from northbound NM 4 to eastbound NM 502	4,324
Transition road from eastbound NM 502 to southbound NM 4	1,181

CY = calendar year; NM = New Mexico State Road (as in NM-4)

Source: NMDOT 2024a

The primary route designated by the State of New Mexico to be used for radioactive and other hazardous material shipments to and from LANL is the approximately 40-mile corridor between LANL and I-25 at Santa Fe. This route passes through the Pueblos of San Ildefonso, Pojoaque, Nambe, and Tesuque and is adjacent to the northern segment of Bandelier National Monument (*see* Figure C.1.10-2). This primary transportation route uses NM-599, which bypasses the city of Santa Fe on the way to I-25.

Road usage performance/efficiency is measured via level-of-service (LOS) ratings. LOS ratings range from “A” to “F,” with “A” being the best travel conditions and “F” being the worst. Transportation planners typically aim for a LOS of “C.” At LOS C, roads are below but close to capacity, and traffic generally flows at the posted speed. Traffic on arterial roadway segments is generally described by assigning LOS categories that reflect peak-hour traffic conditions, as defined below:

- **LOS A** describes the highest quality of traffic service, when motorists are consistently able to travel at their desired speed. Most drivers find operating a vehicle on a LOS A roadway to be stress free.
- **LOS B** describes a condition in which drivers have some restrictions on their speed of travel. Most drivers find operating a vehicle on a LOS B roadway slightly stressful.
- **LOS C** describes a condition of stable traffic flow that has significant restrictions on the ability of motorists to travel at their desired speed. Most drivers find operating a vehicle on a LOS C roadway somewhat stressful.
- **LOS D** describes unstable traffic flow. Drivers are restricted in slow-moving platoons and disruptions in the traffic flow can cause significant congestion. There is little or no opportunity to pass slower-moving traffic. Most drivers find operating a vehicle on a LOS D roadway stressful.
- **LOS E** represents the highest volume of traffic that can move on the roadway without a complete shutdown. Most drivers find operating a vehicle on a LOS E roadway very stressful.
- **LOS F** represents heavily congested flow, with traffic demand exceeding capacity. Traffic flows are slow and discontinuous. Most drivers find operating a vehicle on a LOS F roadway extremely stressful.

The Laboratory began preparing a transit implementation study during FY 2022 with a goal to improve commuting options to LANL. While no recent LOS ratings are available for LANL site roadways or for principal public routes accessing the site, given the modest-to-heavy traffic volumes presented above in Table C.1.10-2 for critical roadways close to the site, a rating of LOS “C” and/or “D” in most cases is likely applicable for LANL’s surrounding thoroughfares, especially during peak-travel (i.e., rush-hour) periods. Traffic metrics for within the LANL site off of Pajarito Road can be estimated using employee counts for the TAs accessed using that specific route of entry (i.e., via Pajarito Road); this quantity was assessed to be approximately 10,000 in CY 2024 based on recent data scaled from a 2021 LANL report (LANL 2021a). Recent traffic data for other principal routes into Los Alamos County (and LANL) were obtained from the NMDOT, as summarized above in Tables C.1.10-1 and C.1.10-2.

### C.1.10.2 Onsite Parking

As of CY 2019, there were approximately 7,350 parking stalls at LANL designated as available to serve approximately 15,000 employees. These stalls are provided throughout numerous designated institutional parking lots and structures distributed across the site and were placed with a goal of minimizing walking distances from vehicles to work locations to the greatest extent practicable. Very few parking lots have a surplus of stalls, with many exhibiting a notable deficit (LANL 2022f). In response to this concern, the Laboratory has recently completed new, multi-level parking garages in TA-3 and TA-50, providing an additional 900 total parking stalls (450 in each garage). The garages also feature smart parking indicators that show open stalls via overhead green/red lighting. Personnel at TA-55 now presently use the new TA-50 parking garage.

### C.1.10.3 Traffic Accidents – Historical Data

Table C.1.10-3 lists historical data related to motor vehicle accidents in Los Alamos County and nearby counties. In 2023, there were approximately 4,000 motor vehicle accidents collectively in Los Alamos, Rio Arriba, and Santa Fe counties, resulting in 30 total fatalities. When accidents are considered per 100 million vehicle-miles traveled, travel in Santa Fe County was the most dangerous in the transportation ROI during 2023, although Rio Arriba County had the highest fatality rate.

**Table C.1.10-3 New Mexico Traffic Accidents in Los Alamos and Nearby Counties, 2023**

County	Total Accidents	Crash Rate <sup>a</sup>	Fatalities	Death Rate <sup>b</sup>
Los Alamos	128	120	0	0
Rio Arriba	632	119	15	2.82
Santa Fe	3,230	171	15	0.80
New Mexico (state)	42,836	152	436	1.55

a Crash rate represents crashes per 100-million vehicle-miles traveled.

b Death rate represents deaths per 100-million vehicle-miles traveled.

Source: NMDOT 2024b

Table C.1.10-4 summarizes the accident history for Los Alamos County from 2019 through 2023. As shown in the table, the crash and death rates in the county were significantly lower than New Mexico state averages during this period.

**Table C.1.10-4 Los Alamos County Traffic Accidents, 2019–2023**

Year	Total Accidents	Crash Rate <sup>a</sup>	Fatalities	Death Rate <sup>b</sup>
2019	136	86	1	0.63
2020	112	86	2	1.53
2021	95	70	3	2.21
2022	139	139	0	0
2023	128	120	0	0
County Average	122	100	1.2	0.87
State Average	41,834	157	442	1.66

a Crash rate measures crashes per 100-million vehicle-miles traveled.

b Death rate measures deaths per 100-million vehicle-miles traveled.

Source: NMDOT 2024b

#### **C.1.10.4 Los Alamos National Laboratory Shipments**

Hazardous, radioactive, industrial, commercial, and recyclable materials, including wastes, are transported to, from, and on LANL during routine operations. Hazardous materials include nonradioactive commercial chemical products that are regulated and controlled based on whether they are listed materials or if they exhibit the hazardous characteristics of ignitability, toxicity, corrosivity, or reactivity. Radioactive materials include special nuclear material (SNM) (i.e., pits, plutonium metals, plutonium oxides, enriched uranium), medical radioisotopes, and other miscellaneous radioactive materials. Offsite shipments, both to and from LANL, are carried out by commercial carriers (including standard commercial truck, air-freight, and DOE secure tractor-trailer). Numerous regulations and requirements govern the transportation of hazardous and radioactive materials, including those of the U.S. Department of Transportation (USDOT), U.S. Nuclear Regulatory Commission (NRC), DOE, U.S. Federal Aviation Administration (FAA), International Air Transport Association, and LANL.

##### **Onsite Shipments**

Onsite hazardous and radioactive material shipments are transported in conformance with USDOT regulations. A shipment is considered an onsite shipment if both the origin and destination are at LANL. These shipments are transported in a variety of Laboratory-operated vehicles depending on the quantity and radioactivity of the material shipped and range from Laboratory-owned pick-up trucks to DOE-owned safe-secure trailers. Maintenance of these vehicles is closely monitored for physical performance as well as security.

Hazardous material shipments vary from bulk gases and liquids to small quantities of laboratory chemicals. Hazardous waste shipments are generally made to the hazardous waste storage facility at TA-50, and radioactive and hazardous waste shipments (including TRU, low-level radioactive waste [LLW], and mixed LLW [MLLW]) are generally made to the waste management area (Area G) within TA-54, as well as to TA-63 (TRU). Most radioactive liquid waste at LANL is conveyed through an underground pipeline system directly to the RLWTF at TA-50. This includes facilities at TA-55.

Onsite radioactive material shipments are transported in conformance with federal regulations. A primary feature of these regulations is stringent packaging requirements governing shipments on public roads. While rare, it may not always be cost-effective for DOE to conform to these stringent

packaging requirements; in such cases, site roads are temporarily closed during the shipment. Regardless, LANL/DOE safety requirements always fully apply.

Onsite transport constitutes the majority of activities that comprise routine operations in support of various programs. The radioactive materials transported on site between and among LANL TAs are mainly of limited quantities, short travel distances, and mostly on closed roads. The impacts of these transportation activities are part of normal operations (NNSA 2026, Section 4.12).

### **Offsite Shipments**

Offsite transport of radioactive materials associated with operations at TA-55 occurs using trucks. The radioactive materials transported include, but are not limited to pits, plutonium metals, plutonium oxides, tritium, uranium (both depleted and enriched), LLW, MLLW, and TRU waste. At LANL, DOE transports and receives radioactive and other hazardous materials and waste shipments to and from other DOE facilities and commercial facilities nationwide. As discussed above, shipments meet applicable USDOT, NRC, FAA, and DOE regulations and requirements. Most unclassified shipments are transported via commercial carriers.

There are several destinations within the DOE-wide complex (e.g., SRS, Pantex Plant, Lawrence Livermore National Laboratory, Y-12 National Security Complex, Nevada National Security Sites [NNS], Waste Isolation Pilot Plant [WIPP]) where NNSA sends radioactive wastes or pits (or pit-related materials) for a variety of site programmatic reasons (e.g., pit processing, pit-material testing/evaluation, weapons assembly, material disposal). LANL has historically demonstrated a successful capacity for maintaining offsite shipment rates between 200 and 500 shipments per year (including waste and nuclear materials) (NNSA 2020b).

The Laboratory has successfully completed on the order of 200–300 average shipments of non-waste radiological material (incoming and outgoing) annually over the last several calendar-years (LANL 2023). During this same period, the Laboratory conducted on the order of roughly 400 offsite waste shipments annually for LLW, MLLW, TRU waste, and hazardous waste, collectively (NNSA 2026).

DOE regulations require that safe-secure trailers be used for offsite shipments of SNM, weapons components, and explosive-like assemblies in DOE custody. Safe-secure trailers are similar in appearance to commercial tractor-trailers but are equipped with unique security and safeguard features that prevent unauthorized cargo removal and minimize the likelihood of an accidental radioactive materials release as a result of a vehicle accident. Classified shipments are made in safe-secure trailers.

The primary regulatory approach to promote safety from radiological exposure during transportation is the specification of standards for the packaging of radioactive materials. Packaging represents the primary barrier between the radioactive material being transported and radiation exposure to the public, workers, and the environment. Transportation packages for radioactive materials must be designed, constructed, and maintained to contain and shield its contents during normal transport conditions. For highly radioactive material, packages must contain and shield their contents in the event of severe accident conditions. The type of packaging used is determined by the total radioactive hazard presented by the material within the package. Four basic types of packaging are used: Excepted, Industrial, Type A, and Type B. Additional details with regard to packaging requirements are discussed in Appendix E.

The Laboratory sends the vast majority of its solid LLW off site to a combination of NNSA in Nevada, and commercial licensed treatment, storage, and disposal (TSD) facilities such as EnergySolutions in Utah, Perma-Fix in Washington-state, and Waste Control Specialists LLC (WCS) in Texas. Over the last several years, the Laboratory has averaged about 300 annual offsite shipments of LLW to these destinations (NNSA 2026).

The Laboratory sends MLLW to appropriately permitted offsite commercial TSD facilities for necessary treatment and disposal. Compliance status for hazardous waste actions at LANL is also applicable to the management of MLLW. The Laboratory typically ships MLLW to facilities in Utah (EnergySolutions), Texas (WCS), Florida (Perma-Fix), and Washington-state (Perma-Fix). Over the last several years, the Laboratory has averaged on the order of 40 annual shipments of MLLW to these offsite TSD facilities (NNSA 2026).

The Laboratory sends hazardous waste to a variety of permitted, offsite commercial TSD facilities across the western U.S. (e.g., Arizona, Colorado, New Mexico). Over the last several years, the Laboratory has averaged on the order of 200 annual shipments of hazardous waste to these offsite facilities (NNSA 2026).

The Laboratory regularly sends quantities of TRU waste to WIPP in New Mexico for underground disposal. During the period 2019–2023, the Laboratory has averaged on the order of 65 annual shipments of TRU waste to WIPP (NNSA 2026). For perspective, a single TRU waste truck shipment can carry up to three separate TRUPACT-II containers as payload, with each container able to hold up to approximately 2.8 cubic meters of TRU if packaged within 55-gallon drums or up to 3.7 cubic meters of TRU if packaged within standard waste boxes (NNSA 2026).

Regulatory standards for packaging and transporting radioactive materials offsite from LANL are designed to achieve the following four primary objectives: (1) Protect persons and property from radiation emitted from packages during transportation by specific limitations on the allowable radiation levels; (2) Contain radioactive material in the package (achieved by packaging design requirements based on performance-oriented packaging integrity tests and environmental criteria); (3) Prevent nuclear criticality (an unplanned nuclear chain reaction that could occur as a result of concentrating too much fissile material within a single location); and (4) Provide physical protection against theft and sabotage during transit.

USDOT regulations pertaining to the transportation of radioactive materials (including those to and from LANL) are provided within 49 CFR Parts 106, 107, and 171–178; and NRC regulations are found in 10 CFR Parts 20, 61, 71, and 73. These and USDOT’s Radioactive Material Regulations Review (USDOT 2008) provide a comprehensive discussion on radioactive material shipping regulations.

The transport of shipments to and from LANL is conducted to essentially support onsite processes and storage of nuclear materials in support of national defense and U.S. nuclear nonproliferation efforts, as well as activities related to environmental cleanup and stewardship. As alluded to earlier, shipments typically consist of weapons nuclear materials (e.g., SNM), radioactive and nonradioactive wastes, hazardous materials, and materials needed to conduct general operations at the site. NNSA’s Office of Secure Transport is responsible for the safe and secure transport of government-owned SNM in the contiguous U.S. (NNSA 2026). SNM is shipped to and from LANL using containers that meet the requirements of Type B transportation packages. These shipments include the transport of various forms of plutonium and uranium that may use NNSA’s safe, secure transport system, in compliance with DOE Order 461.1C, “Packaging and

Transportation for Offsite Materials of National Security Interest,” which requires that packaging and transportation of all nuclear material are conducted in accordance with USDOT and NRC regulations, except where an alternative course of action is identified in this DOE order. NNSA may use specially designed tractor-trailers to transport SNM. While the specific features of numerous transportation logistics are classified, some generalized examples of such may include enhanced structural characteristics, heightened thermal resistance, armed escorts, and 24-hour-a-day, real-time communications to monitor the location and status of all NNSA’s safe, secure transport system shipments. Since 1975, the Office of Secure Transport has accumulated more than 140 million miles of over-the-road experience with no accidents causing a fatality or release of radioactive material (NNSA 2026).

TRU waste is collected, characterized, and packaged onsite at LANL for ultimate transport to the WIPP facility in New Mexico for disposal. Contact-handled TRU waste is loaded into certified packages for shipment. Currently, certified packages include the TRUPACT-II, TRUPACT-III, and the HalfPACT transportation packages. For remote-handled-TRU waste (TRU waste for which the dose rate at the surface of the waste container is greater than 200 millirem per hour) shipments, packaging instead consists of the NRC-certified RH-TRU 72-B container. All of these packaging options are NRC-licensed Type B casks designed specifically for the transport of TRU waste and have undergone extensive testing to demonstrate the ability to provide safe containment of TRU waste during incident-free shipment and in the event of hypothetical accident conditions. Each truck transporting these packages is tracked by emergency response and law enforcement officials via TRANSCOM, the same as for shipments of SNM (DOE 2020).

The vast majority of LLW generated at LANL is shipped offsite for disposal at federal or commercial disposal facilities, typically in drums or steel boxes. All solid LLW that is also categorized as hazardous waste (i.e., MLLW) is likewise conventionally transported offsite for treatment and/or disposal. DOE/LANL uses licensed commercial carriers for most LLW and MLLW shipments, with all shipments conducted in compliance with applicable federal and state regulations (DOE 2020).

With specific regard to nonradiological waste shipments, LANL regularly transports hazardous wastes offsite for treatment and/or disposal at licensed treatment and disposal facilities. Such shipments of materials to and from LANL that are needed to support activities at the site are primarily shipped by commercial carrier (DOE 2020).

In the extremely unlikely event of a release of radiological cargo from a shipment along a route, DOE assumes that local emergency response personnel would be first to arrive at the accident scene. Based on an initial assessment at the scene, their training, and available equipment, first responders would involve state and federal resources as necessary. First responders and/or state and federal responders would initiate actions in accordance with the USDOT’s Emergency Response Guidebook to isolate the incident and perform any actions necessary to protect human health and the environment (such as evacuations or other means to reduce or prevent impacts to the public). Cleanup actions are ultimately the responsibility of the carrier. DOE would partner with the carrier, shipper, and applicable state and local jurisdictions, however, to ensure cleanup actions meet regulatory requirements. To mitigate the possibility of an offsite transportation accident, DOE issued DOE Order 460.2B, which specifies that carriers are expected to exercise due caution and care in dispatching shipments. According to the Order, the carrier determines the acceptability of weather and road conditions, whether a shipment should be held before departure, and when actions should be taken while enroute. The manual emphasizes that shipments should

not be dispatched if severe weather or bad road conditions make travel hazardous. Current weather conditions, the weather forecast, and road conditions would be considered before dispatching a shipment.

### C.1.11 Infrastructure

Site infrastructure includes the physical resources and services required to support the construction and operation of LANL facilities. Utility infrastructure at LANL encompasses electrical power, fuel (natural gas and petroleum), water supply, SWWS, and telecommunications. DOE/NNSA owns and distributes most utility services to LANL facilities, and Los Alamos County provides utility services to the communities of White Rock and Los Alamos (LANL 2024b). Roads and parking at LANL are addressed in Section C.1.10 of this SWEIS. Table C.1.11-1 presents information about the LANL site-wide infrastructure and capacity.

**Table C.1.11-1 LANL Site-Wide Infrastructure**

Resource	Current Estimated Use <sup>a</sup>	Capacity	Available Capacity <sup>b</sup>
Electricity – power consumption (MW-hr/yr)	440,000	651,000–1,440,000 <sup>c</sup>	~210,000–1,000,000 <sup>c</sup>
Electricity – average annual peak demand (MW)	70	116–200 <sup>c</sup>	46–130 <sup>c</sup>
Natural gas (decatherms per year)	1,177,000	8,070,000	6,893,000
Fuel–oil (gallons per year)	901,484	NA	NA
Domestic water (gallons per year)	271,500,000	542,000,000	270,500,000
Sanitary wastewater (gallons per day)	311,689	602,800	~291,000

EPCU = Electrical Power Capacity Upgrade; kWh = kilowatt-hour; MW = megawatt; MW-hr/yr = megawatt-hour per year; NA = not applicable

a Average value from 2017 to 2023 (NNSA 2026).

b Available capacity is calculated by subtracting current estimated use from capacity.

c Presuming completion of the EPCU project, import capacity would increase from 116 MW to 200 MW; capacity for electrical consumption would increase from 651 to 1,440 million kWh per year (based on 7,200 hours/year and 200 MW import capacity).

#### C.1.11.1 Electricity

The Electric Coordination Agreement (ECA) was signed in 1985 between the DOE/NNSA, and Los Alamos County. Under the ECA, the DOE/NNSA and Los Alamos County share power-generation resources and infrastructure through the Los Alamos Power Pool (LAPP). The LAPP supplies LANL with electricity primarily through hydroelectric, coal, and natural gas power generators throughout the western U.S. Import capacity is limited by the physical capability (thermal rating) of the Norton Transmission line import capacity of 116 MVA (LANL 2024b).

Within LANL, NNSA operates a natural-gas-fired steam and electrical power generating plant at TA-3 (i.e., the TA-3 Co-Generation Complex or Power Plant). Onsite electricity generation capability for the LAPP is limited to the 20–27 megawatts from the combustion gas turbine generator. Phase I of the Steam Plant Replacement Project construction was completed in FY 202C. Operation of Phase I equipment is planned for FY 2024. This will eventually replace the existing central steam plant with upgrades to the combustion turbine and the addition of conventional gas-fire steam boilers, providing up to 40 MW on average to the Laboratory. Los

Alamos County operates a 1-MW solar photovoltaic unit on the TA-61 old landfill site (LANL 2024b).

There are two 115-kilovolt (kV) transmission lines that import power from the Public Service Company of New Mexico (PNM) system into LANL. Ownership of one of the transmission lines (Norton Line [NL]) is split between PNM and DOE/NNSA, with operations coordinated between both parties; PNM owns and operates the second line (Reeves Line [RL]). Currently, the 115-kV transmission infrastructure has sufficient capacity to serve baseload requirements for the entire Los Alamos Service Area, which includes LANL and the county. Although the RL and the NL provide some redundancy, the transmission import capacity of 116 MVA is expected to be exceeded before 2027 due to increased demand loads at LANL (NNSA 2023a). The installation of a third transmission line as part of the Electrical Power Capacity Upgrade (EPCU) project would increase the import capacity from 116 to 200 MVA, thereby allowing loads to be fully served by offsite generation and enable future mission growth (LANL 2024b). The EPCU would include additional improvements to onsite transmission, upgrades for the Western Technical Area Substation, and expansion of several distribution feeder circuits. The EPCU project was evaluated in the *Los Alamos National Laboratory Electric Power Capacity Upgrade Project Final Environmental Assessment* (NNSA 2024), and a Finding of No Significant Impact was issued on August 12, 2025 (NNSA 2025). Until the EPCU is implemented, onsite generation can be used to supplement import capacity to meet LANL power needs as necessary (LANL 2024b).

### **C.1.11.2 Fuel**

#### **Natural Gas**

Natural gas is the primary heating fuel used at LANL and in Los Alamos County. The natural gas system includes a high-pressure main and distribution system to Los Alamos County and pressure-reducing stations at LANL buildings. LANL and Los Alamos County both have delivery points where gas is monitored and measured. Approximately 4 miles of the gas pipeline are within LANL boundaries. From the four miles of mains, natural gas is distributed to the point of use via approximately 42 miles of distribution piping (DOE 2011).

LANL receives natural gas through the New Mexico Gas Company transmission system. Natural gas used by LANL is currently used for heating (both steam and hot air), with the TA-3 Co-Generation Complex the principal user of natural gas on site (DOE 2011). The combustion gas turbine generator (within the TA-3 Co-Generation Complex) serves as one of the onsite energy sources by producing electricity from the combustion of natural gas. The combustion gas turbine generator is capable of producing 20–27 MW and is available on an as-required basis to meet peak-load and backup situations (LANL 2024b).

Approximately 52 percent of the gas used by LANL in 2022 was for heat production. The remainder was for electricity production, mainly by the combustion gas turbine generator (LANL 2024b).

#### **Petroleum Fuels**

Fuels, such as oil, diesel, and gasoline, are used at LANL and are brought on site as needed (LANL 2022g). LANL used 1,025,638 gallons of fuel during FY 2023 for its fleet and non-fleet vehicles. The average annual fuel consumption (2017–2023) was 901,184 gallons (LANL 2025h).

### C.1.11.3 Domestic Water

The Los Alamos County water production system consists of deep wells, main distribution lines, pump stations, and storage tanks. The system supplies potable water to all of Los Alamos County, LANL, and Bandelier National Monument. The deep wells are located in three well fields (Guaje, Otowi, and Pajarito). Water is pumped into production lines, and booster pump stations lift this water to reservoir tanks for distribution. Prior to distribution, the entire water supply is disinfected (DOE 2011; LANL 2023).

DOE/NNSA has a contract with Los Alamos County to supply water to the Laboratory. The County owns and operates the main water production system, while LANL owns and maintains an internal distribution system. The distribution system used to supply water to LANL facilities consists of a series of storage tanks, pipelines, and fire pumps. The LANL distribution system is primarily gravity fed, with pumps available for high-demand fire situations at select locations (LANL 2022b). LANL continues to maintain the distribution system by replacing those portions of the system in need of repair identified during leak detection surveys (LANL 2021b).

LANL's average annual potable water use (2017–2023) was approximately 271.5 million gallons. LANL consumed approximately 304 million gallons of potable water in CY 2023 (LANL 2025c). LANL's annual water use ceiling is 542 million gallons (NNSA 2018). Any water use exceeding this ceiling can be considered an indicator of an environmental impact, requiring further NEPA analysis. Water use below this ceiling is not expected to have any impacts to the regional aquifer (LANL 2021b). Trends in water levels in wells reflect a plateau-wide decline in regional aquifer water levels starting in 1977 in response to municipal water production, typically by several feet each year. No unexplained changes in patterns have occurred since this time. The decline is gradual and does not exceed 1 to 2 feet per year for most production wells. In areas where pumping has been reduced, water levels show some recovery. When pumping stops, the static water level returns in about 6 to 12 months (LANL 2021b). Although groundwater levels have declined over time in response to pumping, the current pumping rates are likely to be sustainable for many decades (LADPU 2018).

TA-55 is not a large water user at LANL. Wastewater discharges are a good barometer of the amount of water used and, in 2023, TA-55 discharged 3 million gallons, or about 1.5 percent, of the wastewater discharged or reused at LANL site-wide (LANL 2025d).

### C.1.11.4 Sanitary Wastewater

LANL operates the TA-46 SWWS to treat liquid sanitary wastes. The SWWS is designed to treat up to 220 million gallons per year of wastewater (NNSA 2008). A portion of the treated SWWS effluent is pumped to the Sanitary Effluent Reclamation Facility (SERF), where it is treated for reuse as cooling-tower makeup water. Treated water is reused in LANL cooling towers and is ultimately released at permitted Outfall 001 in the Sandia Canyon. Discharge Permit DP-857 applies to combined effluent discharges from the TA-46 SWWS and the SERF.

LANL has six active septic tank disposal systems (a combined septic tank and leach field) in remote areas of the site (LANL 2024b). Discharge from the septic systems is covered under the NMED-issued Discharge Permit DP-1589.

Sanitary wastewater, generated within TA-55, is treated at the TA-46 SWWS.

### C.1.12 Waste and Materials Management

This section discusses existing waste management at LANL. Laboratory operations (including environmental remediation) generate radioactive and nonradioactive wastes. Radioactive wastes are classified as LLW, MLLW, and TRU waste.<sup>7</sup> Nonradioactive wastes include hazardous waste, municipal solid waste, construction waste, and sanitary waste. This section is grouped by the following general waste categories: (1) radioactive waste; (2) hazardous waste; and (3) other waste (New Mexico Special Waste (NMSW), solid waste, construction/demolition waste and sanitary waste).

Wastes from LANL operations are regulated by federal and state regulations, applicable to specific waste classifications. Institutional requirements for waste management activities are determined and documented by the Laboratory Implementation Requirements Program. This program provides details on proper management of process wastes and contaminated environmental media. The Waste Compliance and Tracking System was specifically designed to manage LANL's waste from generation to disposition.

#### C.1.12.1 Radioactive Waste

The *Atomic Energy Act of 1954* gave DOE regulatory authority for the management of its own radioactive waste. Subsequent rulings have limited or clarified that this authority is specific only to the radioactive component of its waste; other elements of waste streams are subject to other regulatory requirements as applicable.

Laboratory operations generate LLW, MLLW, and TRU waste. LANL is not involved in reprocessing used nuclear fuel (UNF) and, accordingly, does not generate high-level radioactive waste (HLW). The overriding set of requirements the Laboratory must meet in its management of LLW and TRU waste is established in DOE Order 435.1. Waste transported off site must also be packaged and shipped in accordance with USDOT regulations, and the waste itself must meet the waste acceptance criteria of the receiving waste management facility, whether a commercial or government facility. Impacts associated with transportation of waste are addressed in Appendix E.

Wastes from current and recent operations at the Laboratory are managed by the management and operations contractor (Triad), while legacy wastes—defined as the wastes generated before 1999—are managed by the legacy waste cleanup contractor (N3B), which assumed responsibility as the legacy cleanup contractor for DOE-EM in 2018.

#### Low-Level Radioactive Waste

LLW is generated from research and development, facility operations, maintenance and decontamination; facility deactivation and demolition; and environmental remediation. These wastes are generated at LANL when materials, equipment, and water are used in radiological control areas as part of the work activities; when these contaminated items are no longer useable, they are removed from the area as LLW. Typical LLW streams include laboratory equipment, service and utility equipment, plastic bottles, disposable wipes, plastic sheeting and bags, paper, and electronic equipment. Environmental remediation and decontamination, decommissioning, and demolition (DD&D) activities generate LLW primarily in the form of contaminated soils and debris. Both solid LLW and liquid LLW are generated at LANL. The Laboratory sends almost all

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<sup>7</sup> Because TRU waste and mixed TRU waste (containing hazardous materials) are managed and disposed of similarly, this PEIS does not differentiate between TRU and mixed TRU waste. Both are referred to as TRU waste.

of its solid LLW off site to the NNSS. In 2023, LANL made 442 shipments of LLW to offsite disposal facilities (LANL 2025d). Table C.1.12-1 provides the seven-year average LLW generation at LANL.

**Table C.1.12-1 LLW Generation at LANL, 2017–2023**

Waste Type (m <sup>3</sup> /yr)	2017	2018	2019	2020	2021	2022	2023	Average (2017–2023)
LLW (site-wide)	5,211	3,534	2,033	3,819	4,295	5,702	6,505	4,985
LLW (TA-55/PF-4) <sup>a</sup>	307	310	261	187	322	319	408	302

LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; m<sup>3</sup>/yr = cubic meters per year; PF-4 = Plutonium Facility building 4; TA = technical area

a PF-4 in TA-55 generates some waste from other than pit production activities.

Source: LANL 2019a, 2020, 2021a, 2022b, 2023, 2024b, 2025d

Most radioactive liquid waste at LANL is conveyed through an underground pipeline system directly to the RLWTF at TA-50. Waste from generators not connected by the underground pipeline system is transferred by tanker truck to the RLWTF. Liquid LLW is treated at the RLWTF in sequential steps to remove and reduce the radioactive components of the liquid waste stream.

The facilities in TA-55 generate LLW and of the 6,505 cubic meters generated site-wide in 2023, 408 cubic meters were associated with plutonium facilities at TA-55 (LANL 2025d). The seven-year average contribution from TA-55 is about 302 cubic meters per year.

### **Mixed Low-Level Radioactive Waste**

MLLW is waste that contains both LLW and hazardous waste as defined by the RCRA. Most of the operational MLLW is generated by the stockpile stewardship and research and development programs. Typical waste streams include contaminated lead shielding bricks and debris, spent chemical solutions, fluorescent light bulbs, copper solder joints, and used oil. Environmental remediation and DD&D activities also produce some MLLW. MLLW is subject to the regulatory requirements for both hazardous waste and radioactive waste and is managed at LANL in the same manner as described for hazardous waste with the exception of modified storage time limits for certain wastes with no or limited offsite treatment options. LANL is responsible for sending MLLW to appropriately permitted offsite commercial TSD facilities for treatment and disposal actions. In 2023, the Laboratory made 138 shipments of MLLW to three offsite TSD facilities (LANL 2025d). Table C.1.12-2 provides the seven-year average MLLW generation at LANL.

**Table C.1.12-2 MLLW Generation at LANL, 2017–2023**

Waste Type (m <sup>3</sup> /yr)	2017	2018	2019	2020	2021	2022	2023	Average (2017–2023)
MLLW (site-wide)	245.3	62	2,128	57.6	257	297	476	640
MLLW (TA-55/PF-4) <sup>a</sup>	72.4	20	2.9	18.6	58	14	132	45.4

LANL = Los Alamos National Laboratory; MLLW = mixed low-level radioactive waste; m<sup>3</sup>/yr = cubic meters per year; PF-4 = Plutonium Facility building 4; TA = technical area

a PF-4 in TA-55 generates some waste from other than pit production activities.

Source: LANL 2019a, 2020, 2021a, 2022b, 2023, 2024b, 2025d

The facilities in TA-55 generate MLLW and of the 476 cubic meters generated site-wide in 2023, 132 cubic meters were associated with plutonium facilities at TA-55 (LANL 2025d). The seven-year average contribution from TA-55 is about 45 cubic meters per year.

### **Transuranic Waste**

TRU waste is radioactive waste that is not HLW; UNF; byproduct material (as defined in 42 U.S.C. § 2011 et seq.); or naturally occurring radioactive material (DOE Manual 435.1-1). TRU wastes contain manmade elements heavier than uranium on the periodic table (such as plutonium). LANL TRU waste is generated primarily in laboratory experiments, facility production, and component tests. The Laboratory sends solid TRU waste off site to the WIPP facility when the waste meets WIPP's waste acceptance criteria. Some TRU waste is stored at LANL while waiting for an acceptable disposal pathway to be identified. In 2023, LANL made 45 shipments of TRU waste to WIPP (LANL 2025d). Table C.1.12-3 provides the seven-year average TRU waste generation at LANL.

**Table C.1.12-3 TRU Waste Generation at LANL, 2017–2023**

Waste Type (m <sup>3</sup> /yr)	2017	2018	2019	2020	2021	2022	2023	Average (2017–2023)
TRU waste site-wide	243.5	149	121	571.4	279	812	282	388
TRU waste (TA-55/PF-4) <sup>a</sup>	99.6	90.8	92.4	92.4	273	591	192	205

LANL = Los Alamos National Laboratory; m<sup>3</sup>/yr = cubic meters per year; ; PF-4 = Plutonium Facility building 4;

TA = technical area TRU = transuranic

a PF-4 in TA-55 generates some waste from other than pit production activities.

Source: LANL 2019a, 2020, 2021a, 2022b, 2023, 2024b, 2025d

The facilities in TA-55 generate TRU waste and of the 282 cubic meters generated site-wide in 2023, 192 cubic meters were associated with plutonium facilities at TA-55 (LANL 2025d). The seven-year average contribution from TA-55 is about 205 cubic meters per year.

### **C.1.12.2 Hazardous Waste**

Per RCRA (42 U.S.C. § 6901 et seq.), hazardous wastes include all solid wastes that are (1) listed as hazardous by the EPA (listed wastes) or (2) ignitable, corrosive, reactive, or toxic (characteristic wastes). Mixed radioactive waste (also called mixed waste) is listed or characteristic hazardous waste commingled with radioactive waste. LANL performs a broad range of research activities that can generate a variety of waste, including hazardous waste. Commonly generated hazardous waste includes many types of research chemicals, solvents, acids, bases, carcinogens, compressed gases, metals, and other solid waste contaminated with hazardous material. Hazardous waste may include equipment, containers, structures, and other items intended for disposal that are considered hazardous (e.g., compressed gas cylinders, contaminated cleanup materials or protective gear). The nature of the LANL mission is also such that research activities often change over time, either by small amounts or in their entirety, and the wastes produced can likewise change. As a result, the Laboratory's approach to managing hazardous waste is designed to accommodate a wide variety of waste generators and waste types. After material is declared a hazardous waste, the waste is characterized, labeled, and collected in appropriate storage areas. Many hazardous wastes are accumulated for up to 90 days at consolidated storage facilities. Although some hazardous wastes are treated on site, the majority of hazardous waste is ultimately shipped to offsite RCRA-permitted TSD facilities for final treatment or disposal. In 2023, LANL made 353 shipments of

hazardous waste to a variety of offsite commercial TSD facilities (LANL 2025d). Table C.1.12-4 provides the seven-year average hazardous waste generation at LANL. Of the 2,547 metric tons of hazardous waste generated annually from the LANL site, TA-55 contributes an average of 33 metric tons per year.

**Table C.1.12-4 Hazardous Waste Generation at LANL, 2017–2023**

Waste Type (MT/yr)	2017	2018	2019	2020	2021	2022	2023	Average (2017–2023)
Hazardous Waste (site-wide)	4,083	1,587	2,330	2,957	1,386	1,619	3,265	2,547
Hazardous Waste (TA-55/PF-4) <sup>a</sup>	17.6	7.8	21.9	15.0	31.0	108	29.7	33

LANL = Los Alamos National Laboratory; MT/yr = metric tons per year; PF-4 = Plutonium Facility building 4; TA = technical area

a PF-4 in TA-55 generates some waste from other than pit production activities.

Source: LANL 2019a, 2020, 2021a, 2022b, 2023, 2024b, 2025d

### **C.1.12.3 Other Waste**

#### **New Mexico Special Waste**

Per NMAC 20.9.2.7, NMSW is a nonhazardous solid waste that has unique handling, transportation, and/or disposal requirements to assure protection of the environment and the public health, welfare, and safety. NMSW includes treated formerly characteristic hazardous waste, asbestos waste, ash, infectious waste, sludge, industrial solid waste, spill of a commercial chemical product, dry chemicals that become characteristic hazardous waste when wetted, and petroleum-contaminated soil. LANL generates NMSW in various facilities and processes. The largest quantities of NMSW generated at LANL are the filter cakes from treating the effluent of the TA-46 SWWS for cooling-tower makeup water. This filter cake is a solid material consisting principally of magnesium silicates and iron oxy-hydroxides, along with other minor chemically co-precipitated constituents, associated with the filtration process of the SERF.

#### **Solid Sanitary Waste**

LANL uses several different approaches to manage waste materials that are not radioactive or hazardous. First, LANL has an active Pollution Prevention Program that includes efforts to evaluate materials used on site to determine if there are alternatives that generate less waste or waste that is easier to manage or that involves fewer adverse impacts. Programs have also been established to recycle, often for reuse, items such as computers, monitors, laptops, tablets, batteries, and cell phones to minimize waste. Onsite food services promote the use of compostable products and provide means for employees to support material separation. Several other categories of waste materials are segregated and diverted from landfill disposal, with paper and cardboard, metals, and green waste (e.g., chips, compost, mulch, and clean wood) as larger-quantity contributors. Waste not amenable to recovery is sent through the facility's transfer station to another facility with disposal capabilities. The Laboratory sends solid waste to the Los Alamos County Eco Station for transfer to municipal landfills. Los Alamos County operates the transfer station and is responsible to the State of New Mexico for obtaining all related permits for these activities.

### **Construction/Demolition Waste**

Construction and demolition debris is regulated as a separate category of solid waste under the New Mexico Solid Waste Regulations. Construction and demolition debris is not hazardous and may be disposed of in a municipal landfill or a construction and demolition debris landfill. Construction and demolition waste typically consists of soils, broken-up concrete, scrap metals, and various building material waste or rubble. The volumes of construction and demolition debris generated annually are provided in the 2026 LANL SWEIS (NNSA 2026, Section 4.11).

### **Liquid Sanitary Waste**

The Laboratory treats liquid sanitary waste on site at the Sanitary Wastewater Treatment Plant, located at TA-46. Treated water is reused in LANL cooling towers and is ultimately released at permitted Outfall 001.

#### **C.1.12.4 Materials Management**

The Laboratory's materials management operations are conducted pursuant to DOE orders and to various applicable federal, state, and local laws and regulations. Regulatory oversight lies with various federal, state, and local agencies. The Laboratory uses radioactive materials, chemicals, and explosive materials in a wide variety of operations including scientific and weapons R&D, diagnostic research, research on the properties of materials, and isotope separation.

Regarding radioactive materials, the NRC categorizes quantities of SNM into three main levels according to the risk and potential for its use in a fissile explosive or in production of nuclear material for use in a fissile explosive. These safeguard categories are: SNM Category I designating strategic quantities; SNM Category II designating quantities of moderate strategic significance; and SNM Category III designating quantities of low strategic significance (NRC 2017). DOE/NNSA uses a similar approach to categorize the SNM managed at its locations. These groupings, again based on the mass and form of SNM present, are designated Security Categories I through IV, and are used to establish the types and levels of security, control, and accounting measures required in the management of these materials.

Regarding chemicals, the Laboratory uses a broad range of hazardous chemicals in both small and large quantities. The nature of LANL activities is also such that chemical inventories can change significantly over time and from facility to facility as programs change or research findings dictate changes in direction. The general following chemical types, many using DOE designations, are used and stored at LANL:

- corrosives (liquids, solids, and gases);
- toxic substances (including gases);
- flammables and combustibles (including solids, liquids, and gases);
- nonflammable gases;
- water reactives/pyrophorics/spontaneously combustibles;
- oxidizing substances;
- organic peroxides; and
- explosives.

The Laboratory uses explosives in various R&D and test applications. These applications involve a wide range of activities including synthesis and formulation, characterizations, and machining

as well as detonations. LANL uses a comprehensive explosives safety program to manage explosives, with DOE Explosives Safety Standard (DOE-STD-1212) as the controlling document.

The No-Action Alternative would involve construction of new facilities, including some with new or expanded laboratory or research functions. As a result, it is expected that the use and presence of radioactive/hazardous materials at LANL would increase to some extent. The additional radioactive/hazardous materials likely would be similar to materials already used within LANL; any new radioactive/hazardous materials would not be allowed on site without appropriate equipment, facilities, procedures, and training necessary to safely manage those materials.

LANL annual waste generation rates and off-site shipments for disposal are described and explained in the 2026 LANL SWEIS (NNSA 2026).

### C.1.13 Human Health and Safety

In accordance with DOE Order 450.2, DOE Order 458.1, and DOE Order 440.1B, operations at LANL are required to be conducted in a manner that protects the health and safety of workers and the public, preserves the quality of the environment, and prevents property damage. In addition, DOE Order 452.3 requires LANL operations to comply with applicable environment, safety, and health (ES&H) laws, regulations, and requirements and with directives promulgated by NNSA and DOE regarding occupational safety and health.

Routine operations at LANL have the potential to affect the health of the public and workers. Air emissions at LANL can lead to exposure to radioactive and nonradioactive materials. Liquid effluents discharged into waterbodies may affect downstream populations who use the water for drinking or recreation. Additionally, workers are exposed to radiation and occupational hazards similar to those experienced at many industrial work sites. This section characterizes the human health impacts from current operations at LANL. It is against this baseline that the potential incremental and cumulative health impacts associated with the alternatives are evaluated.

#### Radiation Dose Measurement

In this PEIS, radiation doses are measured in units of either “person-rem” or “rem.”

**Person-rem** is used to measure the total collective radiation dose for a group of people. To determine the population dose, this PEIS sums up the individual dose of every person within a 50-mile radius of LANL. Statistically, approximately 1,667 person-rem would result in one latent cancer fatality (LCF).

**Rem** is used to measure the radiation dose for a single individual. Individual doses are converted to LCFs by multiplying the dose by 0.0006 (DOE 2003). For example, an individual who receives a dose of 1.5 rem would have a 0.0009 chance of developing an LCF.

#### C.1.13.1 Public Health

##### Radiological

Table C.1.13-1 shows the major sources and levels of background radiation doses to an average individual in the vicinity of LANL, as well as the collective dose to the population within 50 miles of the site. Background radiation is attributed to naturally occurring radiation such as cosmic radiation from space and terrestrial gamma radiation and from radionuclides naturally in the environment, including radon. In addition, members of the population receive radiation doses from medical and dental uses of radiation and from manmade products. These sources and background radiation doses are unrelated to LANL operations.

Table C.1.13-1 Background Radiation Dose Unrelated to LANL Operations

Source	Individual Dose <sup>a</sup> (millirem per year)	Collective Dose <sup>b</sup> (person-rem per year)
<b><i>Natural Background Radiation at LANL</i></b>		
Cosmic radiation	66	24,420
Terrestrial radiation	100	37,000
Internal (food and water consumption)	30	11,100
Radon and Thoron in homes (inhaled)	270	99,900
<b><i>Other Background Radiation</i></b>		
Diagnostic x-rays and nuclear medicine	300	111,000
Consumer products	13	4,810
Industrial plus occupational	1	370
<b>TOTALS</b>	<b>780</b>	<b>288,600</b>

LANL = Los Alamos National Laboratory; U.S. = United States

a The average background radiation dose to a Los Alamos County resident is approximately 780 millirem per year. In comparison, the average background radiation dose to the average U.S. resident is approximately 625 millirem per year. The higher background dose in Los Alamos County is largely due to higher natural background radiation (e.g., cosmic radiation, terrestrial radiation, and radon/thoron).

b The collective dose is the combined dose for all individuals residing within a 50-mile radius of LANL (approximately 370,000 people).

Source: LANL 2025c

Releases of radionuclides into the environment from Laboratory operations are another source of radiation dose to individuals in the vicinity of LANL. The environment potentially affected by radiological site releases includes air, water, and soil. These transport pathways (the environmental medium through which a contaminant moves) require an associated exposure pathway (e.g., inhaling air, drinking water, or dermal contact with soil) to affect human health. Monitoring of materials released from LANL and environmental monitoring and surveillance on and around the site are discussed in Sections C.1.3 (soils), C.1.4 (water resources), and C.1.5 (air quality) of this PEIS. A radiation dose is calculated to determine the health impact from exposure to radiation. Health impacts (i.e., latent cancer fatalities [LCFs]) are calculated from the risk factor of 0.0006 LCF to the general population expected per rem (or person-rem) of radiation dose (DOE 2003). Table C.1.13-2 provides the various dose limits set for exposure pathways by DOE and the EPA for radiation workers and members of the public.

Table C.1.13-2 provides the various dose limits set for exposure pathways by DOE and the EPA for radiation workers and members of the public. Table C.1.13-3 presents the annual doses to the public from LANL emissions of radioactive materials to the air for the period 2020–2023. Doses are presented for a maximally exposed individual (MEI)<sup>8</sup> and the population within a 50-mile radius of LANL. These doses fall within radiological exposure limits presented in Table C.1.13-2 and are much lower than the background radiation dose presented in Table C.1.13-1. Additionally, as demonstrated by the low radionuclide releases from TA-55 over the past five years (*see* Section C.1.5), the contribution to these MEI and population doses from radiological air emissions from TA-55 is very small.

<sup>8</sup> The MEI is a hypothetical member of the public who receives the greatest possible dose from Laboratory operations. In 2022, the offsite location of the hypothetical MEI was at 95 Entrada Drive, close to environmental air-monitoring station 396, as shown on Figure C.1.5-2. The MEI location potentially changes annually.

**Table C.1.13-2 Dose Limits for Members of the Public and Radiation Workers**

Guidance Criteria (organization)	Public Dose Limit	Worker Dose Limit
10 CFR Part 835 (DOE)	NA	5,000 millirem per year <sup>a</sup>
DOE Order 458.1 (DOE) <sup>b</sup>	10 millirem per year (all air pathways) 4 millirem per year (drinking water pathways) 100 millirem per year (all pathways)	NA
40 CFR Part 61 (EPA)	10 millirem per year (all air pathways)	NA
40 CFR Part 141 (EPA)	4 millirem per year (drinking water pathways)	NA

CFR = Code of Federal Regulations; DOE = U.S. Department of Energy; EPA = U.S. Environmental Protection Agency; NA = not applicable

- a The regulatory dose limit for an individual worker is 5,000 millirem/year (10 CFR Part 835). At LANL, an administrative control level of 2,000 millirem per year has been established for external exposures (LANL 2020a).
- b Derived from 40 CFR Part 61, 40 CFR Part 141, and 10 CFR Part 20.

**Table C.1.13-3 Annual Radiation Doses to Public from LANL Operations, 2020–2023**

Members of the Public	Year	Dose
Dose to maximally exposed individual (millirem)	2020	0.29
	2021	0.50
	2022	0.40
	2023	0.43
	<b>2020–2023 Average</b>	<b>0.40</b>
Dose to population within 50 miles (person-rem) <sup>a</sup>	2020	0.08
	2021	0.08
	2022	0.12
	2023	0.07
	<b>2020–2023 Average</b>	<b>0.09</b>
Average annual dose to a person within 50 miles (millirem)	2020	$2.2 \times 10^{-4}$
	2021	$2.2 \times 10^{-4}$
	2022	$3.3 \times 10^{-4}$
	2023	$1.9 \times 10^{-4}$
	<b>2020–2023 Average</b>	<b><math>2.4 \times 10^{-4}</math></b>

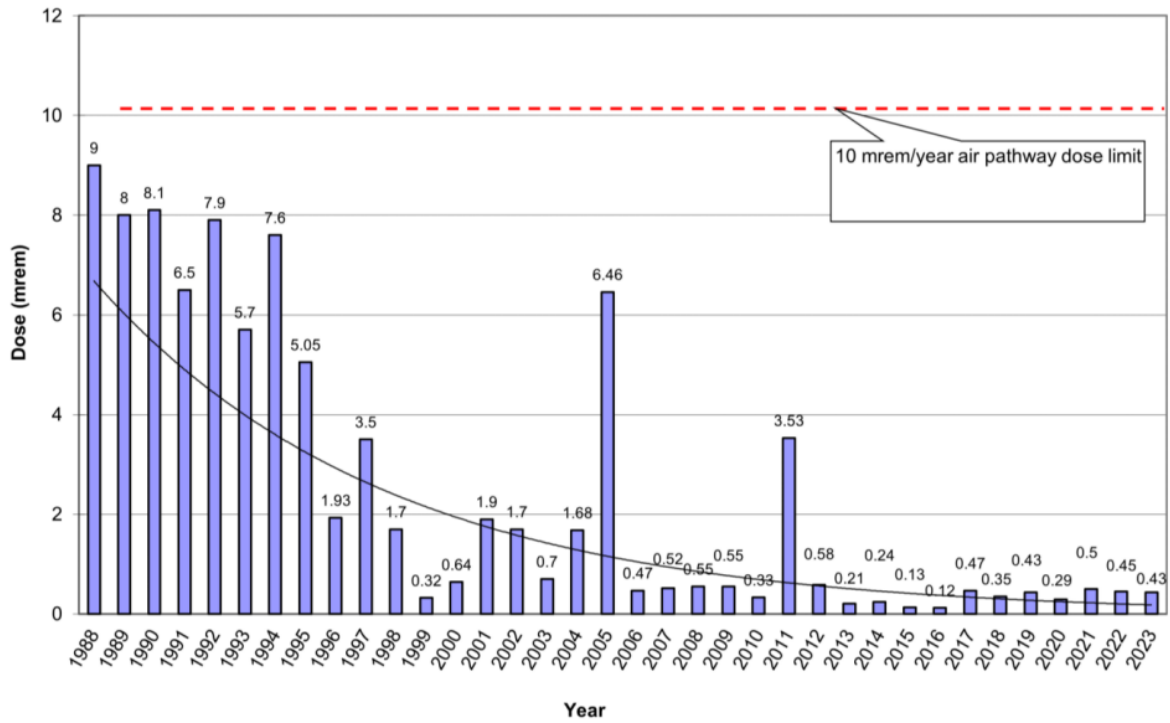
a The population dose is the combined dose for all individuals residing within a 50-mile radius of LANL (approximately 370,000 people), calculated with respect to distance and direction from the site.

Source: LANL 2022a, 2025c, 2025d; NNSA 2026

Figure C.1.13-1 shows the annual MEI doses for more than 30 years of LANL operations. The general downward trend is the result of improved engineering controls and ongoing remediation.<sup>9</sup> Figure C.1.13-2 shows collective population doses from LANL activities for the period 2008–2023. The trend-line for the past 10 years shows a general decrease, which is the result of improved

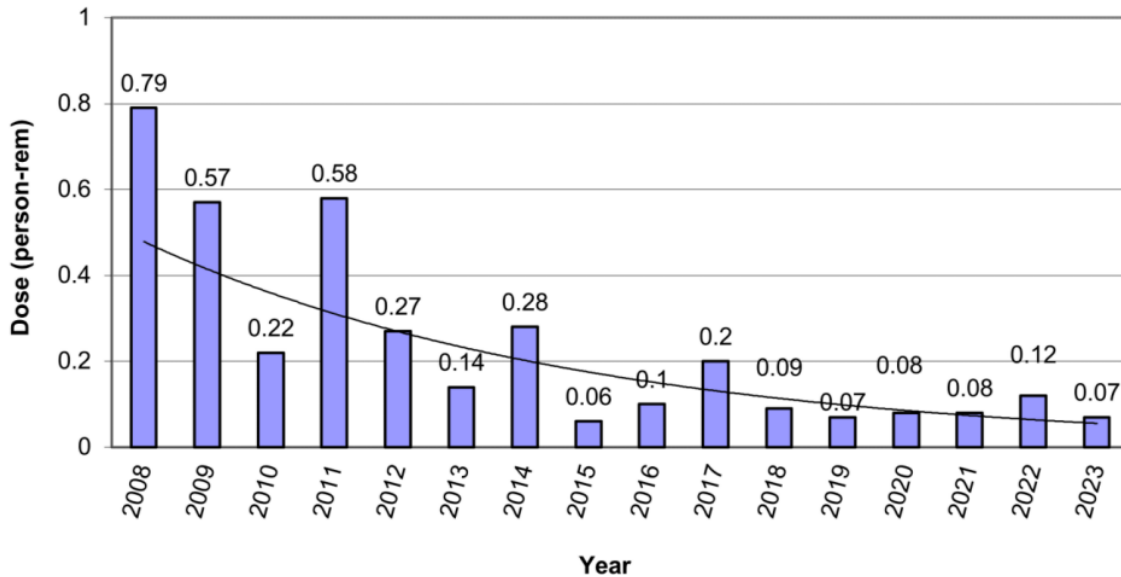
<sup>9</sup> The 6.46-millirem dose in 2005 shown on Figure 3.1.13-1 resulted from a leak at TA-53, and the 3.53-millirem dose in 2011 was from the remediation of Material Disposal Area B (LANL 2024a).

engineering controls at the LANSCE and the tritium facilities (LANL 2025c). None of these peaks were associated with operations at TA-55.



Source: LANL 2025c

Figure C.1.13-1 Trend in Annual MEI Dose at LANL



Source: LANL 2025c

Figure C.1.13-2 Trend in Annual Collective Dose to the Population within 50 Miles of LANL

Based on the information presented in Table C.1.13-2, the risk of the hypothetical MEI developing an LCF from exposure to LANL radiological air emissions would be a maximum of  $2.4 \times 10^{-7}$  (or about 1 chance in 4.2 million). The projected number of LCFs to the population within a 50-mile radius of LANL would be about  $5.4 \times 10^{-5}$  (or about 1 chance in about 18,500). For perspective, this number may be compared with the number of fatal cancers expected in the same population from all causes. The latest mortality rate associated with cancer for the entire U.S. population in 2022 (for which final data are available) was 141.5 per 100,000 people (USCSWG 2025). Based on this national cancer mortality rate, approximately 524 fatal cancers would be expected to occur annually in the population of approximately 370,000 people living within 50 miles of LANL.

As shown in Table C.1.13-2, the annual radiological dose from LANL is well below the applicable limits for radiation protection of the public. The dose to the MEI resulting from LANL operations is approximately 4 percent of the National Emissions Standards for Hazardous Air Pollutants (NESHAP) standard of 10 millirem per year (LANL 2025c). The dose to the MEI from LANL operations is also much less than one-tenth of one percent of the total dose from sources of natural radioactivity shown in Table C.1.13-1 above.

### **Nonradiological**

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media through which people may come in contact with hazardous chemicals (e.g., surface water during swimming or food through ingestion). Hazardous chemicals can cause cancer and noncancerous health effects. Sections C.1.3 (soils), C.1.4 (water resources), and C.1.5 (air quality) of this PEIS present the baseline data for assessing potential health impacts from the chemical environment.

Effective administrative and design controls that decrease hazardous chemical releases to the environment and help achieve compliance with permit requirements (e.g., via NPDES and NESHAP permits) contribute to minimizing health impacts on the public. The effectiveness of these controls is verified through the use of environmental monitoring information and inspection of mitigation measures. Health impacts on the public may occur through inhalation of air containing hazardous chemicals released to the atmosphere during normal LANL operations. Risks to public health from other pathways, such as ingestion of contaminated drinking water or direct exposure, are lower than those from inhalation (LANL 2025c). Los Alamos County monitors its water supply in compliance with the *Safe Drinking Water Act*, and LANL analyzed additional samples from Los Alamos County water supply wells in 2020. No water supply wells showed detections of Laboratory-related constituents above an applicable drinking water standard. The drinking water supply meets NMED and EPA drinking water standards, and no adverse health impacts are expected. With regard to soil, plants, and animals, 2021 sampling results for contaminants were similar to previous years and no chemical concentrations above human-health-based screening criteria were detected at any offsite locations (LANL 2025c).

Section C.1.5 of this PEIS addresses the baseline air emission concentrations and applicable standards for hazardous chemicals. The baseline concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. The Laboratory's emissions of regulated pollutants are below the amounts allowed in LANL's CAA Title V Operating Permit. There are no measurable health effects to the public from the Laboratory's current air emissions (LANL 2025c).

Beryllium metal, alloys, and compounds are used at LANL. Beryllium is identified with respiratory and immune system toxicity and is regulated under both state and federal programs. Although the State of New Mexico does not have an ambient air quality standard for beryllium, beryllium concentrations are monitored at over 20 sites located near potential beryllium sources at LANL or in nearby communities. For comparison purposes, the results are compared to the ambient standard from the NESHAP standard for beryllium of 10 nanograms per cubic meter (40 CFR Part 61, Subpart C). DOE is not required to monitor to this standard because all beryllium-permitted sources meet the emission standards, but it is used in this case for comparative purposes. In 2022, all monitored beryllium values were less than the NESHAP standard (NNSA 2026).

### **Cancer Incidences**

The National Cancer Institute publishes national, state, and county incidence rates of various types of cancer (NCI 2025). However, the published information does not provide an association of these rates with their causes, (e.g., specific facility operations and human lifestyles). Table C.1.13-4 presents incidence rates for the U.S., New Mexico, and the four counties surrounding LANL (Los Alamos County, Rio Arriba County, Sandoval County, and Santa Fe County).

**Table C.1.13-4 Cancer Incidence Rates<sup>a</sup> for the U.S., New Mexico, and Adjacent Counties, 2017–2021**

Location	All Cancers	Thyroid	Breast	Lung and Bronchus	Leukemia	Prostate	Colon and Rectum
United States	444.4	12.9	129.8	53.1	14.1	113.2	41.3
New Mexico	370.7	14.8	116.3	32.7	12.4	86.9	37.4
Los Alamos County	379.1	(b)	126.7	20.4	13.8	129.4	(b)
Rio Arriba County	302.9	10.2	93.8	24.3	(b)	77.9	34.6
Sandoval County	406.3	17.7	126.0	33.4	13.5	96.0	34.9
Santa Fe County	355.6	13.6	139.4	24.5	9.7	93.5	31.3

a Age-adjusted incidence rates; cases per 100,000 persons per year.

b Data has been suppressed to ensure confidentiality and stability of rate estimates. Counts are suppressed if fewer than 16 records were reported in a specific area-sex-race category.

Source: NCI 2025

As shown in the table, most cancer incidence rates in New Mexico and the counties surrounding LANL are lower than the rates for the U.S. Within the four counties surrounding LANL, Los Alamos County and Sandoval County generally have higher cancer incidence rates for most cancer types.

#### **C.1.13.2 Worker Health**

All employees at LANL are required to know and understand the ES&H requirements of their assignment, the potential hazards in the work area, and the controls necessary for working safely. Employees must participate in all required ES&H training and health monitoring programs. All work assignments must be performed in full compliance with applicable ES&H requirements as published in LANL policies and procedures and established in safety procedures. All employees are responsible for working in a manner that produces high-quality results, preserves environmental quality, and protects the health and safety of workers and members of the public.

The LANL Integrated Safety Management System addresses the identification of workplace hazards, control measures, safe work practices, and feedback and continuous improvement functions necessary to perform work safely at LANL. This program articulates the institutional requirements for all operations at LANL or at any other sites where LANL personnel and contractors are working.

When the LANL mission is fulfilled through collaborations, both onsite and offsite, potential impacts could also include worker exposure to electrical, low-level radiological, and transportation hazards. However, work activities would be performed in accordance with federal and state regulations, and the personnel safety exposures to radiological sources would be maintained within established administrative limits. Additionally, offsite transport of radiological materials and wastes are performed in accordance with USDOT regulations, as well as DOE/NNSA and LANL procedures.

The regulations at 10 CFR Part 835 establish radiation protection standards, limits, and program requirements for protecting workers from ionizing radiation resulting from the conduct of DOE/NNSA activities and requires DOE/NNSA contractors to develop and maintain an approved radiation protection program. LANL’s Radiation Protection Program governs radiological activities at LANL and offsite locations. As noted in the Program, LANL’s radiological support operations may include, when requested by DOE/NNSA, support of offsite activities or events involving radiation-generating devices and sealed radioactive sources.

Additionally, DOE Order 458.1 establishes requirements to protect the public and the environment against undue risk from radiation associated with DOE/NNSA-directed activities. Public radiological doses at LANL, as well as for offsite DOE/NNSA-directed activities, are reported in the LANL annual site environmental reports. Radiological doses generated by these operations are consistently found to be well below the applicable limits for radiation protection of the public.

### **Radiological**

LANL workers receive the same dose as the general public from background radiation but also receive an additional dose from working in facilities with radiological materials and radiation-generating devices, such as accelerators or from performing environmental remediation activities. Table C.1.13-5 presents the annual average individual and collective worker doses from LANL operations during the period 2021–2023. These doses fall within the regulatory limits presented in Table C.1.13-2 above.

**Table C.1.13-5 Radiation Doses to LANL Workers from Operations**

Occupational Personnel	From External Releases and Direct Radiation			
	2021	2022	2023	Average
Number of workers receiving a measurable dose	4,026	4,444	3,646	4,039
Total (collective) worker dose (person-rem)	300	366	306	324
Average worker dose (millirem) <sup>a</sup>	73	82	84	80

CFR = Code of Federal Regulations; LANL = Los Alamos National Laboratory

a No standard is specified for an “average radiation worker”; however, the radiological limit for an individual worker is 5,000 millirem per year (10 CFR Part 835). At LANL, an administrative control level of 2 rem (2,000 millirem) per year has been established for external exposures (LANL 2024a).

Source: DOE 2023a; LANL 2022a, 2025c, 2025d

Based on the dose-to-risk conversion factor of 0.0006 LCF per 1 person-rem, the annual LCF risk to an average LANL worker due to radiation exposure from LANL operations is estimated to be  $4.8 \times 10^{-5}$ . Statistically, the probability of a worker developing a fatal cancer at some point in the future from radiation exposure associated with one year of LANL operations is about 1 in 21,000. No excess fatal cancers are projected in the total worker population from one year of normal operations. Since 2020, no worker exceeded the 2 rem per year LANL administrative control level established for external exposures; however, a total effective dose of 2 rem was exceeded by one worker due to an abnormal event on June 8, 2020 (LANL 2023).

Changes in workload and types of work at nuclear facilities—particularly the TA-55 Plutonium Facility—tend to drive increases or decreases in the LANL annual collective dose. The TA-55 Plutonium Facility operations accounted for the majority of occupational dose at LANL in 2022, which is consistent with past operations at LANL. Occupational dose was accrued from pit production, plutonium-238 work that produces general-purpose heat sources and radioisotope thermoelectric generators, weapons stewardship and manufacturing work, materials recovery and repackaging, and construction and maintenance at the TA-55 Plutonium Facility. The top 25 doses at LANL in 2023 were accrued by individuals who conducted these plutonium facility operations. An increase in work at TA-55 led to an increase in the number of personnel across multiple shifts, contributing to the increase in the annual collective dose (LANL 2025d). For 2023, the collective worker dose for workers at TA-55 represented 85 percent of the total LANL worker dose site-wide.

### **Nonradiological**

LANL is a research site in which a large variety of hazardous materials are used. LANL operations represent a potential for exposure of some workers to hazardous materials (such as solvents, metals, and carcinogens). Typically, operations are controlled through specific work control documents so that those workers are only exposed to low levels of chemicals that are below a threshold of concern.

Workers are provided with information and training on identified hazards and follow requirements in specific work control documents to protect them and minimize hazards and exposures. LANL has several programs and procedures in place to provide direction for monitoring, handling, storing, and using hazardous materials. Work activities are periodically monitored with measurements performed at personal breathing zones and general work areas. ES&H monitoring records indicate that personnel exposure to hazardous materials is maintained well below established regulatory requirements and exposure guidelines.

Under 10 CFR Part 851, DOE lists the requirements for a worker safety and health program to ensure that DOE contractors and their workers operate a safe workplace. It establishes procedures for investigating whether a violation of a requirement of this part has occurred, for determining the nature and extent of any such violation, and for imposing an appropriate remedy. In addition, 10 CFR Part 851 incorporates many Occupational Safety and Health Administration (OSHA) requirements and other protections. Appropriate monitoring that reflects the frequency and quantity of chemicals used in the operational processes ensures that these standards are not exceeded. DOE also requires that conditions in the workplace minimize recognized chemical hazards that cause, or are likely to cause, illness or physical harm.

## **Occupational Injuries**

LANL’s occupational health and safety performance is measured by injury and illness rates (total recordable case and days away, restricted, or transferred) pursuant to DOE Orders that use OSHA criteria. As shown on Table C.1.13-6, the number of total recordable cases at LANL has varied between 201 and 248 over the period 2021–2023, averaging approximately 234 work-related injuries or illnesses annually that result in either death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. “Days away, restricted, or transferred” represent severe injuries annually. As shown in Table C.1.13-6, the number of “days away, restricted, or transferred” cases at LANL has varied between 59 and 101 over the past three years, averaging approximately 74 work-related severe injuries or illnesses annually that result in days away from work or days of job restriction or transfer.

**Table C.1.13-6 Occupational Injury Statistics for LANL**

<b>Parameter</b>	<b>2021<sup>c</sup></b>	<b>2022</b>	<b>2023</b>	<b>Average</b>
Number of TRCs <sup>a</sup>	227	201	248	234
Number of DART Cases <sup>b</sup>	101	59	63	74

DART = days away, restricted time; LANL = Los Alamos National Laboratory; TRCs = total recordable cases

a Number of TRCs: The total number of work-related injuries or illnesses that resulted in either death, days away from work, days of restricted work activity, or days of job transfer.

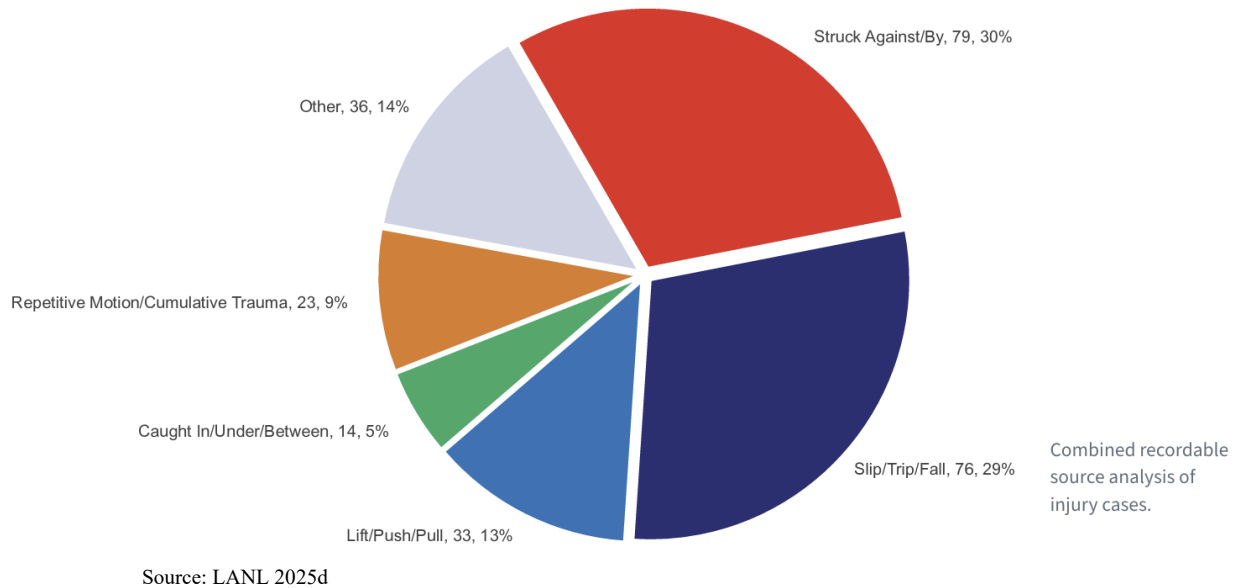
b DART Case: An injury or illness case where the most serious outcome of the case resulted in days away from work or days of job restriction or transfer.

c Cases from 2021 include work-related COVID-19 cases.

Source: DOE 2025a

During normal operations, LANL workers may be exposed to hazardous conditions that can cause injury or death. The potential for health impacts varies among facilities and workers. Figure C.1.13-3 depicts the types of occupational injuries at LANL for the total recordable cases in 2023. In 2023, 72 percent of recordable injury cases resulted from three common causes: struck against/by (30 percent), slip/trip/fall (29 percent), and lift/push/pull cases (13 percent). No work-related fatalities occurred at LANL between 2020 and 2023 (LANL 2025d; NNSA 2026).

Workers are protected from workplace hazards through appropriate training, protective equipment, monitoring, materials substitution, and engineering and management controls. Under 10 CFR Part 851, DOE lists the requirements for a worker safety and health program to ensure that DOE contractors and their workers operate a safe workplace. DOE establishes procedures for investigating whether a violation of a requirement of this part has occurred, for determining the nature and extent of any such violation, and for imposing an appropriate remedy. In addition, 10 CFR Part 851 incorporates many OSHA requirements and other protections. Appropriate monitoring that reflects the frequency and quantity of chemicals used in the operational processes ensures that these standards are not exceeded. DOE also requires that conditions in the workplace minimize hazards that cause, or are likely to cause, illness or physical harm.



**Figure C.1.13-3 LANL Recordable Injury Data, 2023**

## C.2 Savannah River Site

Sections C.2.1 through C.2.13 provide information related to the affected environment for each environmental resource area within the ROIs for SRS. The SRS ROIs are presented in Chapter 3, Table 3.2-1.

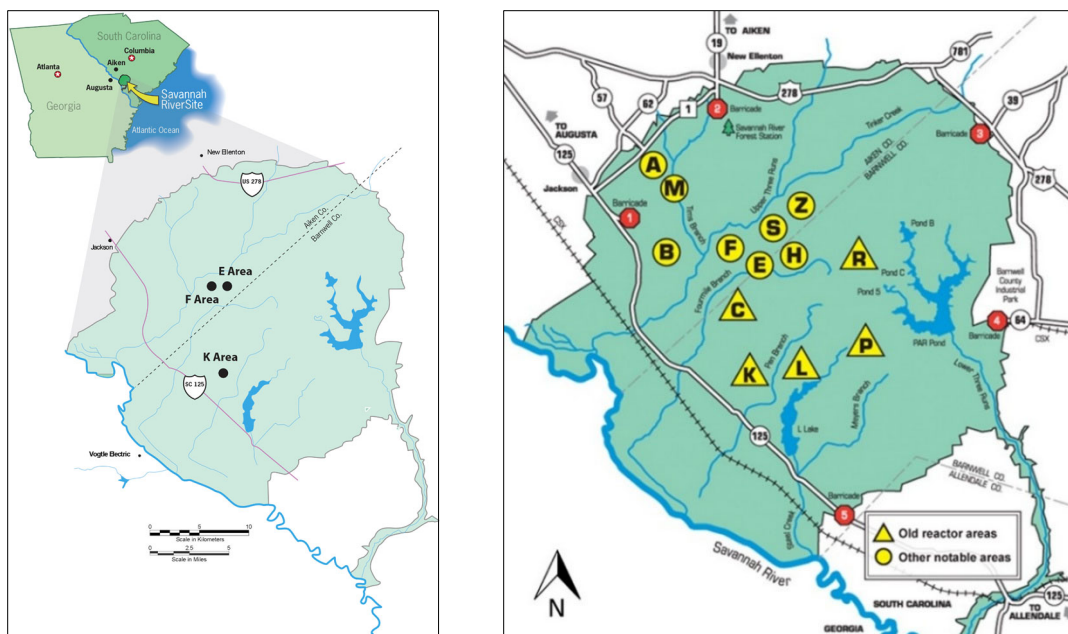
### C.2.1 Land Use

This section describes the existing onsite land uses at SRS, with a particular focus on F Area within the Industrial Core, which was originally developed in the early 1950s. Land within a six-mile radius of F Area lies entirely within SRS's boundaries and is used for industrial purposes associated with SRS and as forest land. This section also addresses adopted land use designations, ownership, and management of the surrounding areas on and off site. Owners and managers of land in the SRS ROI include federal and local governments as well as private organizations and individuals.<sup>10</sup>

#### C.2.1.1 Location and Setting

SRS is located along the Savannah River in the sandhills area of three western South Carolina counties: Aiken, Allendale, and Barnwell. SRS encompasses a circular area of approximately 310 square miles (about 198,400 acres). It is sited in a generally rural area about 15 miles southeast of Augusta, Georgia, and 12 miles south of Aiken, South Carolina, the nearest population centers (*see* Figure C.2.1-1). SRS is a controlled area, with public access limited to through traffic on State Highway 125 (SC 125), U.S. Highway 278 (US 278), and the CSX railway line as shown on Figure C.2.1-1.

<sup>10</sup> There are no federally recognized Tribal lands in the immediate vicinity of SRS. The nearest such lands belong to the Catawba Indian Nation, located more than 100 miles north of the site.



Source: NNSA 2020a

**Figure C.2.1-1 Location of the Savannah River Site**

Regional land uses in the vicinity of SRS include agricultural, recreational, industrial, and, to a lesser extent, urban and residential. SRS is bordered mostly by forest and agricultural land. The nearest residences are located to the west, north, and northeast of SRS, some within 200 feet of the SRS boundary (NNSA 2020a).

**C.2.1.2 Existing Onsite Land Uses**

SRS is largely undeveloped except for the major industrial areas, where development is concentrated. Land use at SRS can be classified into three major categories: forest/undeveloped, water/wetlands, and developed facilities. When the area was originally acquired by the Federal government in 1950 for development of the site, approximately 67 percent was forested, and 33 percent was in cropland or pastureland. Presently, open fields and forests make up 73 percent of the site, while 22 percent is wetlands, streams, and two lakes. Production and support areas, roads, and utility corridors account for the remaining five percent of the land area (NNSA 2020a). The current uses of the land that makes up SRS are provided in Table C.2.1-1.

**Table C.2.1-1 Current Land Use on SRS**

SRS Land Use	Area (acres)	Percent
Primary SRS Missions/Mission Support (Industrial Areas)	14,076	7
Research Set-Aside Areas	14,005	7
Land Buffer for Nuclear Activities, Natural Resource Management, and Military Use	158,281	80
Non-Federal Uses <sup>a</sup>	11,982	6
<b>SITE TOTALS</b>	<b>198,344</b>	<b>100</b>

SRS = Savannah River Site

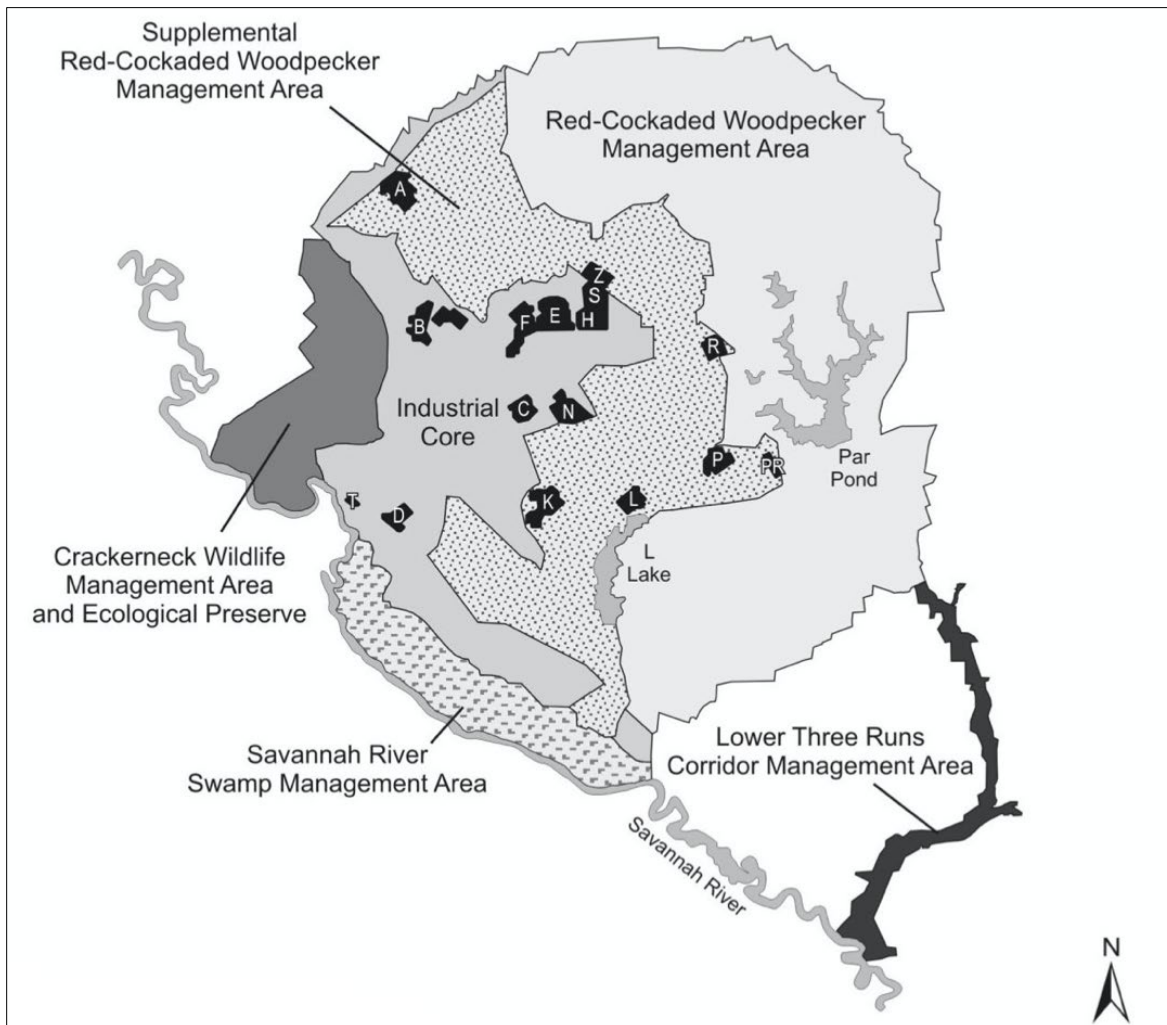
<sup>a</sup> Includes lands held by the University of Georgia, Three Rivers Solid Waste Authority, South Carolina Department of Natural Resources, and SBA Towers and Allied Wireless via leases, permits, or cooperative agreements.

Source: DOE 2015

In 1972, all of SRS was designated a National Environmental Research Park. The purpose of the National Environmental Research Park is to conduct research and education activities to assess and document environmental effects associated with energy and weapons material production, explore methods for eliminating or minimizing adverse effects of energy development and nuclear materials on the environment, train people in ecological and environmental sciences, and educate the public. DOE has also established a set-aside program to provide reference areas for understanding human impacts on the environment. The SRS set-aside program currently contains 30 research reserves totaling 14,006 acres (NNSA 2020a).

### C.2.1.3 Planning (Management) Areas

As depicted in Figure C.2.1-2, SRS is divided into six management areas based on existing biological and physical conditions, operations capability, and suitability for mission objectives: (1) Industrial Core Management Area; (2) Red-Cockaded Woodpecker Management Area; (3) Supplemental Red-Cockaded Woodpecker Management Area; (4) Crackerneck Wildlife Management Area and Ecological Preserve; (5) Savannah River Swamp Management Area; and (6) Lower Three Runs Corridor Management Area.



Source: NNSA 2020a

**Figure C.2.1-2 SRS Management Areas**

The 38,444-acre Industrial Core Management Area contains the major SRS facilities. The primary objective of this area is to support facilities and site missions. Other important objectives of the SRS management areas are to promote conservation and restoration, provide research and educational opportunities, and generate revenue from the sale of forest products.

**F Area.** The F Area, located near the center of SRS and entirely within the Industrial Core Management Area, is a highly developed operations zone comprising approximately 364 acres. It is situated approximately 5.8 miles from the SRS boundary and contains a mix of nuclear, industrial, warehouse, laboratory, and administrative facilities (NNSA 2020a).

The proposed pit production activities at SRS would largely be housed within the Savannah River Plutonium Processing Facility (SRPPF) complex and would be sited within F Area, incorporating and repurposing what was previously referred to as the Mixed-Oxide Fuel Fabrication Facility (MFFF). Construction of the MFFF began in August 2007 and was halted in October 2018. Redevelopment of the MFFF to provide the necessary structures for the SRPPF is ongoing. The SRPPF structure comprises three floors and approximately 400,000 square feet of enclosed space. The facility stands approximately 73 feet above grade and occupies a footprint of 120,000 square feet. The broader SRPPF complex includes additional adjacent structures such as large reinforced concrete facilities, support buildings, trailers, and parking areas (NNSA 2020a).

**Historical and Current Operations.** F Area has historically supported chemical separation and nuclear materials processing missions. Three key legacy facilities—F-Canyon, FB Line, and 235-F (also referred to as the F Area Materials Storage (FAMS) facility)—remain in surveillance and maintenance status under long-term site stewardship (SRS 2023a).

- **F-Canyon** was one of two chemical separations facilities at SRS. Commissioned in the 1950s, its operational mission involved recovery of plutonium-239 (Pu-239) and uranium-238 (U-238) through chemical dissolution and separation of irradiated aluminum-based fuel elements. Pu-239 was used in weapons production; U-238 was recovered as depleted uranium oxide for later disposal. Production activities ceased in March 2002, and deactivation of most systems was completed by August 2006, with remaining systems still undergoing deactivation. F-Canyon is currently used in part for TRU waste remediation.
- **FB Line**, located atop F-Canyon, was constructed in the early 1960s to convert Pu-239 nitrate solution into solid form. Stabilization and packaging operations concluded in March 2002, with complete de-inventory in February 2005 and deactivation finalized in June 2006. The facility is now fully deactivated and maintained in surveillance status.
- **FAMS (235-F)** is a two-story, 50,000-square-foot facility located at the rear of F Area. Originally designed for Pu-239 processing but never used for that purpose, the facility later supported neptunium target fabrication for Pu-238 production and contributed to NASA space missions through encapsulated Pu-238 fabrication. The facility's research role concluded in the 1980s. All nuclear materials have since been removed from the building, and it is now maintained for surveillance only.

#### C.2.1.4 Surrounding Land Uses

Lands in the vicinity of SRS are predominantly undeveloped, forested, or used for agricultural purposes, consistent with land use patterns of the upper Coastal Plain. For the purposes of this analysis, surrounding lands are categorized into four general classes:

1. **Federal Land.** The SRS itself is federally owned and managed by DOE/NNSA. In addition, federally managed research and conservation programs are administered across the site, including extensive forest stewardship by the USFS under the Savannah River Forest Station. Much of the surrounding federal land remains in a natural or semi-natural state and is used for environmental monitoring, habitat conservation, and national security missions.
2. **State Land.** The Yuchi Wildlife Management Area, operated by the Georgia Department of Natural Resources' Wildlife Resources Division, is located directly south of SRS across the Savannah River in Burke County, Georgia. The 7,800-acre area provides opportunities for hunting (deer, turkey, small game) and includes designated camping areas. The site contributes to regional habitat preservation and recreational use adjacent to the SRS (GDNR 2025).
  - The Chem-Nuclear Site, a state-licensed LLW disposal facility operated by EnergySolutions, is located east of SRS in Barnwell County near the town of Snelling. The facility encompasses approximately 235 acres and has operated since 1971 under state ownership (SCDES 2025a).
3. **Private Land.** Lands surrounding SRS are predominantly private and are characterized by a mixture of forested tracts, agricultural operations, low-density residential development, and limited industrial activity. Regional land uses in the vicinity of SRS include agricultural, recreational, industrial, and, to a lesser extent, urban and residential uses. The site is bordered primarily by silviculture and agricultural lands, with the nearest residential dwellings located to the west, north, and northeast—some within 200 feet of the SRS boundary. Agricultural activity in the region, particularly within Aiken, Allendale, and Barnwell counties, is diverse and includes the cultivation of corn, hay, peanuts, cotton, and winter wheat. Open water and non-forested wetlands are also present along the Savannah River Valley, contributing to the region's ecological complexity.
  - The towns of New Ellenton and Jackson, situated directly northwest of SRS, are the closest population centers. Farther northwest, approximately 15 miles from the site across the Savannah River, lies the city of Augusta, Georgia—the largest urban center in the region. Augusta serves as a regional hub for commerce, health care, and transportation.
  - Industrial development is also present within a 25-mile radius of SRS. Key facilities include textile mills, polystyrene foam and paper manufacturing plants, chemical processing facilities, and energy infrastructure such as the Barnwell LLW Disposal Facility and Plant Vogtle, detailed below.
4. **Utility Infrastructure.** South of SRS, also across the Savannah River in Waynesboro, Georgia, is the Alvin W. Vogtle Electric Generating Plant (Plant Vogtle). This nuclear facility includes four operating reactor units; Units 1 and 2 entered service in 1987 and 1989, respectively, while Units 3 and 4 began commercial operation in 2023 and 2024. The plant is co-owned by Georgia Power, Oglethorpe Power Corporation, the Municipal Electric Authority of Georgia, and Dalton Utilities. As of 2024, Plant Vogtle is the largest single-site generator of nuclear energy in the U.S.<sup>11</sup> The plant has also maintained certification as a wildlife habitat under the Wildlife Habitat Council since 1993 (Southern Nuclear 2025).

### C.2.2 Aesthetic and Scenic Resources

The proposed actions at SRS would occur within the site boundaries, with activities primarily concentrated in F Area. The visual ROI includes F Area and views of the associated facilities from

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<sup>11</sup> Plant Vogtle has a rated total generating capacity of approximately 4,800 MW, or about 2.3 times the capacity of the Hoover Dam (2,080 MW) (Southern Nuclear 2025).

within the SRS property. The visual character of the lands surrounding SRS differs substantially from that of LANL; the relatively uniform topography and extensive forest cover surrounding SRS effectively screen onsite facilities from public viewpoints located offsite. Consequently, the offsite visual environment is not anticipated to be affected by the proposed actions and is addressed in less detail in this analysis compared to the discussion provided for LANL in C.1.2.

### C.2.2.1 Onsite Visual Environment

SRS consists primarily of natural or managed forest lands, with only five percent of its surface area developed for industrial and administrative uses. The SRS landscape is characterized by wetlands and upland hills. Vegetation includes bottomland hardwood forests, scrub oak and pine forests, and forested wetlands. The viewshed, which is the extent of the area that may be viewed from SRS, consists mainly of forested land. The closest urban area, Aiken, South Carolina, is 12 miles from SRS. Viewpoints affected by DOE facilities are primarily associated with the public access roadways through SRS and the CSX railway. There are no visually sensitive locations on SRS.

Most of the large facilities are in the interior portions of the site in the Industrial Core Management Area (*see* Figure C.2.1-2) and are not visible to the general public because of their distance from the site boundary or the presence of natural forest screening adjacent to public access roads. While facilities are scattered throughout SRS in different management areas, they are primarily concentrated in the core and are brightly lit at night. The only areas visually impacted by the SRS facilities are those within the view corridors of SC 125 and US 278.

**F Area.** The F Area is located approximately 3.5 miles from SC 125 and approximately 6.0 miles from US 278. Public views of the facilities within F Area are effectively screened by densely forested areas and the relatively flat terrain bordering segments of both SC 125 and US 278. In addition, the F Area facilities are not visible from the Savannah River, which lies approximately 6.5 miles to the southwest.

As depicted in Figure C.2.2-1 the industrial facilities within F Area include prominent large-scale concrete structures such as the F-Canyon, FB Line, FAMS, and the SRPPF, which is undergoing modification. In addition to these primary facilities, the F Area contains various smaller administrative and support buildings, temporary trailers, and associated infrastructure such as parking lots.

Other significant infrastructure within F Area includes the F-Tank Farm (FTF), which comprises 22 of the 51 tanks in the SRS's Tank Farms (*see* Figure C.2.2-2). The FTF consists of 22 below-grade carbon steel and reinforced concrete tanks. The tanks of the FTF measure approximately 80 to 100 feet in diameter, with a height (below grade) of approximately 23 feet.

Structural heights within F Area range from approximately 10 feet to 73 feet, with select stacks and towers extending up to approximately 200 feet in height. The existing visual character of the F Area is consistent with a VRM Class IV designation, which allows for significant modification of the natural landscape where visual change is considered acceptable.

Lands surrounding the F Area to the south, west, and north consist of forested preservation areas, characterized by contiguous hardwood and mixed pine forests that provide substantial visual screening. To the east of F Area lies the E Area, which is also developed for industrial purposes. Figure C.2.2-3 provides a land cover map for SRS and the surrounding region.



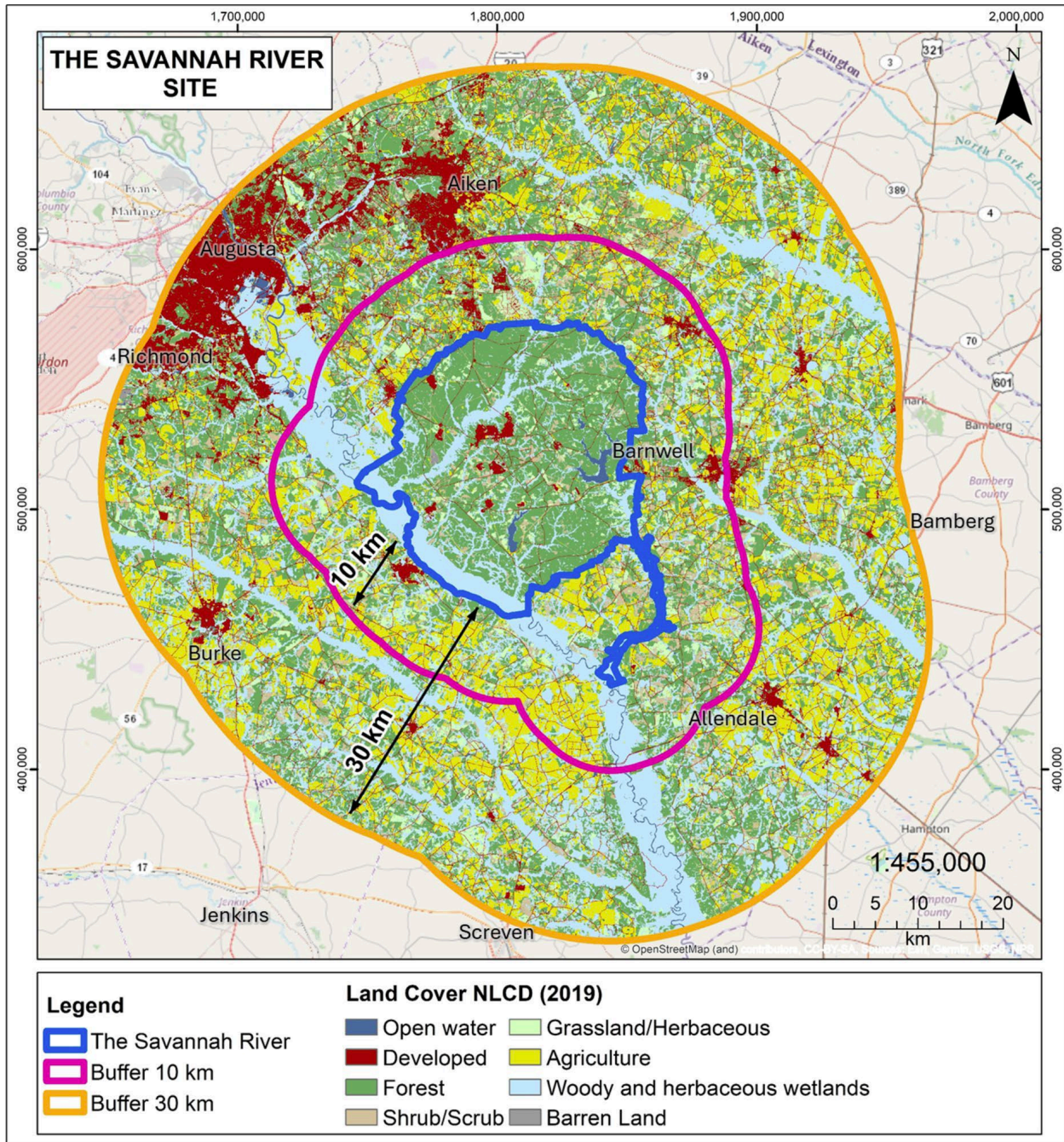
Source: DOE 2023b

**Figure C.2.2-1 Aerial View of the F Area**



Source: DOE 2025c

**Figure C.2.2-2 Aerial View of the F-Tank Farm**



Source: Burger 2025

**Figure C.2.2-3 Land Cover Types on SRS and Surrounding Areas**

**C.2.2.2 Offsite Visual Environment**

Similar to conditions at LANL, the visual environment surrounding SRS is characterized by continuity with the onsite landscape. Adjacent properties primarily consist of private rural lands and agricultural holdings. There are no federally protected lands, such as national parks or national

forests, nor any federally recognized tribal lands contiguous with or located in close proximity to SRS.<sup>12</sup>

The only identified visually sensitive area within the offsite viewshed is the Yuchi Wildlife Management Area, situated across the Savannah River to the south-southwest of SRS. Immediately north of this area lies Plant Vogtle, a commercial nuclear power facility occupying approximately 3,100 acres (onX Maps 2025).

Vegetative cover throughout the surrounding landscape obstructs practically all views toward onsite development and actions at the core of SRS from offsite locations. Consequently, there are virtually no visual exposures or impacts to sensitive receptors in the offsite environment, except for potential limited visibility associated with transportation corridors.

### **C.2.3 Geology and Soils**

This section describes the geological and topographical characteristics of the SRS site and the SRPPF location. It also covers SRS stratigraphy, faulting and seismicity, soils and foundation stability, and mineral resources.

#### **C.2.3.1 Geologic and Topographic Setting**

The SRS site sits on the Aiken Plateau, which is part of the southeastern Atlantic Coastal Plain. This area is characterized by a wedge of unconsolidated river and marine sediments. The center of SRS is about 25 miles southeast of the geologic fall line, where the Coastal Plain's sandy soils meet the rockier terrain of the foothills.

Older, eroded geological formations at SRS are covered by younger, loosely consolidated Coastal Plain sediments (SRNS 2019a). This eroded surface slopes approximately 37 feet per mile to the southeast. The Atlantic Coastal Plain sediments in South Carolina are made up of layers of sand, clay, limestone, and gravel that gently slope towards the sea. Near the coast, this sedimentary wedge is about 4,000 feet thick (CB&I AREVA 2015).

The Aiken Plateau, which covers the central and northeastern parts of SRS, is heavily eroded, featuring broad flat areas cut by narrow, steep-sided valleys. The southwestern portions of SRS are on erosional terraces, formed by repeated marine retreats during glacial periods between 10,000 and 1 million years ago (NNSA 2015). Near the center of SRS, the Atlantic Coastal Plain sedimentary sequence is roughly 1,000 feet thick and consists of sand, clay, and silt formations.

There are no volcanic features at SRS. The area has not experienced volcanic activity within the last 230 million years. Future volcanism is not expected because SRS is located along the passive continental margin of North America.

#### **C.2.3.2 SRS Stratigraphy**

The sedimentary rocks at SRS are categorized into formations based on their distinct characteristics. One notable formation is the Tinker/Santee, a 50- to 70-foot-thick layer of yellow and tan sand, calcareous sand, and limestone (CB&I AREVA 2015). This layer is important because it contains small, discontinuous calcareous sand zones, also known as "soft zones." These

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<sup>12</sup> The nearest federally designated National Forest, Monument, Park, or Wilderness Area to SRS is the Long Cane Ranger District of the Sumter National Forest, located approximately 23 miles northwest of the site (onX Maps 2025).

areas, where sand contains calcium carbonate, are susceptible to dissolution by water, which could lead to ground subsidence (NNSA 2015).

Soft zones are found across SRS, becoming more common towards the southeast. They are composed of soil, not open water-filled cavities. Exploratory borings in the F, H, K, and S Areas have encountered these soft zones at depths between 100 and 150 feet. Soft zones at SRS are limited in areal extent, less than approximately 15 ft thick, and are poorly interconnected. Soft zones at SRS are stable under static conditions and have withstood the effects of past earthquakes (NNSA 2020a). Early U.S. Army Corps of Engineers studies identified these soft zones as a potential concern for facility foundation design.

### C.2.3.3 Faulting and Seismicity

The only known seismic hazard within 200 miles of SRS is the Charleston seismic zone, located approximately 70 miles southeast. Extensive investigations confirm that no other capable or active faults in this radius significantly influence regional seismicity, excluding the less-defined faults within the Charleston zone (NRC 2005; CB&I AREVA 2015). While no faults are visible at the surface in the SRS area, subsurface profiling and core drilling have revealed several northeast-trending reverse faults in the Cretaceous and early Tertiary strata. These faults do not reach the surface and thus cause no ground-level displacement.

The Charleston and Summerville, South Carolina areas are the most seismically active regions potentially affecting SRS (about 90 miles to the southeast), with nearly three centuries of data available. However, earthquake activity is typically low, with most magnitudes at or below 3.0 on the Richter scale. The 1886 Charleston earthquake, estimated at magnitude 6.8, was the most damaging in the southeastern U.S. and one of the largest historical shocks in eastern North America. At SRS, its estimated magnitude ranged from 6.5 to 7.5, causing widespread destruction in Charleston, 60 fatalities, and structural damage hundreds of miles from the epicenter. The SRS area experienced an estimated PGA of 0.10g during this event (NRC 2005).

#### Peak Ground Acceleration (PGA)

A measure of the maximum horizontal acceleration (as a percentage of the acceleration due to the earth's gravity) experienced by a particle on the surface of the earth during the course of earthquake motion.

Local seismic activity around the SRS site involves occasional small, shallow earthquakes. These events are generally linked to strain release near minor faults, intrusive bodies, or the edges of metamorphic geological formations (WSRC 2000). Between 1973 and 2024, the USGS recorded six earthquakes greater than magnitude 2.5 (the largest earthquake was a magnitude 3.2) on or near SRS (USGS 2025c). Earthquakes of these magnitudes are usually imperceptible to humans but are detected by seismic instruments and are unlikely to cause structural damage. Therefore, earthquakes capable of causing structural damage are not expected to originate near the SRS (NNSA 2015).

The latest USGS seismic hazard data indicates a maximum probabilistic peak horizontal PGA of between approximately 0.13g and 0.20g for F Area, based on a 2-percent exceedance probability in 50 years, corresponding to an annual occurrence probability of about 1 in 2,500 (USGS 2025d). Most of the PGA is related to the proximity of SRS to the Charleston seismic zone and not from locally generated earthquakes or from more distant moderate-sized earthquakes in the region.

### C.2.3.4 Soils and Foundation Stability

The SRS site features a wide variety of soils that can change significantly even over short distances. These soils range from seasonally wet (hydric) to well drained, and their composition varies from predominantly sandy (with high water permeability) to clay-rich (with low water permeability). Generally, the uplands and ridges have excessively or well-drained sandy soils, while stream terraces and floodplains contain poorly to moderately well-drained loamy-clayey soils.

Significant areas at SRS have soils with altered profiles up to six feet deep, making identification difficult. Within the fenced perimeters of E, F, H, K, and S Areas, most soils have been disturbed to make way for buildings, parking lots, and roads. These disturbed soils are classified as urban land where they are covered by structures. Otherwise, they consist of well-drained, heterogeneous materials—often compacted spoil or refuse from major construction and excavation (NNSA 2015).

During the initial planning for construction of the SRPPF building, both natural and engineered slopes were assessed. The closest engineered slopes are 15 feet high and located over 400 feet north and west of the SRPPF structures (CB&I AREVA 2015). The area is characterized by shallow, poorly drained, elliptical depressions termed Carolina bays with associated sand rims within the surface sediments. A total of 197 of these features have been identified at SRS (CB&I AREVA 2015). The most likely explanation for their formation is that strong, unidirectional winds acting on ponded surface water created waves, forming sand rims perpendicular to the wind direction as shoreline features. Slope stability from the existing topography and SRPPF's engineered modifications ensure proper drainage and erosion control.

As previously discussed, subsurface locations across SRS have soft zones interspersed within stronger materials at depths of 100 to 150 feet. Explorations show that soft zones near the SRPPF are isolated pockets of soft soil at depth (CB&I AREVA 2015). Subsurface soils at the SRPPF location have also been evaluated for their potential to liquefy during earthquakes. Using established groundwater levels and considering laboratory and geophysical parameters, investigations confirmed the structure's acceptability regarding liquefaction and post-earthquake dynamic settlement (CB&I AREVA 2015).

#### **Soil Monitoring**

Past activities have resulted in soil contamination at SRS. Soil sampling is carried out at locations across the SRS site, at the site perimeter, and at offsite locations as part of the surveillance monitoring program (SRNS 2024). Soil samples were collected at 24 locations in 2023, which included 5 onsite locations, 12 site perimeter locations, and 7 offsite locations. Radionuclide concentrations in soil vary greatly among locations because of differences in the patterns, retention, and transport of rainfall. Analyses detect uranium isotopes (uranium-233/234, uranium-235, and uranium-238) in the soil samples each year. Uranium is naturally occurring in soil and is expected to be present in the environment. Radionuclides detected above background levels included cesium-137, plutonium-238, plutonium-239/240, americium-241, and curium-233/244 (SRNS 2024, Appendix D). The maximum plutonium-238 and plutonium-239/240 activity of 0.039 pCi/g and 0.139 pCi/g, respectively, were detected in F Area (SRNS 2024, Appendix D). Dose assessments for all pathways considering exposure to contaminated soils are assessed in Section 3.2.13 and are below applicable regulatory limits (SRNS 2024).

### **C.2.3.5 Mineral Resources**

The mixed sands, gravels, and clays commonly found beneath SRS are widespread and therefore are of limited commercial value. A possible exception might be well-sorted quartz sand, which is valuable as a filtration medium, an abrasive, and engineering backfill. No sizable, economically valuable deposits of quartz sand are evident at the surface or in the shallow subsurface, and no viable geologic resources occur in F Area other than small gravel deposits (NNSA 2015).

### **C.2.4 Water Resources**

This section addresses surface water, groundwater, sediments, and floodplains located on SRS. Wetlands are discussed in Section C.2.7 of this PEIS as part of biological resources. Water resources in proximity to SRS may be affected by water withdrawals, effluent discharges, waste disposal, spills and unplanned releases, soil erosion, or stormwater runoff from SRS operations. The SRS area lies almost entirely within the Savannah River Basin. The consumption of domestic water is addressed in Section C.2.11 as an element of infrastructure.

#### **C.2.4.1 Surface Water**

SRS lies almost entirely within the Savannah River Basin and within the smaller area designated the Middle Savannah River watershed (SCDHEC 2025). Surface water drainage within the SRS is generally toward the Savannah River, the predominant surface water feature of the region, or toward tributaries that flow to the Savannah River. The river borders the southwest side of the site and also provides the demarcation between the states of South Carolina and Georgia. The only portion of SRS not draining toward the Savannah River is a small area on the northeast side, where drainage is eastward toward the Salkehatchie River and within the Salkehatchie River watershed (SCDHEC 2025).

The Savannah River along the SRS boundary has a wide channel with numerous tributaries and extensive floodplain swamps (NNSA 2015). The USGS maintains records on a Savannah River gauging station (identified as “USGS 021973269 Savannah River Near Waynesboro, GA”) adjacent to SRS. During the period 2005–2024, the average monthly river flow at SRS ranged from 5,280 cubic feet per sec (cfs) in November to 7,970 cfs in February, with a minimum monthly flow of 3,891 cfs in November 2012 (USGS 2025e).

In addition to the Savannah River along SRS’s southwestern border, several smaller streams, creeks, and their tributaries cross the site, some even originating within its boundaries. Figure C.2.4-1 provides an overview of the stream systems found within SRS. F Area lies roughly midway between Upper Three Runs Creek to the north and Fourmile Branch (also known as Fourmile Creek) to the south. Both streams drain to the southwest, eventually reaching the Savannah River. The northern portion of F Area is within the Middle Upper Three Runs local watershed (SCDHEC 2025), and the natural drainage for the area of the SRPPF is northward to the Upper Three Runs Creek. Par Pond and L Lake are manmade ponds that drain to Lower Three Runs and Steel Creek, respectively (Figure C.2.4-1). Other SRS surface water features not shown in the figure include roughly 50 small manmade ponds and 300 natural depressions, referred to as Carolina bays, that are capable of accumulating water from stormwater runoff. SRS operations do not include effluent discharges into any Carolina bays (NNSA 2015).

Surface water drainage on SRS occurs via five main streams that originate on, or pass through, the site. These streams—Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs—flow generally northeast to southwest and discharge to the Savannah River, with the

exception of Pen Branch, which discharges to the Savannah River floodplain swamp. No streams or tributaries at SRS are federally designated Wild and Scenic Rivers or state-designated Scenic Rivers (SCDNR 2018).

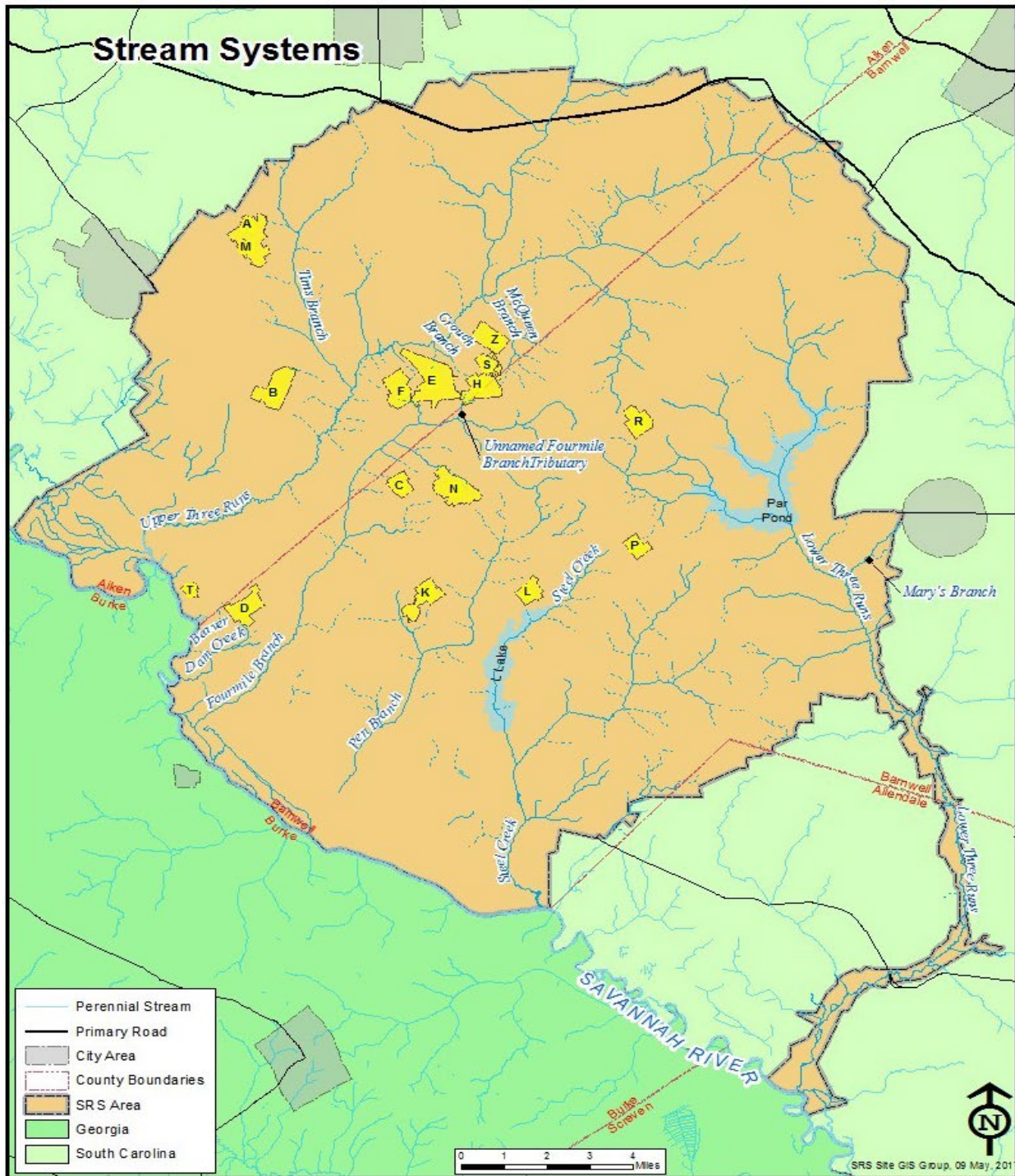


Figure C.2.4-1 Stream Systems within SRS Surface Water Quality

The Savannah River from SRS to near the city of Savannah is classified as a freshwater source (Class FW) that is suitable for primary- and secondary-contact recreation, drinking water supply (after conventional treatment), fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora, and industrial and agricultural uses (SCDES 2024a, 2025b). The Savannah River along SRS (as well as upstream and downstream from the site) is listed by the South Carolina Department of Environmental Services (SCDES) as impaired for fish consumption because of mercury contamination (SCDES 2024b, 2025b). Upper Three Runs, Fourmile Branch, and Lower Three Runs are listed by the state as impaired for recreational use (swimming) because of E. coli contamination (SCDES 2024b, 2025b). The nearest downstream water intake on the Savannah River is approximately 90 river miles from SRS.

The *South Carolina Surface Water Withdrawal, Permitting Use, and Reporting Act* regulates surface water withdrawals. This act applies to anyone withdrawing more than 3 million gallons of surface water during any one month. SRS has a surface water withdrawal permit and reports annual water use to the South Carolina Department of Environmental Services (SCDES; formerly SCDHEC). In 2023, SRS surface water use was within permitted limits (SRNS 2025). Water pumped directly from the Savannah River provides makeup water to L Lake, for L Area fire protection needs, and steam production (Ameresco Plant) (NNSA 2015, 2020a).

### **Industrial Effluents**

SCDES administers the NPDES program, which protects surface waters by limiting releases of pollutants into streams, reservoirs, and wetlands. SRS has one NPDES permit for industrial activities that discharge to surface water (SC0000175). A major goal of the NPDES program is to control or eliminate discharges of toxic pollutants, oil, hazardous substances, sediment, and contaminated stormwater to protect the quality of the nation's water. To achieve this goal, SCDES requires SRS to prepare the following plans:

- Best Management Practices Plan to identify and control the discharge of hazardous and toxic substances
- Industrial Stormwater Pollution Prevention Plan to address the potential discharge of pollutants in stormwater
- Spill Prevention, Control, and Countermeasures Plan to minimize the potential for discharges of oil, including petroleum, fuel oil, sludge, and oily wastewater

In 2023, 21 industrial wastewater outfalls were operated and monitored under the SRS NPDES permit (SRNS 2022), including four industrial wastewater outfalls in F Area. No exceptions to the permit requirements were reported for the 2023 monitoring of the outfalls in F Area (SRNS 2025).

Releases of radionuclides in liquid effluents (including direct releases and shallow groundwater migration from seepage basins and the Solid Waste Disposal Facility) have averaged about 450 Ci per year from 2020 through 2023 with more than 99 percent of which were from tritium (SRNS 2020a, 2021, 2022, 2023a). SRS demonstrates derived concentration standard (DCS) compliance when the sum of the ratios of each radionuclide's observed concentration to its corresponding DCS does not exceed 1.00. The DCS sum of fractions for all liquid effluent locations was less than 1.00 (SRNS 2025).

### **Stormwater Runoff**

SCDES issued a new five-year Industrial Stormwater General Permit, effective July 2022. SRS has 33 outfalls under this permit. SRS typically collects stormwater samples during qualifying rain

(flow) events, characterized by two conditions: 1) at least 72 hours have elapsed since the previous flow event, and 2) the sample collection should occur during the first 30 minutes of the flow event. There are two stormwater outfalls in F Area. No exceptions to the permit requirements were reported for the 2023 monitoring of the outfalls in F Area (SRNS 2025).

SRS monitors the accumulated stormwater in the site's stormwater basins for radionuclides. The maximum tritium in the F Area Pond 400, which would receive stormwater runoff from Building 226-F (SRPPF), was 840 pCi/L in 2023 (SRNS 2025). A comparison of this tritium concentration to drinking water standards is provided in the next section.

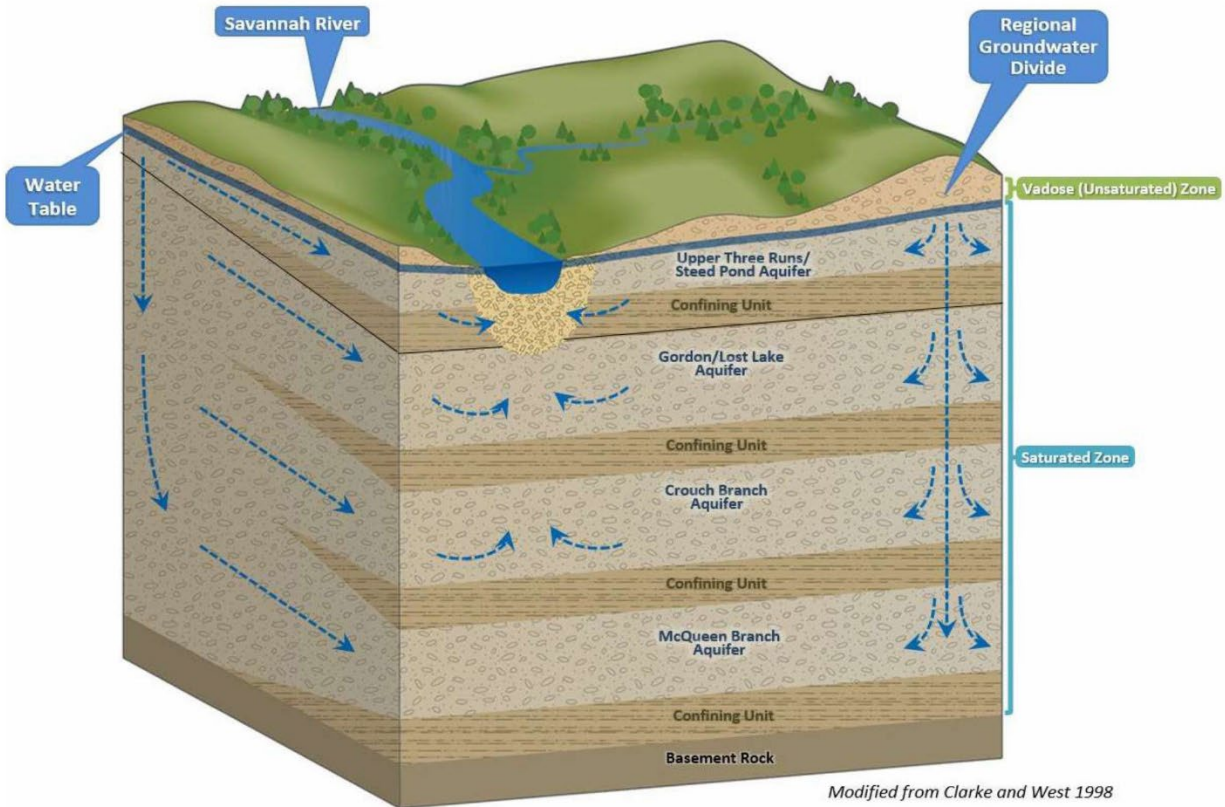
### **Surface Water and Sediment Monitoring**

Tritium was detected in 2023 in all five primary streams on SRS. The average tritium activity in Pen Branch was reported to be 5,163 pCi/L (SRNS 2025). The average tritium activity in Fourmile Branch (13,777 pCi/L) was slightly less than the drinking water standard (20,000 pCi/L), and the average tritium activity in Upper Three Runs was 373 pCi/L (SRNS 2025). Estimated tritium releases and average activity in Pen Branch and Fourmile Branch have generally decreased over the last 10 years (SRNS 2025). Gross alpha activities slightly exceeded the screening level (15 pCi/L) in Upper Three Runs during 2023 monitoring (SRNS 2025). Average tritium activity observed in Savannah River samples downstream of SRS was less than 400 pCi/L (SRNS 2025). Radionuclide levels monitored during 2023 at two offsite drinking water sources (using Savannah River water) were below drinking water standards for all radionuclides (SRNS 2025); average tritium activity in the Savannah River at the downstream drinking water location was 375 pCi/L (SRNS 2025).

Sediment sample analysis measures the movement, deposition, and accumulation of long-lived radionuclides in streambeds and in the bed of the Savannah River. In 2023, SRS collected annual sediment samples at 11 Savannah River locations, 8 basin or pond locations, and 21 onsite streams or swamp discharge locations. Radionuclide concentrations in SRS stream, river, and basin sediment are within historical levels. Results indicate radioactive materials from effluent release points are not accumulating in the sediment at the sampling locations (SRNS 2025).

#### **C.2.4.2 Groundwater**

SRS, along with large portions of Alabama, northern Florida, Georgia, and South Carolina, is located over an area designated the Southeastern Coastal Plain Aquifer System, which contains multiple regional *aquifers* separated by multiple regional confining units as well as many aquifers and confining units of local extent (Miller 1990). The generalized groundwater flow regime at SRS is shown in Figure C.2.4-2. There are four aquifer layers beneath SRS that are separated by layers that act as confining units (SRNS 2019a). In Aiken County, where roughly the northern third of SRS is located, the Crouch Branch aquifer occurs from approximately 200 to 300 feet below land surface and the McQueen Branch occurs from approximately 325 to 450 feet below land surface. Most of the wells in Aiken County are screened across both of these aquifers (USGS 2019).



Source: SRNS 2025

**Figure C.2.4-2 Generalized Groundwater Flow System at the SRS**

### **Flow and Transport of Groundwater**

As shown in Figure C.2.4-2, groundwater movement is largely horizontal toward local discharge zones along streams, but some movement is downward into deeper aquifers, some even reaching the regional flow system. SRS groundwater velocities in confining units are low, generally in the range of several inches to several feet per year, while velocities in aquifers can range from tens to hundreds of feet per year (NNSA 2015).

Under F Area, the shallow Upper Three Runs aquifer flows primarily to the north, discharging into Upper Three Runs Creek, and also moves downward into the Gordon aquifer. Water in the Gordon aquifer flows horizontally toward the Savannah River. Groundwater in deeper aquifers flows horizontally southwest toward the river and the coast level (CB&I AREVA 2015). The water table of the upper aquifer at F Area is found at a depth of about 100 feet below existing ground level (NNSA 2015).

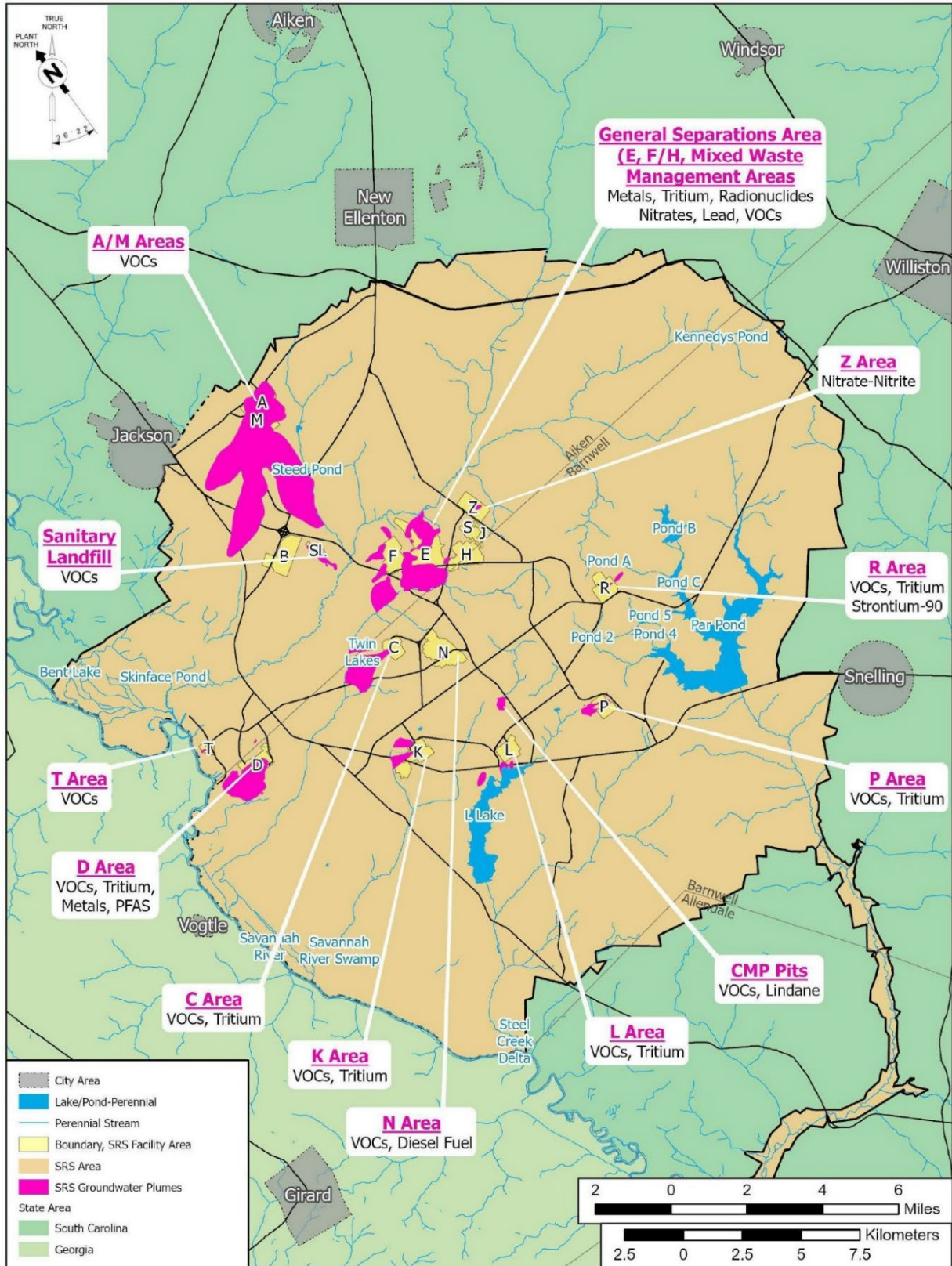
Water use at SRS (*see* Section C.2.4.4) includes the use of groundwater to support facility processes as well as for drinking water. Groundwater contamination from past SRS actions, as discussed in Section C.2.4.2.2, predominantly occurs in the shallow aquifers, specifically the Upper Three Runs and Gordon Aquifers. The SRS's drinking water wells generally extract water from the deeper Crouch Branch and McQueen Branch Aquifers (SRNS 2018b).

## **Groundwater Quality**

Aiken County groundwater is generally high quality, requiring little treatment prior to use (USGS 2019). SRS groundwater is generally soft, slightly acidic, and low in dissolved solids with high dissolved iron concentrations in some aquifers (CB&I AREVA 2015). Past SRS chemical and radioactive waste management actions that included seepage basins, tanks, ponds, trenches, burial and burning pits, and landfills have resulted in contamination of soil and water resources with waste byproducts. These contamination sites, including groundwater contamination plumes, are being monitored and remediated pursuant to a 1993 tri-party agreement (i.e., the Federal Facilities Agreement for the Savannah River Site) among DOE, EPA and SCDHEC (now SCDES). The agreement integrates regulatory requirements of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA; 42 U.S.C. § 9601) and RCRA (42 U.S.C. § 6901). Approximately 5 to 10 percent of SRS groundwater resources have been contaminated with radionuclides (e.g., tritium, gross alpha, and nonvolatile beta emitters) and industrial solvents (e.g., trichloroethylene and tetrachloroethylene) (NNSA 2015). Metals and other chemicals have also been detected and are included in monitoring efforts. Figure C.2.4-3 shows the groundwater contamination plumes that have been identified at the SRS and identifies the primary contaminants associated with each plume. Groundwater contamination at SRS is limited primarily to the Upper Three Runs/Steed Pond Aquifers and the Gordon/Lost Lake Aquifers (SRNS 2025).

The major contaminants of concern in the groundwater beneath SRS, including common degreasers (trichloroethylene and tetrachloroethylene) and radionuclides (tritium, gross alpha, and nonvolatile beta emitters) (SRNS 2025) were observed in SRS groundwater during 2023 at concentrations above or near the limits of the drinking water standards at operating areas across the site (SRNS 2025). Groundwater contamination is most prevalent in the water table aquifer. Groundwater contamination at F Area is a result of separations and waste management activities. Maximum groundwater contaminant concentrations in F Area during 2023 exceeded water quality standards for tritium, trichloroethylene, gross alpha, nonvolatile beta, strontium-90, and technetium-99 (SRNS 2025). Contamination of deeper aquifers is of most concern in the A- and M-Areas, where trichloroethylene has been detected in the Gordon and Crouch Branch aquifers, and in the E-, F-, and H-Areas, where tritium has been detected in the Gordon aquifer (NNSA 2023b). Groundwater contamination from SRS operations does not extend beyond SRS boundaries (SRNS 2020a, 2022, 2025).

The SRS Environmental Remediation Program has been under way for more than 20 years, with many of the remedial actions directed at groundwater, either directly or reducing or eliminating the contamination source that lies above the water table. The program has resulted in an overall reduction in the size of most SRS groundwater plumes (SRNS 2025). The status of remedial actions is reported annually in the SRS environmental reports as other publicly available documents, in accordance with the Federal Facilities Agreement.



Source: SRNS 2025

Figure C.2.4-3 Groundwater Plumes at SRS and the Associated Primary Contaminants

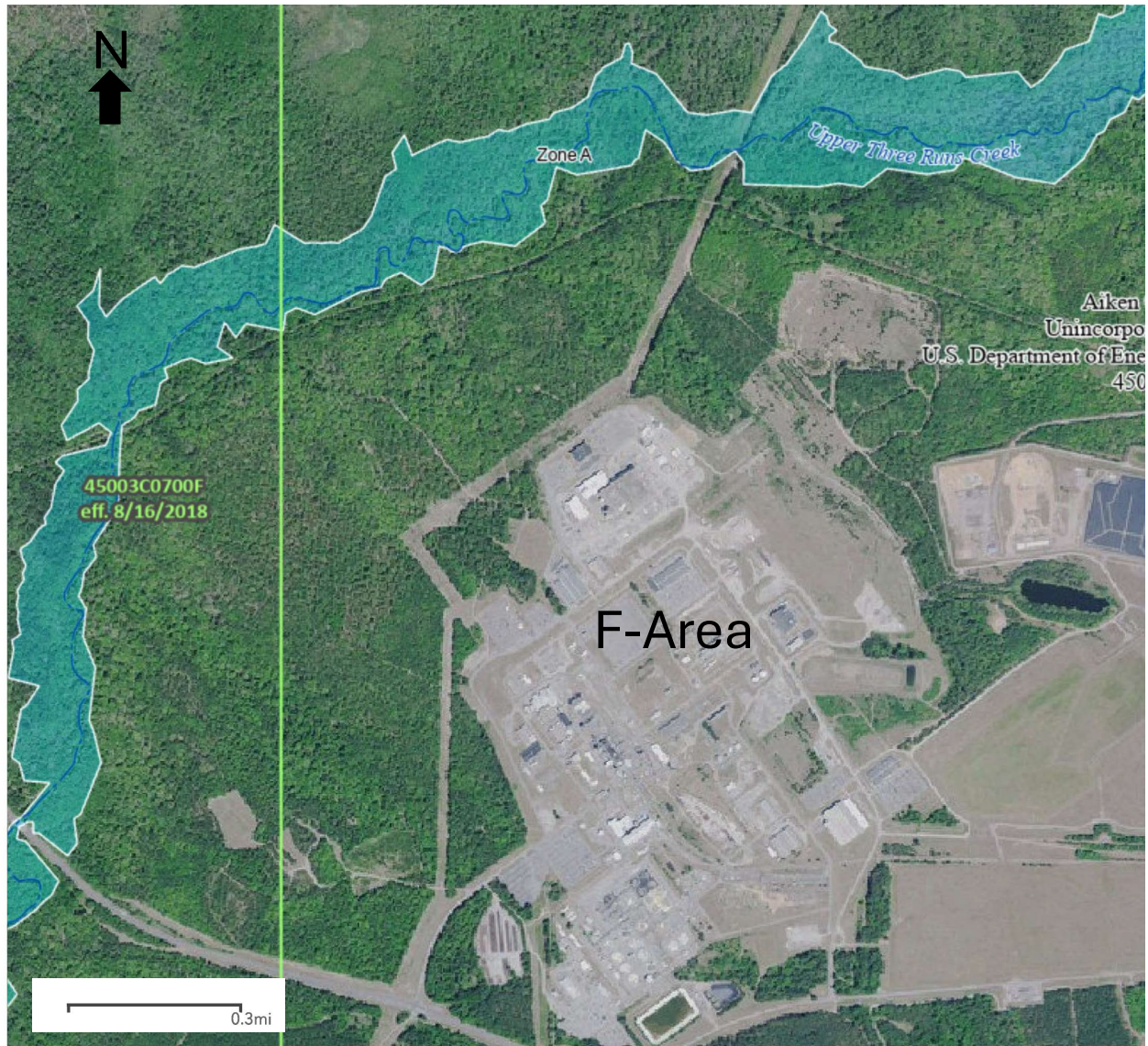
## **Groundwater Use**

All SRS aquifers meet the conditions under the *South Carolina Pollution Control Act* (SC Code § 48-1-10 et seq.) for classification as underground sources of drinking water (SCDES 2025e). This classification determines the applicable water quality standards, which are not currently met in all areas of SRS as described above. Groundwater in and around SRS is used extensively for domestic, industrial, and municipal purposes. In 2023, groundwater withdrawals in Allendale, Aiken, and Barnwell counties for all uses were 27 percent of total (surface water and groundwater) withdrawals (SCDES 2024a). Groundwater withdrawals for public water supply use were 69 percent of total water supply withdrawals in the three counties during 2023 (SCDES 2024a). No aquifers in the SRS region are designated by the EPA as sole-source aquifers.

The A Area domestic water system supplies treated water to most of SRS from two 600 to 900 foot deep wells in A Area, each having a capacity of 1,500 gallons per minute and drawing water from the Crouch Branch (Tuscaloosa) aquifer (SRNS 2023a). The top of the Crouch Branch aquifer is typically 350 to 500 feet below ground surface; the thickness of the aquifer varies from 100 to more than 350 feet (SRNS 2011). As a result of facility shutdowns, SRS staff reductions, and water supply system upgrades and consolidation, there has been a major decline in water use since annual reporting of SRS groundwater usage began in 1983. Groundwater use at SRS in 2023 (including drinking water and process water uses) was 2.60 million gallons per day (SRNS 2025), which is less than 2 percent of the 2023 total water withdrawals, and less than 6 percent of the 2023 groundwater withdrawals, for Aiken, Barnwell, and Allendale counties. All samples from the SRS A Area domestic water system collected and analyzed in 2023 met SCDES and EPA drinking water quality standards (SRNS 2025).

### **C.2.4.3 Floodplains**

There are significant floodplain swamps associated with the Savannah River in the SRS area. The Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Maps, as well as the online South Carolina Watershed Atlas (SCDHEC 2025), show the river's 100-year flood zone extending as far as one to three miles into the SRS along parts of the site's southwest border. At its nearest, F Area is about seven miles from the river. FEMA Flood Insurance Rate Maps 450002-0695F and 450002-0700F also show a 100-year flood zone for Upper Three Runs Creek, the nearest waterbody to the SRPPF (Figure C.2.4-4). The irregular floodplain for this creek appears to extend several hundred feet toward the SRPPF in places, but the distance between the creek's normal bed and the nearest edge of the cleared area around the SRPPF is approximately 2,000 feet. DOE regulations require that activities determined to be critical actions, where any adverse impacts from flooding would be unacceptable, be evaluated for potential impacts from the larger, but less frequent, 500-year flood event. In 2000, SRS reported the results of a hydrologic study to develop facility-specific probabilistic flood hazard curves to determine flood elevations as a function of return period for SRS facilities. Return periods considered extended to 100,000 years. With regard to F Area, the study concluded that the probabilities of facility flooding from either Upper Three Runs Creek or Fourmile Branch are significantly less than 0.00001 per year (Chen 2000). That is, water elevations in either stream from a 100,000-year flood event would not reach F Area.



Source: FEMA 2025

**Figure C.2.4-4 100-Year Floodplain near F Area**

## **C.2.5 Climate and Air Quality**

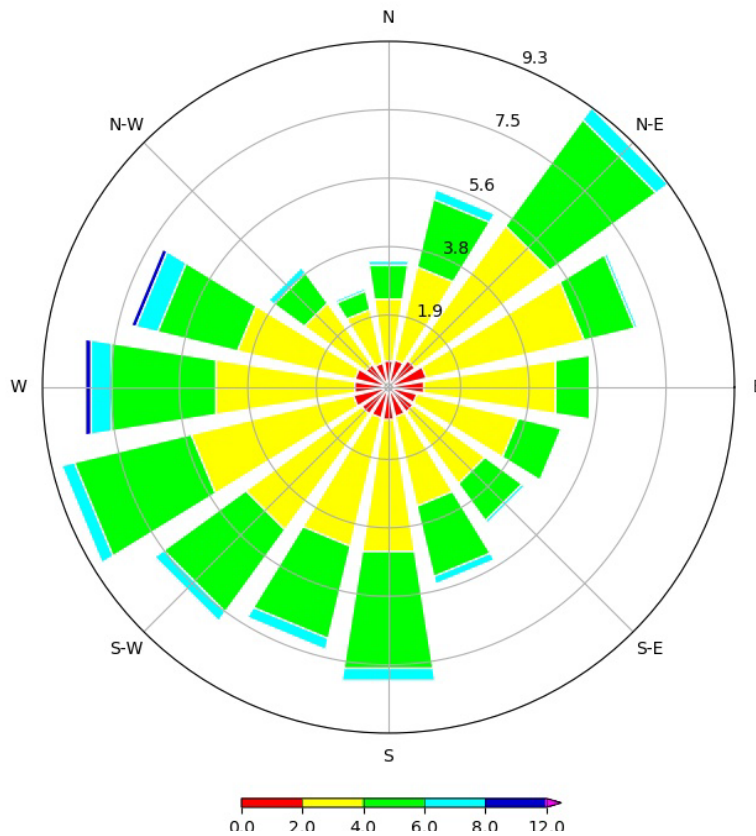
### **C.2.5.1 Climate and Meteorology**

The climate at SRS is subtropical, characterized by mild winters and long, humid summers. Meteorological data has been collected at SRS for more than 60 years. The total annual precipitation over this period averages nearly 46 inches. The annual average temperature is roughly 64°F. Average daily temperatures range from 40°F in January to 80°F in July and August (SRNL 2021).

Meteorological data, including wind, is collected at SRS to determine offsite contamination levels. Figure C.2.5-1 shows the best available five-year (2019–2023) compilation of wind direction and frequency measured from H Area where most of SRS’s radiological air releases occur. The wind rose illustrates a range of wind conditions up to 12 meters per second (m/s) (26 mph). Figure

C.2.5-1 illustrates that there was no strong prevalent wind direction during this period (SRNS 2026). Data collected in 2019 reflected seasonal patterns of predominant westerly and easterly winds in winter, southerly and westerly winds in spring, southerly and westerly winds in summer, and northeasterly winds in fall (SRNL 2021).

2019-01-01 00:00:00 UTC through 2023-12-31 23:45:00 UTC



**Figure C.2.5-1 H Area Wind Rose 2019–2023**

Severe weather events that can cause destructive effects at the SRS and surrounding areas include fog, snow and ice storms, heat waves, thunderstorms, flooding, hurricanes, and tornadoes. Fog at the facility is monitored using a ceilometer in the monitoring area, with data collection beginning in 2010. Fog is identified by reports of vertical visibility indicating the absence of a discernible cloud base. The total number of foggy days is calculated as the number of days when fog is reported. On average, the site experiences about 35 fog days annually. Historically, August and December typically have the most fog days, while October usually sees the fewest (SRNL 2021).

Restrictions on outdoor work due to excessive heat are based on wet bulb globe temperature (WBGT) values. In 2017, the thresholds for heat stress categories were updated, with lower temperature criteria established for Categories 4 and 5. The highest WBGT recorded was 95°F on August 11th. That year, Category 4 (WBGT > 86°F) was reached or exceeded on 112 days and Category 5 (WBGT > 88°F) on 74 days. Most heat stress days occurred during summer and early fall, though several Category 4 and 5 days were also observed in October (SRNL 2021).

Several other notable severe weather events have occurred in recent years. Severe thunderstorms and tornado activity in the fall of 2025 brought significant rainfall and caused wind damage, power

outages, and the confirmation of a minor tornado (HereAiken 2025). Hurricane Helene also impacted the area in September 2024. The hurricane brought heavy winds and rainfall, downing trees and power lines, causing extended power outages and at least four confirmed deaths in Aiken County, none of which were on SRS (WGAC 2024).

### C.2.5.2 Air Quality

**Ambient Air Quality Standards.** The EPA Region 4 and SCDES regulate air quality in South Carolina. South Carolina has adopted the EPA established primary and secondary NAAQS (40 CFR Part 50) in compliance with the CAA (42 U.S.C. § 7401 et seq.), as amended. All areas within the State of South Carolina are currently in full attainment of all criteria pollutants and meet or exceed all established NAAQS (Table C.2.5-1).

As with LANL, the SRS must comply with the conditions of its Title V air permit. This includes meeting all applicable federal regulatory requirements for emissions of criteria pollutants and HAPs. SRS is subject to the same permitting, monitoring, and reporting obligations as other major sources of air emissions.

**Table C.2.5-1 National Ambient Air Quality Standards**

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon monoxide		Primary	8-hour	8.7 ppm <sup>a</sup>	Maximum allowable
			1-hour	13.1 ppm <sup>a</sup>	
Lead		Primary and Secondary	Rolling 3- month average	0.15 µg/m <sup>3</sup>	Not to be exceeded
Nitrogen dioxide		Primary	24-hour	0.10 ppm <sup>a</sup>	Maximum allowable 24-hour average
		Primary and Secondary	Annual	0.05 ppm <sup>a</sup>	Maximum allowable annual arithmetic average
Ozone		Primary and Secondary	8-hour	0.070 ppm	Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years
Particulate matter	(PM <sub>2.5</sub> )	Primary	Annual	9 µg/m <sup>3</sup>	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m <sup>3</sup>	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 µg/m <sup>3</sup>	98 <sup>th</sup> percentile, averaged over 3 years
	(PM <sub>10</sub> )	Primary and Secondary	24-hour	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year on average over 3 years

µg/m<sup>3</sup> = microgram per cubic meter; PM<sub>2.5</sub> = particulate matter less than 2.5 microns in diameter; PM<sub>10</sub> = particulate matter less than 10 microns in diameter; ppm = parts per million

**Nonradiological Air Quality.** SRS holds a Title V Operating Permit (TV-0080-0041) issued by SCDES for criteria pollutants and HAPs. Similar to LANL, the permit establishes emission limits, operational requirements, and testing, monitoring and reporting obligations for all regulated sources at SRS (SRNS 2024).

SRS uses nonradioactive volatile chemicals (gasoline and toluene), fuels, and combustion products that can adversely affect the environment if released into the air in sufficient quantities. However, the site uses most of these materials in very small quantities, and the environmental impact from their potential release is negligible. Due to the nature and quantity of potential air emissions, regulators do not require SRS to sample or monitor the ambient air for chemical pollutants. Following SCDES requirements, SRS uses process data to calculate emissions (SRNS 2024).

**Greenhouse Gases.** SRS actively pursues sustainability through renewable energy use, water conservation, waste diversion, sustainable buildings, fleet fuel efficiency, and environmentally responsible procurement (SRNS 2024).

**Radiological Air Quality.** Atmospheric emissions of radionuclides from SRS are regulated under the EPA's NESHAPs. Monitoring systems continuously track airborne radionuclide releases from process area stacks, with tritium and krypton-85 accounting for most of the radioactivity released annually. Total annual tritium released from SRS operations from 2013 to 2023 has ranged from about 7,000 to 40,000 Ci per year, with an annual average tritium release of 16,600 Ci. SRS tritium releases fluctuate from year to year due to deactivation of legacy process buildings, the amount of tritium released during routine operations, and natural decay of tritium (about 5 percent per year) (SRNS 2024). The annual health effects of these releases are presented in Section C.5.1.13.

During the past 10 years, the total annual tritium release from SRS operations has ranged from about 7,000 to 40,000 Ci per year, with an annual average tritium release of 16,601 Ci (Table C.2.5-2). SRS tritium releases fluctuate from year to year due to deactivation of legacy process buildings, the amount of tritium released during routine operations, and natural decay of tritium (about 5 percent per year) (SRNS 2024).

**Table C.2.5-2 Range of SRS Radiological Atmospheric Releases, 2017–2023**

Release Type	Total (curies)
Tritium	$7.03 \times 10^3$ to $3.93 \times 10^4$
Krypton-85	$5.45 \times 10^3$ to $2.27 \times 10^4$
Short-lived fission and activation products (T1/2 < 3 hr) <sup>a,b</sup>	$4.31 \times 10^{-9}$ to $2.82 \times 10^{-5}$
Fission and activation products (T1/2 > 3 hr) <sup>a,b</sup>	$3.12 \times 10^{-2}$ to $7.04 \times 10^{-2}$
Total radio-iodine	$3.06 \times 10^{-3}$ to $9.99 \times 10^{-3}$
Total radio-strontium <sup>c</sup>	$4.54 \times 10^{-3}$ to $1.25 \times 10^{-3}$
Total uranium	$5.65 \times 10^{-5}$ to $2.96 \times 10^{-4}$
Plutonium <sup>d</sup>	$1.77 \times 10^{-4}$ to $1.06 \times 10^{-3}$
Other actinides	$5.18 \times 10^{-6}$ to $2.49 \times 10^{-4}$
Other	$2.30 \times 10^{-6}$ to $4.00 \times 10^{-2}$

a International Commission on Radiological Protection 107 half-life data, Nuclear Decay Data for Dosimetric Calculations (2008).

b International Atomic Energy Agency Common Fission and Activation Products.

c Includes unidentified beta releases.

d Includes unidentified alpha releases.

Source: SRNS 2024

Average concentrations of radionuclides released from SRS facilities are routinely calculated to compare to facility limits and assess the effectiveness of effluent treatment systems. Tritium emissions have occasionally exceeded these standards because tritiated water vapor, the form in which tritium is released, is difficult to capture or filter. Comprehensive monitoring both onsite and in surrounding communities and assessments show that offsite radiation levels remain well below regulatory limits despite occasional exceedances. In fact, the annual effective dose to the MEI from SRS airborne radionuclide releases is typically less than 1 millirem, well below the 10 millirem dose limit. Figure C.2.5-2 illustrates the location of on- and offsite radiological air surveillance sampling locations (SRNS 2024).

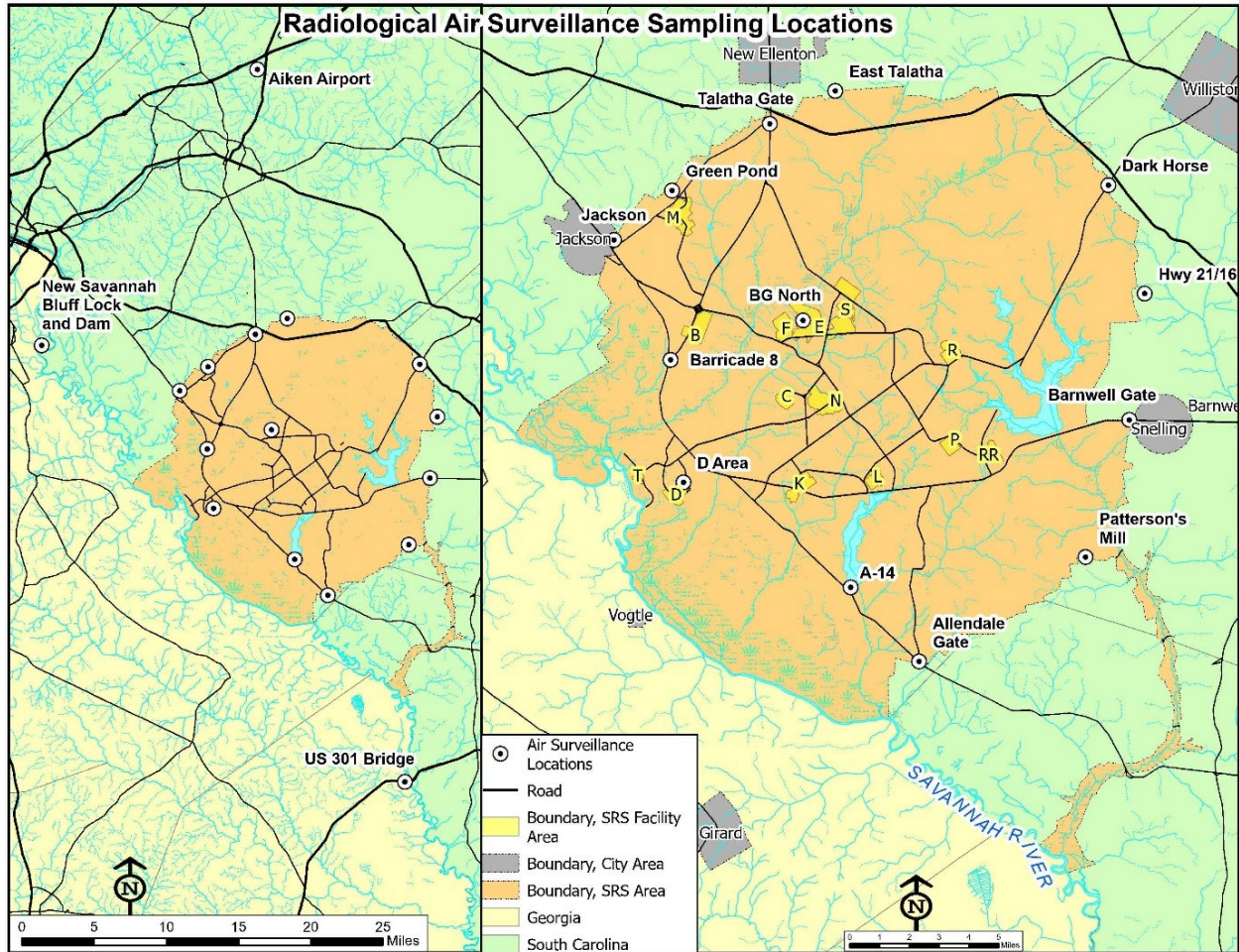


Figure C.2.5-2 Radiological Air Surveillance Sampling Locations

**C.2.5.3 Visibility**

SRS encompasses approximately 310 square miles across Aiken, Allendale, and Barnwell counties in South Carolina, bordered to the southwest by the Savannah River. The proximity of the river contributes to frequent fog and elevated humidity levels in the area, particularly during cooler months, which can influence local meteorology and air pollutant dispersion (SRNS 2024).

## C.2.6 Noise

At SRS, major noise sources in active areas include industrial equipment such as cooling systems, transformers, engines, vents, paging systems, construction, materials handling equipment, and vehicles. Outside these zones, noise mainly arises from vehicular and rail traffic. Most industrial facilities are situated far from site boundaries, resulting in noise levels at the perimeter that are near background conditions, thereby limiting impacts on nearby environments and sensitive receptors (NNSA 2020a).

Noise levels at SRS are managed in accordance with recognized standards, including those established by the ANSI standard. The ANSI guidelines provide recommended day-night average sound levels (DNL) for various residential land use categories to protect public health and welfare. For quiet suburban residential areas, which are representative of many communities surrounding SRS, the typical DNL range is 45 to 50 decibels, with corresponding day and night levels of approximately 45 dB and 39 dB, respectively (ANSI 2013). These limits help guide operational practices and administrative controls at SRS to minimize noise impacts on nearby residents and sensitive receptors (NNSA 2020a).

## C.2.7 Biological Resources

This section discusses biological resources by habitat type (terrestrial and aquatic/wetland) and status (threatened, endangered or other special designation). The Natural Resources Management Plan for the Savannah River Site describes how biological resources are managed by DOE (DOE 2019).

### C.2.7.1 Terrestrial Resources

Forested cover types at SRS include bottomland hardwood, pine forest, mixed forest, and forested wetland. Non-forested cover types include scrub-shrub, emergent wetland, industrial, grassland, clearcut, bare soil/borrow pit, and open water. Approximately 90 percent of the land cover at SRS is bottomland hardwood forests, pine forests, mixed forests, and forested wetland (DOE 1999b; Wike et al. 2006). Table C.2.7-1 identifies the amount of land of each SRS cover/land use type.

**Table C.2.7-1 Land Cover/Use Types and Approximate Area on SRS**

Vegetation Type	Acres
Bottomland hardwood	44,138
Pine forest	64,676
Mixed forest	32,839
Forested wetland	31,596
Scrub shrub	9,036
Emergent wetland	1,212
Industrial	2,244
Grassland	1,852
Clearcut	7,556
Bare soil/borrow pit	194
Open water	3,914
<b>TOTAL</b>	<b>199,257<sup>a</sup></b>

a This area is slightly different (~0.5 percent) from the 198,344 acres of the SRS because of measurements using multispectral sensors with aerial photography.

Source: Wike et al. 2006, p 2-6, Figure 2-2

The SRPPF complex is located within F Area. The area is industrial, covered with buildings, parking lots, bare soil, and construction equipment and materials. No native vegetation occurs within the area, with only small (i.e., less than 1 acre) patches of installed grass lawn along roads and among industrial and construction facilities. The area is surrounded by a narrow strip (about 50 to 500 feet) of land that has been cleared of pine or mixed forest vegetation and is now grassland or scrub-shrub vegetation. To the west, north, and northeast beyond the strip of grass and scrub-shrubs, pine and mixed forest vegetation extend down to bottomland hardwood forest along Upper Three Runs Creek.

Wildlife studies conducted in developed parts of SRS have documented the presence of 144 species (Wike et al. 2006). Of the 144 species, only 29 percent of them were considered common and only four percent were classified as abundant (NNSA 2020a). The species identified as abundant in the developed areas were all bird species. In a highly developed area such as F Area it is less likely that these common species would be present. The species considered abundant in developed areas include the rock dove (*Columba livia*), common crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), and house sparrow (*Passer domesticus*). These are all bird species that are known to be highly adaptable to human development.

SRS wetlands, most of which are associated with floodplains, streams, and impoundments, include bottomland hardwood, cypress-tupelo, scrub-shrub, emergent vegetation, and Carolina bays (NNSA 2020a). Forested wetlands (swamp forests) occur along the Savannah River, and bottomland hardwood forest extends upstream along Upper Three Runs Creek (Wike et al. 2006). Carolina bays, a type of wetland unique to the southeastern U.S., are natural, shallow, oval- or elliptical-shaped depressions that occur in isolated inter-stream areas (Wike et al. 2006, Fig. 5-23). Bays are typically fed by rainfall or shallow groundwater and therefore have an unpredictable hydrology. Carolina bays can range from lakes to shallow *marshes*, with vegetation varying from the drier edges to the more hydric centers. Although many bays are dominated by herbaceous plant species, forest species often occur around the drier outer edge. Among the 300 Carolina bays found throughout the SRS, fewer than 20 have permanent fish populations. Redfin pickerel (*Esox americanus americanus*), mud sunfish (*Acantharchus pomotis*), lake chubsucker (*Erimyzon sucetta*), and mosquito fish (*Gambusia affinis*) are present in these bays. Wike et al. (2006) provides a description of wetlands found throughout the SRS. The location of the SRPPF is in an existing industrial area that does not contain any wetlands. Forested and shrub wetlands occur approximately 0.5 mile north and northwest of the SRPPF along Upper Three Runs Creek but do not overlap with it.

### C.2.7.2 Aquatic Resources

The land within the SRPPF complex has been previously developed for industrial use. As a result, no open water or wetlands exist within the area. There are, however, aquatic resources, including Upper Three Runs Creek and associated bottom hardwood wetlands located approximately 0.5 mile downslope north of F Area. Upper Three Runs Creek receives effluent from the F/H Area Effluent Treatment Facility (ETF) at a discharge point just downstream of the Road C Bridge (Wike et al. 2006). Aquatic plants and animals do not occur within the SRPPF complex due to the absence of aquatic habitat.

Although fishing is not permitted within SRS, sport and commercial fishing is popular on the Savannah River. The South Carolina Department of Environmental Services has issued a

consumption advisory for some fish species caught in the part of the Savannah River that borders the southwestern boundary of SRS due to mercury contamination concerns (SCDES 2025d).

### C.2.7.3 Threatened, Endangered, or Other Special Designation

There are two plant species and seven animal species known to occur on SRS with threatened or endangered status at a state of federal level (Table C.2.7-2). Since the finalization of the SRS Pit Production EIS in 2020, one new plant species, Ocmulgee skullcap (*Scutellaria ocmulgee*), was designated with endangered status in 2024 (USFWS 2024b). Ocmulgee skullcap is not a species known to occur on SRS. Critical habitat for threatened or endangered species does not exist on SRS. Detailed information about the species can be found in Section 3.5.3 of the SRS Pit Production EIS (NNSA 2020a).

**Table C.2.7-2 Endangered or Threatened Species on SRS**

Species	Status and Occurrence	
	Federal	State
<b>Plants</b>		
Smooth purple coneflower ( <i>Echinacea laevigata</i> )	Endangered; four native colonies on SRS	Endangered
Pondberry ( <i>Lindera melissifolia</i> )	Endangered; at least one colony known on SRS	Endangered
<b>Animals</b>		
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	Not listed, protected under the <i>Bald and Golden Eagle Protection Act</i>	Threatened
Red-cockaded woodpecker ( <i>Picoides borealis</i> )	Endangered; numerous colonies on SRS	Endangered
Wood stork ( <i>Mycteria americana</i> )	Threatened; feed in SRS swamps and reservoirs	Endangered
Shortnose sturgeon ( <i>Acipenser brevirostrum</i> )	Endangered; eggs and larvae collected from Savannah River adjacent to SRS	Endangered
American alligator ( <i>Alligator mississippiensis</i> )	Threatened due to similarity of appearance to threatened American crocodile	Not listed
American swallow-tailed kite ( <i>Elanoides forficatus</i> )	Not listed	Endangered; one sighting reported
Gopher tortoise ( <i>Gopherus polyphemus</i> )	Not listed	Endangered; one reported; habitat on SRS
Rafinesque’s big-eared bat ( <i>Corynorhinus rafinesquii</i> )	Not listed	Endangered <sup>a</sup>

SRS = Savannah River Site

a Occurrence data not available.

Source: SCDNR 2019; Wike et al. 2006, p 3-45

The smooth purple coneflower (*Echinacea laevigata*) and pondberry (*Lindera melissifolia*) are plant species federally listed as endangered. Four known natural colonies or locations of the smooth purple coneflower occur on SRS (NNSA 2020a). The smooth purple coneflower is

associated with open woodlands, prairie settings, clear-cuts, and road banks preferring more sunny locations (DOE 2019; Wike et al. 2006; Knox and Sharitz 1990). Management includes selected tree and shrub removal and periodic burning (DOE 2019). Following completion of the MFFF administration building, a conservation garden was established near the building entrance, featuring the smooth purple coneflower to promote preservation and awareness (Aiken Standard 2012). Scientists from the Savannah River Ecology Laboratory (SREL) collected seeds from native SRS smooth purple coneflower plants under permit TE31066A-0 from USFWS. These seeds were propagated in the SREL greenhouse and transplanted to the conservation garden (Augusta Chronicle 2012). Two populations of the pondberry are managed at Carolina bays (DOE 2019; SRNS 2019b). The pondberry and the four naturally occurring populations of the smooth purple coneflower are located about 2 to 12 miles from the project area (NNSA 2020a).

The red-cockaded woodpecker (*Picoides borealis*) is a native of the southern pine forests of the U.S. with a preference for mature pine trees over 70 years old. Once common, it was listed as federally endangered in 1970 owing to loss of mature longleaf pine forests (Wike et al. 2006). The red-cockaded woodpecker is the most actively managed protected species on SRS. For management purposes, SRS is divided into six management areas based upon existing biological and physical conditions, operations capability, and suitability for mission objectives (DOE 2019). The largest of the management areas is the 87,200-acre Red-Cockaded Woodpecker Management Area, which covers the eastern side of the SRS. Within the Red-Cockaded Woodpecker Management Area, the USFS-Savannah River manages more than 65,000 acres with emphasis on improving and creating suitable habitat for red-cockaded woodpeckers (SRNS 2019a). These restoration efforts have increased active red-cockaded woodpecker clusters on SRS from 3 to 133 from 1985 through 2018. USFS-Savannah River currently manages 133 cluster sites (SRNS 2019a). The SRPPF complex is located in the Industrial Core Management Area, in the west central part of the SRS (DOE 2019). The project site contains no habitat for red-cockaded woodpeckers, as the site has been previously developed for industrial uses. The nearest active red-cockaded woodpecker cluster is about three to four miles to the northeast, across the Upper Three Runs Creek.

The wood stork (*Mycteria americana*) is a large, long-legged wading bird federally listed as threatened. The wood stork is not known to nest on SRS but forages locally in temporary ponds, shorelines, bottomlands, and swamps, primarily along the Savannah River Swamp, in the delta areas of streams flowing into the river (DOE 2019; Wike et al. 2006; SREL 1998). Wood storks have also been observed foraging in Carolina bay wetlands. The nearest nesting colonies are in Georgia, west of SRS. No wood storks occur within the SRPPF complex, which contains no wood stork habitat.

The shortnose sturgeon (*Acipenser brevirostrum*) is federally listed as endangered and is known to occur in the Savannah River to the south and southwest of the project area. This species does not occur near the project site. The American swallow-tailed kite (*Elanoides forficatus*), Gopher tortoise (*Gopherus polyphemus*), and Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) are not listed under the Federal ESA but are considered endangered in South Carolina. None of these species is common on SRS and are only known from a few observations or captures (Wike et al. 2006). The project area contains no habitat for any of these species. The bald eagle was delisted under the ESA in 2007 following a nationwide recovery of populations. The species remains protected under the *Bald and Golden Eagle Protection Act* (16 U.S.C. §§ 668–668[d]) and is considered a threatened species in the state of South Carolina.

**Migratory Birds.** Migratory birds and their nests are protected under the MBTA. DOE, including NNSA, operates under a signed Memorandum of Understanding with the USFWS regarding implementation of Executive Order 13186 (66 FR 3853, January 17, 2001) concerning the responsibilities of Federal agencies to promote the conservation of migratory bird populations (DOE 2013). Some migratory birds are known to use industrial areas on the SRS, and nests have been found on buildings, structures, and equipment (SRNS 2018a, 2019a).

**Bald and Golden Eagles.** Bald and golden eagles are currently protected under both the MBTA and the BGEPA. The bald eagle has never been abundant on the SRS, but sightings have increased as South Carolina populations have recovered (Wike et al. 2006). Bald eagles nest on SRS and are considered year-round residents (SRNS 2019a). The golden eagle, also protected under the BGEPA, winters on the SRS. Mid-winter surveys in 2018 documented seven bald eagles and nine golden eagles (SRNS 2019a). Bald and golden eagles do not occur within the SRPPF complex.

**Sensitive or At-Risk Species.** Sensitive species is a general term often used to refer to species recognized by federal and state natural resources management agencies as species that may be vulnerable to future declines in population status. Terms used for sensitive species may include “threatened and endangered,” “conservation concern,” “sensitive,” and “species of concern.” Sensitive species may not be directly protected by federal or state statutes but may be considered “at-risk” for future protection under the ESA. Species “at-risk” that have the potential to be listed under the ESA may have future impacts on development and operations at SRS because of their federal protections. It is important to manage “at-risk” species that occur on SRS property to reduce future risk to the mission and promote conservation of declining species. DOE coordinates with the South Carolina Department of Natural Resources and Fish and the USFWS to locate and conserve protected and at-risk species.

DOE designated 30 set-aside areas on SRS. These sites are representative of the major or unique vegetation communities on SRS and serve to provide sites for long-term ecological research, protect sensitive species, and preserve the biological integrity of Upper Three Runs Creek. The set-aside areas contain 14,560 acres, or 7 percent of SRS (SREL 2018). The majority of the set-aside areas are located in the Upper Three Runs Creek drainage (NNSA 2020a). The sites are representative of major or unique vegetation communities on SRS and do not overlap with the SRPPF complex. The nearest set-aside area is 0.5 mile north/northwest to the SRPPF complex (NNSA 2020a).

## **C.2.8 Cultural and Paleontological Resources**

See Section C.1.8 for definitions of cultural and paleontological resources, and a brief overview of national cultural resources policy.

### **C.2.8.1 Cultural Resources Management**

The management of cultural resources at SRS is conducted in accordance with the stipulations set forth in a Programmatic Memorandum of Agreement (PMOA) developed by DOE, the South Carolina State Historic Preservation Office (SCSHPO), and the ACHP (SRARP 1989). This agreement provides DOE with an alternative means of fulfilling Section 106 compliance requirements by allowing the submission of an annual report detailing cultural resource management activities and outcomes, as opposed to conducting project-specific consultations. The DOE’s comprehensive cultural resource management program at SRS includes research, public engagement, education, and regulatory compliance (SRARP 2017; NNSA 2015).

SRS has two principal cultural resources management plans: the *Archaeological Resource Management Plan*, developed by the Savannah River Archaeological Research Program (SRARP 2016) and the PMOA. The 2016 management plan addresses overall archaeological management and compliance, while the PMOA focuses on the preservation, management, and treatment of NRHP-eligible Cold War properties within the SRS Cold War Historic District. Implementation of the PMOA is facilitated through the *Savannah River Site's Cold War Built Environment Cultural Resources Management Plan* (DOE 2005a).

Native American groups with traditional links to the SRS region include the Apalachee, Cherokee, Chickasaw, Creek, Shawnee, Westo, and Yuchi. The Native American resources found in this area include villages, ceremonial lodges, burial sites, cemeteries, and natural areas with traditional plants used for cultural purposes.

### **C.2.8.2 Cultural Resources**

Approximately 36 percent of the SRS has been surveyed for archaeological and historic built environment resources dating prior to 1950, covering 70,458 acres as of 2018 (SRNS 2020b). Survey efforts have documented a total of 2,043 archaeological sites and seven historic buildings or structures from this period (SRNS 2020b). Prehistoric resources found across SRS include village sites, base camps, limited activity areas, quarries, and workshops. Historic sites consist of farmsteads, tenant houses, mills, plantations, slave quarters, farm dikes, dams, cattle pens, ferry locations, churches, schools, towns, cemeteries, commercial building sites, and roads. Among the archaeological sites, 1,303 are precontact Native American sites, while 740 are historic archaeological sites (pre-1942) potentially related to early historic Native American, Hispanic, and Euro-American cultures. Of the 1,303 precontact sites, 82 have been deemed eligible for the NRHP. Similarly, 64 of the 740 historic archaeological sites have been found eligible for listing. All seven historic buildings or structures have been determined eligible for the NRHP (SRNS 2020b).

There are no National Historic Landmarks at SRS. All Cold War-era resources at SRS, built between 1950 and 1989, were inventoried in 2004. These Cold War-era properties include buildings and structures linked to the development of nuclear materials and technologies for weapons, power generation, and medical applications. One Cold War-era historic district at SRS, which encompasses landscape features, archaeological sites, and built structures has been determined eligible for NRHP (SRNS 2020b).

#### **Cultural Resources in the Project Area (F Area)**

The F Area is a well-developed 364-acre section near the center of SRS, situated within the Industrial Core Management Area that includes nuclear, industrial, warehouse, laboratory, and administrative facilities. Despite extensive ground disturbance from prior development, surveys conducted at the proposed area of construction for MFFF identified precontact resources; two eligible for NRHP. Adverse effects anticipated on these sites were mitigated through a data recovery plan approved by the SCSHPO. In accordance with the PMOA, Savannah River Archaeological Research Program staff members monitored five additional archaeological sites located in the vicinity of the construction site during MFFF ground-disturbing activities. These eligible sites were determined to be significant due to their research potential to provide information on settlement and subsistence from the Early Archaic through Mississippian time periods (8000 before the Common Era through 1450).

Several facilities in F Area are recognized as NRHP-eligible for their association with SRS’s Cold War production mission and the Atomic Energy Commission’s peaceful atomic energy programs. None were expected to be adversely affected by MFFF construction (NNSA 2015).

No traditional cultural properties—such as Native American village sites, ceremonial places, cemeteries, or important natural resource areas—were found during surveys. Given the developed nature of F Area, DOE determined it would be unlikely that plants of concern to Native American cultures would be present in the project zone (NNSA 2015, pp. 3-35 and 3-36).

### C.2.8.3 Paleontological Resources

Paleontological resources at the SRS mainly date back to the Eocene Age (54 to 39 million years ago) and include fossilized plants, invertebrates, giant oysters, mollusks, and bryozoa. Except for the giant oysters, most fossils are common and widespread, resulting in low scientific or research value (NRC 2005).

#### Paleontological Resources in the Project Area (F Area)

Although fossil-bearing layers exist at SRS, none have been identified in the F Area. Due to significant disturbance in the F Area, paleontological resources are unlikely there, and no fossils have been found to date.

### C.2.9 Socioeconomics

The socioeconomic ROI for this PEIS includes Aiken and Barnwell counties in South Carolina and Columbia and Richmond counties in Georgia. Table C.2.9-1 provides the residence information for the SRS employees as of 2023 that reside within the four-county ROI. SRS-affiliated employment includes federal employees, contractor employees, and subcontractors. As shown in the table, in 2023, the total direct SRS employment was 12,691 persons. The total number of SRS workers residing in the ROI was approximately 84.5 percent (SRNS 2026). Within the ROI, the largest percentage of employees reside in Aiken County. As of December 2023, approximately 6,668 employees reside in Aiken County, 647 employees in Barnwell County, 1,853 employees in Columbia County, 1,536 employees in Richmond County, with the remaining employees residing in surrounding counties. In 2023, direct SRS employment accounted for approximately 5.5 percent of employment in the ROI.

**Table C.2.9-1 Savannah River Site Employees by County, 2023**

County	Number of Employees	Percent of Total Site Employment
Aiken, South Caroling	6,668	52.7
Barnwell, South Carolina	647	5.1
Columbia, Georgia	1,853	14.6
Richmond, Georgia	1,536	12.1
Other	1,967	15.5
<b>TOTALS</b>	<b>12,691</b>	<b>100.0</b>

Source: Derived from SRNS 2026

This section discusses regional economic characteristics, population and demographics, housing, and community services as compared to the state population. Data from the USCB, 2019–2023 American Community Survey, and state and local government agencies, were used to describe

baseline socioeconomic characteristics. Other data sources include the BLS, BEA, state economic development agencies, local government agencies, chamber of commerce records, and private organizations.

### C.2.9.1 Regional Income and Economic Characteristics

The four counties within the ROI show differences in income levels and economic health. Columbia County has the highest median household income at \$96,122 and the highest per capita personal income at \$42,457 among the four-county ROI, while Barnwell County has the lowest income level at \$41,800 and the highest poverty rate at 28 percent. Aiken County’s median household income of \$67,940 slightly exceeds the South Carolina state median of \$66,818, with a poverty rate of 14.6 percent, indicating moderate economic health within the ROI. Richmond County has moderate income and poverty figures.

Based on the difference in the number of currently employed people in the four-county ROI, the higher percentage of SRS employees residing in Aiken County is consistent with the site being the primary employer in Aiken County. Table C.2.9-2 presents detailed income information for the ROI in 2023.

**Table C.2.9-2 Income Information for the Four-County Region of Influence, 2023**

County/Area	Median Family Income	Per Capita Personal Income	Percent Below Poverty
Aiken	\$67,940	\$36,627	14.6
Barnwell	\$41,800	\$26,141	28.0
Columbia	\$96,122	\$42,457	7.1
Richmond	\$53,197	\$30,209	20.2
South Carolina	\$66,818	\$37,993	13.2
Georgia	\$74,664	\$39,525	14.2

Note: Poverty thresholds are determined by the USCB annually and are dependent on the number and age of persons in the household.

Source: USCB 2023a, 2023b

Between 2010 and 2023, the general labor force in the ROI increased by approximately 3.7 percent, rising from 231,534 to 240,178 persons. During the same period, general employment in the ROI grew by 10.6 percent, from 209,271 to 231,347 persons, while the number of unemployed persons decreased by 60.3 percent, from 22,263 to 8,831. This reflects a significant economic recovery in the region. Correspondingly, the unemployment rate in the ROI declined from 9.6 percent in 2010 to 3.7 percent in 2023 (BLS 2025). Overall, the ROI exhibited strong labor force growth, increased employment, and significant reductions in unemployment and unemployment rates from 2010 to 2023.

During the same time period, both Georgia and South Carolina experienced notable labor market improvements characterized by growth in labor force and employment, with significant reductions in unemployment and unemployment rates. In South Carolina, the labor force grew from approximately 2,170,408 in 2010 to 2,475,460 in 2023, an increase of approximately 14.1 percent. Employment grew from nearly 1,929,604 to 2,401,212 million over the same period, a 24.4 percent increase. The number of unemployed individuals decreased from 240,804 to 74,248, contributing to a decline in the unemployment rate from 11.1 percent in 2010 to 3.0 percent in 2023.

Similarly, Georgia’s labor force grew from approximately 4,687,372 in 2010 to 5,342,462 in 2023, an increase of nearly 14.0 percent. Employment increased from about 4,199,634 to 5,167,050, a 23.1 percent rise. The number of unemployed individuals decreased from 487,738 to 175,412, contributing to a decline in the unemployment rate from 10.4 percent to 3.3 percent in 2023. Table C.2.9-3 presents the employment profile for the ROI and the state of South Carolina and Georgia for 2010 and 2023.

**Table C.2.9-3 Employment Profile in the ROI, South Carolina, and Georgia, 2010 and 2023**

County/Area	Labor Force		Employed		Unemployed		Unemployment Rate	
	2010	2023	2010	2023	2010	2023	2010	2023
Aiken	72,863	75,138	66,139	72,901	6,724	2,237	9.2	3.0
Barnwell	9,553	8,111	7,974	7,786	1,579	325	16.5	4.0
Columbia	61,424	72,955	56,994	70,602	4,430	2,353	7.2	3.2
Richmond	87,694	83,974	78,164	80,058	9,530	3,916	10.9	4.7
<b>ROI TOTALS</b>	<b>231,534</b>	<b>240,178</b>	<b>209,271</b>	<b>231,347</b>	<b>22,263</b>	<b>8,831</b>	<b>9.6</b>	<b>3.7</b>
South Carolina	2,170,408	2,475,460	1,929,604	2,401,212	240,804	74,248	11.1	3.0
Georgia	4,687,372	5,342,462	4,199,634	5,167,050	487,738	175,412	10.4	3.3

Source: BLS 2025

**Aiken County.** The median household income in Aiken County is \$67,940, slightly above the South Carolina state median of \$66,818. The per capita personal income is \$36,627, and the poverty rate is 14.6 percent, comparable to the state average. Approximately 6,668 SRS employees reside in Aiken County, accounting for approximately 9.2 percent of 2023 employment within the county. Between 2010 and 2023, the labor force increased by 3.1 percent, from 72,863 to 75,138 persons. The number of unemployed people decreased by 66.7 percent, from 6,724 to 2,237. The unemployment rate declined by 6.2 percentage points, from 9.2 percent to 3.0 percent over the same period.

**Barnwell County.** The median household income is \$41,800, with a per capita personal income of \$26,141. Approximately 28.0 percent of residents live below the poverty line. Approximately 647 SRS employees reside in Barnwell County, accounting for approximately 8.3 percent of 2023 employment within the county. Between 2010 and 2023, the labor force decreased by 15.1 percent, from 9,553 to 8,111 persons. The number of unemployed people dropped by 79.4 percent, from 1,579 to 325. The unemployment rate declined by 12.5 percentage points, from 16.5 percent to 4.0 percent over that same period.

**Columbia County.** The median household income is \$96,122, with a per capita personal income of \$42,457. About 7.1 percent of residents live below the poverty line. Approximately 1,853 SRS employees reside in Columbia County, accounting for approximately 2.6 percent of 2023 employment within the county. Between 2010 and 2023, the labor force increased by 18.7 percent, from 61,424 to 72,955 persons. The number of unemployed people decreased by 46.9 percent, from 4,430 to 2,353. The unemployment rate declined by 4.0 percentage points, from 7.2 percent to 3.2 percent over that same period.

**Richmond County.** The median household income is \$53,197, with a per capita personal income of \$30,209. Approximately 20.2 percent of residents live below the poverty line. Approximately 1,536 SRS employees reside in Richmond County, accounting for approximately 1.9 percent of

2023 employment within the county. Between 2010 and 2023, the labor force decreased by 4.3 percent, from 87,694 to 83,974 persons. The number of unemployed people decreased by 58.9 percent, from 9,530 to 3,916. The unemployment rate declined by 6.2 percentage points, from 10.9 percent to 4.7 percent over that same period.

### C.2.9.2 Population and Demographic Characteristics

This section presents population and information on the population within the four-county ROI. It also includes information on the federally recognized tribes.

#### Population

As shown in Table C.2.9-4, the population within the four-county ROI was approximately 558,192 in 2023. This reflects steady growth from 507,322 in 2010, with an average annual growth rate of approximately 0.6 percent. This growth rate is consistent with broader trends observed in South Carolina and Georgia, where populations have expanded significantly over the past decade (USCB 2010a, 2023c).

South Carolina’s population reached about 5,212,774 in 2023, growing steadily from 4,625,364 in 2010. Projections indicate continued growth, with the state population expected to reach approximately 7,220,210 by 2050. Georgia, with a larger population of 10,822,590 in 2023, has also seen significant growth since 2010 and is projected to grow to 13,064,658 by 2050 (USCB 2010a, 2023c; Georgia 2025; South Carolina 2019).

Overall, the ROI reflects a range of demographic trends: Columbia County exhibits strong growth, Aiken County moderate growth, Richmond County stable population, and Barnwell County declining population.

**Table C.2.9-4 Historical and Projected Population within the Four-County ROI, South Carolina, and Georgia**

County	2010	2023	2025	2030	2035	2040	2045	2050
Aiken	160,099	171,949	175,635	178,735	180,550	182,365	184,180	185,995
Barnwell	22,621	20,565	19,515	18,395	17,250	16,105	14,960	13,815
Columbia	124,053	159,638	169,529	179,827	189,611	199,243	208,730	217,669
Richmond	200,549	206,040	207,883	212,216	214,704	215,847	216,386	216,927
<b>ROI TOTALS</b>	<b>507,322</b>	<b>558,192</b>	<b>572,562</b>	<b>589,173</b>	<b>602,115</b>	<b>613,560</b>	<b>624,256</b>	<b>634,406</b>
South Carolina	4,625,364	5,212,774	5,542,140	5,881,710	6,223,085	6,555,460	6,887,835	7,220,210
Georgia	9,687,653	10,822,590	11,269,572	11,823,402	12,302,072	12,711,597	13,064,658	13,371,813

ROI = region of influence

Source: USCB 2010a, 2015, 2020, 2023c; Georgia 2025; South Carolina 2019

**Aiken County.** From 2010 to 2023, Aiken County experienced steady growth, with its population rising from approximately 160,099 in 2010 to about 171,949 in 2023. This upward trend is expected to continue, with the population projected to reach nearly 182,365 by 2040 and 185,995 by 2050.

**Barnwell County.** From 2010 to 2023, Barnwell County experienced a gradual decline in population, decreasing from around 22,621 in 2010 to approximately 20,565 in 2023. This downward trend is projected to continue, with the population expected to decrease to around 16,105 by 2040 and further decline to 13,815 by 2050.

**Columbia County.** From 2010 to 2023, Columbia County has shown strong growth, with its population rising from approximately 124,053 in 2010 to 159,638 in 2023. The population is projected to continue increasing significantly, reaching about 199,243 by 2040 and 217,669 by 2050.

**Richmond County.** From 2010 to 2023, Richmond County’s population has remained relatively stable, growing modestly from 200,549 in 2010 to 206,040 in 2023. Projections indicate a slight increase to about 215,847 by 2040 and 216,927 by 2050.

### **Federally Recognized Tribes**

Regardless of the alternatives evaluated in this PEIS, the DOE/NNSA remains committed to fulfilling its obligations to tribal nations.

There are no federally recognized tribes or tribal lands within a 50-mile radius of SRS. The Catawba Nation, located in the northern part of South Carolina in York County, is the only federally recognized tribe in South Carolina. Additionally, there are no federally recognized tribes within the socioeconomic ROI of SRS. However, the Beaver Creek Indian Tribe, a state-recognized tribe and nonprofit organization, is headquartered in Salley, Aiken County, with many tribal members residing in Aiken, Lexington, and Orangeburg counties.

### **C.2.9.3 Housing**

Table C.2.9-5 lists the distribution of housing units in the ROI and South Carolina and Georgia. As of 2023, the ROI had approximately 241,680 total housing units, with an overall occupancy rate of 84.4 percent and a vacancy rate of 15.7 percent (USCB 2023d). Vacant rental units represent about 3.0 percent of the total housing stock, while other vacant units make up approximately 12.7 percent. Vacancy rates in the four-county ROI are lower than those in South Carolina and Georgia. The ROI’s vacancy rate was approximately 15.7 percent in 2023 (37,861 vacant units out of 241,680 total units), whereas South Carolina’s vacancy rate was about 13.8 percent, and Georgia’s was approximately 10.6 percent. However, the ROI’s proportion of vacant rental units (about 3.0 percent) is higher than both South Carolina (2.3 percent) and Georgia (2.3 percent) when considered relative to total housing units (USCB 2023d, 2023e). This indicates that the ROI may have a somewhat greater availability of vacant rental units compared to the states. At the same time, the ROI experiences a higher proportion of other vacant units, which may include seasonal homes, properties for sale, or units in transition, reflecting a complex housing market with diverse vacancy types.

**Aiken County.** The Aiken County housing stock totaled 78,715 units as of 2023, reflecting a 9.0 percent increase since 2010. The vacancy rate was 12.8 percent, indicating a moderate level of available housing. The median value of owner-occupied homes in 2023 was approximately \$199,500.

**Barnwell County.** The Barnwell County housing stock totaled 9,901 units as of 2023, reflecting a 5.5 percent decrease since 2010. The vacancy rate was 18.1 percent, indicating a relatively high level of available housing. The median value of owner-occupied homes in 2023 was approximately \$97,200.

**Columbia County.** The Columbia County housing stock totaled ,412 total units in 2023, a 24.3 percent growth since 2010. The vacancy rate was 13.8 percent, reflecting a moderate vacancy level. The median value of owner-occupied homes in 2023 was approximately \$287,400.

**Richmond County.** The Richmond County housing stock totaled 92,652 units in 2023, a 7.4 percent increase since 2010. The vacancy rate was 19.0 percent, indicating a significant proportion of available housing. The median value of owner-occupied homes in 2023 was around \$163,300.

**Table C.2.9-5 Housing Characteristics for the Four-County Region of Influence**

County/ Area	2010					2023				
	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Vacant Rental Units	All Other Vacant Units	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Vacant Rental Units	All Other Vacant Units
Aiken	72,249	64,253	7,996	1,742	6,254	78,715	68,606	10,109	809	9,300
Barnwell	10,484	8,937	1,547	348	1,199	9,901	8,107	1,794	114	1,680
Columbia	48,626	44,898	3,728	949	2,779	60,412	52,083	8,329	1345	6,984
Richmond	86,331	76,924	9,407	3,537	5,870	92,652	75,023	17,629	4,959	12,670
<b>ROI TOTALS</b>	<b>217,690</b>	<b>195,012</b>	<b>22,678</b>	<b>6,576</b>	<b>16,102</b>	<b>241,680</b>	<b>203,819</b>	<b>37,861</b>	<b>7,227</b>	<b>30,634</b>
South Carolina	2,137,683	1,801,181	336,502	92,758	243,744	2,401,638	2,070,390	331,248	54,196	277,052
Georgia	4,088,801	3,585,584	503,217	174,416	328,801	4,483,873	4,008,013	475,860	101,196	374,664

ROI = region of influence  
Source: USCB 2023d, 2023e

#### C.2.9.4 Local Government Finances

SRS has a substantial impact on the economy of South Carolina. If there is a change in employment, employee incomes, or procurement at SRS, these changes would be expected to have a direct effect on city and county revenues, such as the gross receipts tax.

Table C.2.9-6 summarizes the general funds revenues for the four-county ROI. The general funds of these counties support the ongoing operations of their governments as well as community services such as police protection and parks and recreation.

**Table C.2.9-6 General Funds Revenues for the Four-County Region of Influence**

Revenue Source	Aiken	Barnwell	Columbia	Richmond
Property taxes	\$49,545,121	\$10,602,070	\$36,872,910	\$62,146,276
Other taxes	\$14,200,406	\$1,431,675	\$48,204,924	\$74,055,341
Licenses and permits	\$3,078,310	\$0	\$482,995	\$1,916,619
Intergovernmental	\$11,408,824	\$2,963,953	\$2,916,236	\$12,701,716
Charges for services	\$5,001,161	\$699,887	\$5,893,712	\$22,500,595
Investment income	\$1,868,208	\$175,773	\$352,811	\$5,315,964
Other revenue	\$5,510,907	\$1,251,226	\$3,041,224	\$5,893,363
<b>REVENUE TOTALS</b>	<b>\$90,612,937</b>	<b>\$17,124,584</b>	<b>\$97,764,812</b>	<b>\$184,529,874</b>

Source: Aiken County 2024; Barnwell County 2024; Columbia County 2023; Richmond County 2024

#### C.2.9.5 Community Services

This section describes the capacity and existing demands on fire protection services, police protection services, public education, and health care within the ROI. Providers of these services in the ROI are fire and police departments, hospitals and clinics, and public school districts.

**Fire Protection.** The ROI is served by 90 fire departments and stations composed of a mix of career and volunteer firefighters, as well as civilian and volunteer nonfirefighting personnel, working collaboratively to ensure public safety. In Aiken County fire services are provided through a combination of paid and volunteer firefighters operating from various stations, including six fire departments within the city of Aiken (South Carolina 2025). Barnwell County’s fire services are coordinated at the county level and supported by multiple local departments such as the City of Barnwell Fire Department, Red Oak Fire Department, and Elko Fire Department, providing a broad range of emergency responses including fire suppression, hazardous material handling, vehicle extrication, and disaster preparedness (South Carolina 2025). Columbia County Fire Rescue provides fire protection and education, vehicle extrication and rescue, medical first response, and other services to the citizens of Columbia County. Columbia County fire services has 21 stations which are fully staffed 24 hours a day by professional firefighters dedicated to fire suppression, rescue operations, and other emergency services (Columbia County 2025). Richmond County and the City of Augusta operate 19 fire stations, equipped with a modern fleet that includes a Mobile Emergency Operations Command Unit, 25 fire engines, and three ambulances to support its extensive emergency response capabilities (Augusta 2025). In addition, the SRS Fire Department plays a critical role across the region by performing specialized rescues such as high and low angle, confined space, structural collapse, vehicle extrication, and trench collapse, alongside providing emergency medical services and hazardous material incident response, complementing the broader fire protection efforts within the ROI.

**Police Protection Services.** Police protection in the ROI is provided by county sheriff’s departments and various local police departments. There are approximately 19 police departments within the ROI employing more than 1,700 officers (FBI 2023). Each department provides law enforcement services in conjunction with other law enforcement agencies, including the state highway patrol. The Aiken County Police Department has 110 law enforcement employees, including 88 officers and 22 civilians (FBI 2023). Centerra-SRS, a subsidiary of Centerra Group, LLC, is a paramilitary organization is contracted by the DOE Savannah River Operations Office to provide total security services, including access control, property protection, law enforcement, criminal investigations, traffic control, canine explosives and drug detection, aviation support, river patrol, alarm equipment monitoring, and a Special Response Team to SRS (Centerra-SRS 2025).

**Medical Services.** Medical services in the ROI include a mix of hospital care and specialized occupational health support. Aiken County has one hospital, Aiken Regional Medical Centers, a 273-bed acute-care facility located in the city of Aiken. This full-service hospital offers a broad range of medical services, including emergency care, surgical services, diagnostic imaging, and specialized treatments, serving as a primary healthcare provider for both the county and surrounding areas. There are five hospitals in Richmond County that provide comprehensive services such as emergency care, advanced surgical procedures, cardiology, maternity care, and other specialized treatments. There are currently no hospitals in Barnwell and Columbia counties; however, a new hospital in Columbia County is projected to open in 2026. In addition, the SRS offers onsite medical services focused on supporting the health and safety of its workforce. These services include emergency medical response capabilities providing occupational health support for workers with work-related illnesses, ensuring their well-being in this specialized industrial environment (AHD 2022).

**School Services.** South Carolina is divided into 96 school districts and Georgia is divided into 253 school districts, eight of which are within the ROI. For the 2023/2024 school year, total public school enrollment in the ROI was 86,010 students. Total students within the ROI make up approximately 3.5 percent of the student population in South Carolina and Georgia. Richmond County has the greatest number of schools (51) and the largest student population (30,366), and Barnwell County has the least number of schools (10) and smallest student population (3,129) within the ROI. The ROI has an average student-to-teacher ratio of 14 to 1. Table C.2.9-7 summarizes school enrollment in the ROI.

**Table C.2.9-7 School Enrollment for the SRS Region of Influence, 2023/2024 School Year**

County/Area	School Districts	Number of Schools	Number of Students	Student-to-Teacher Ratio
Aiken	1	41	23,103	14:1
Barnwell	3	10	3,129	13:1
Columbia	2	31	29,412	16:1
Richmond	2	51	30,366	12:1
<b>ROI TOTALS</b>	<b>8</b>	<b>133</b>	<b>86,010</b>	<b>14:1</b>

Source: NCES 2025

## C.2.10 Traffic and Transportation

This section presents the primary transportation modes and routes used to transport SRS-affiliated employees, commercial shipments, and hazardous and radioactive material shipments. It also includes information regarding transportation packaging, transportation accidents, onsite/offsite traffic volumes, and a description of SRS's transportation infrastructure, including its onsite parking and roadway configurations.

### C.2.10.1 Regional and Site Transportation Routes

The primary means of transportation to SRS is via motor vehicle. The nearest commercial bus terminal is in the city of Aiken, SC, approximately 20 miles driving distance from SRS. The nearest commercial rail connection is located adjacent to the Aiken Municipal Airport, 25 miles north of SRS. Augusta Regional Airport (Bush Field), located about 20 miles northwest of SRS, is the closest commercial airport to the site.

SRS is surrounded by a system of Interstate highways, U.S. highways, State highways, and local roads. The regional transportation network services the four South Carolina counties (Aiken, Allendale, Bamberg, and Barnwell) and two Georgia counties (Columbia and Richmond) that generate nearly all of the SRS commuter traffic. Figure C.2.10-1 shows the regional transportation infrastructure around the site. The closest Interstate highway to SRS is Interstate 20 (I-20), west of Aiken and Augusta, and is the major transportation route from the local area to Columbia, South Carolina, and Atlanta, Georgia, and points beyond. I-520 is a loop that circles Augusta and North Augusta, connecting to I-20 at each end of the loop. Truck shipments to and from SRS primarily enter the region on I-20. Trucks to and from SRS primarily use I-520 and SC 125. Figure C.2.10-2 shows the vehicular access routes to/from SRS and onsite roads and railways.

SRS is managed as a controlled area with limited public access. As depicted below in Figure C.2.10-2, Vehicular access to SRS is provided from SCs 19, 64, 125, and 781, and US 278. SC 19 runs north from the site through New Ellenton toward Aiken; SC 64 runs in an easterly direction

from the site toward Barnwell; and SC 125 runs through the site itself in a southeasterly direction between North Augusta and Allendale, passing through Beech Island and Jackson. US 278 also runs through the site, in a southeasterly direction between North Augusta and Barnwell. SC 781 connects US 278 with Williston to the northeast of the site. The northern perimeter of the site is located approximately 10 miles from downtown Aiken. Of additional note, another primary road, U.S. Highway 301, crosses the Savannah River directly to the south of SRS (*see* Figure C.2.10-1).

Within SRS, there are approximately 130 miles of primary and 1,100 miles of secondary roads that connect the operational areas of the site to each other. The South Carolina Department of Transportation and the Lower Savannah Council of Governments Transportation Department collect and maintain data on the efficiency of the transportation system within the region surrounding SRS. As was the case with LANL above in Section C.1.10.1, public-road performance nearby to SRS is measured using LOS designations, ranking from “A” to “F,” with “A” as the best travel conditions and “F” the worst; see Table C.2.10-1 below for recent (CY 2024) annual average daily traffic and truck counts along these roads, as well as estimated LOS’s. Most planners typically aim for LOS “C,” which is defined as roads that are below but close to capacity, with traffic that generally flows at posted speeds. In regard to planned major road improvements within the general SRS region, replacement of the I-20 bridges over the Savannah River and Augusta Canal was completed in early 2025. The overall construction project included the widening of approximately 2 miles of I-20 from four to six lanes, replacement of four bridges, and the addition of intersection-improvements at the West Martintown Road Interchange in South Carolina.

The Norfolk/Southern Railway owns two tracks that traverse through a five-mile area outside the SRS boundary. One track extends east-southeast from Augusta, Georgia, to Charleston, South Carolina (*see* Figures C.2.10-1 and C.2.10-2). The other track (not visible in the figures) extends south from Augusta turning eastward at the Burke County line to a point approximately three miles from SRS and continues south to Savannah, Georgia. A CSX rail line traverses the west side of the site, approximately parallel to SC 125. SRS operates and maintains its own railroad system for providing direct rail service to various areas within SRS. The onsite rail system, consisting of about 32 miles of track, interfaces with commercial railroads at the site, with a rail spur providing rail access to F Area and E Area (*see* Figure C.2.10-2) (NNSA 2020a).

The aforementioned Bush Field and the Columbia Metropolitan Airport in Lexington County, South Carolina, are the only two airports within 60 miles of SRS that provide scheduled air passenger services. The Columbia Metropolitan Airport is the nearest air-traffic “hub,” and is located approximately 60 miles from SRS. Barnwell County Airport, a small general aviation facility, is located about 15 miles from the site and is the closest airport to the SRS boundary. Private aircraft, including corporate jets, use the Barnwell County Airport. Other small, nearby airports include Aiken Municipal Airport (25 miles away), Allendale County Airport (27 miles away), Bamberg County Airport (30 miles away), Burke County Airport in Waynesboro (26 miles away), and Daniel Field in Augusta (28 miles away).

DOE operates a heliport on SRS in B Area, where two lightweight, multipurpose helicopters are based to provide support to the security services at the site. The USFS conducts regular helicopter operations across SRS for purposes of wildfire detection/response, prescribed fire operations, and wildlife/forest health surveillance. USFS operations originate from the heliport adjacent to the USFS facility on SRS. In addition, South Carolina Electric and Gas conducts limited helicopter operations across SRS for purposes of right-of-way inspection and clearance; these operations originate offsite, with site access accomplished via electrical line pathways only (NNSA 2020a).

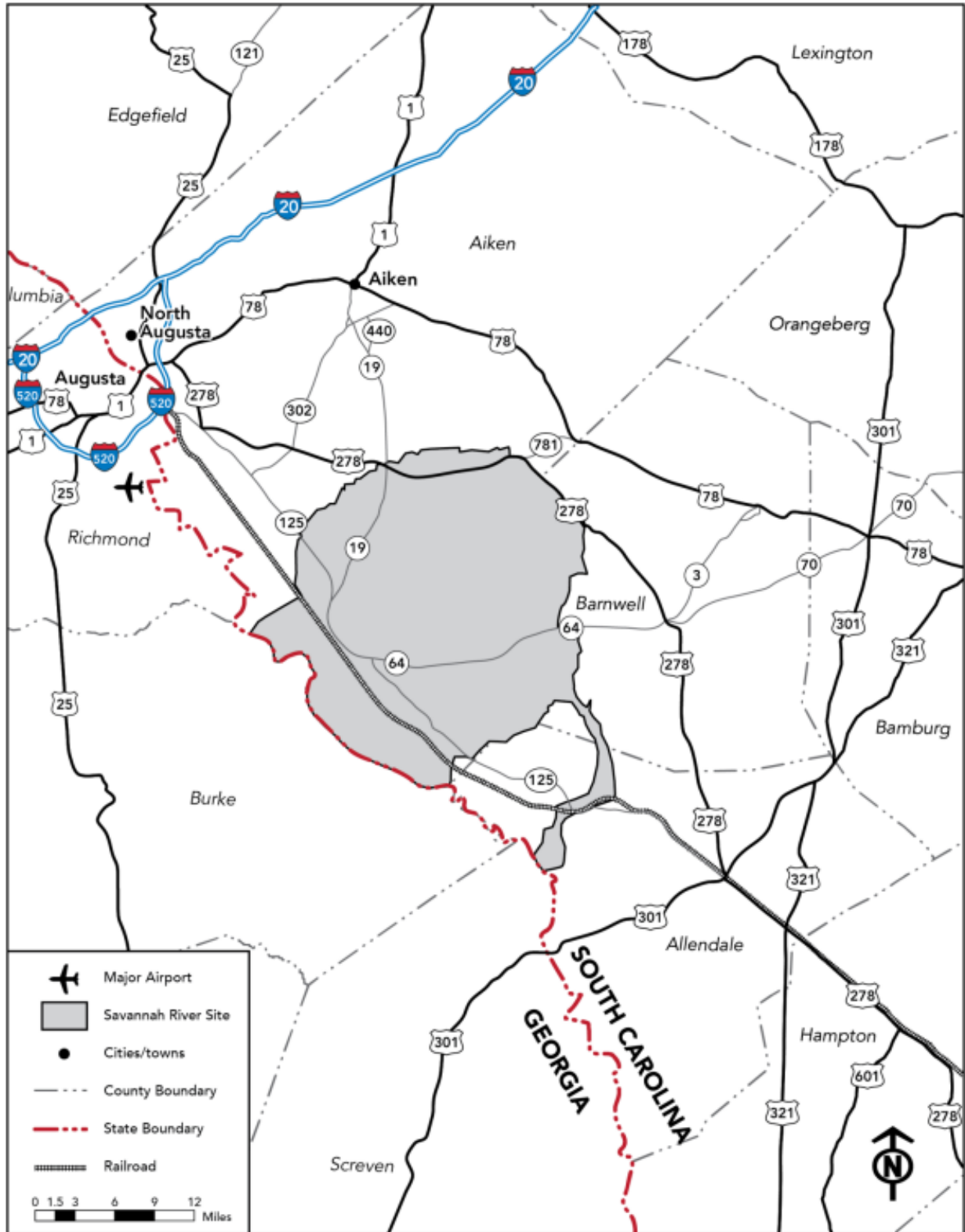


Figure C.2.10-1 Regional Road Network Surrounding SRS

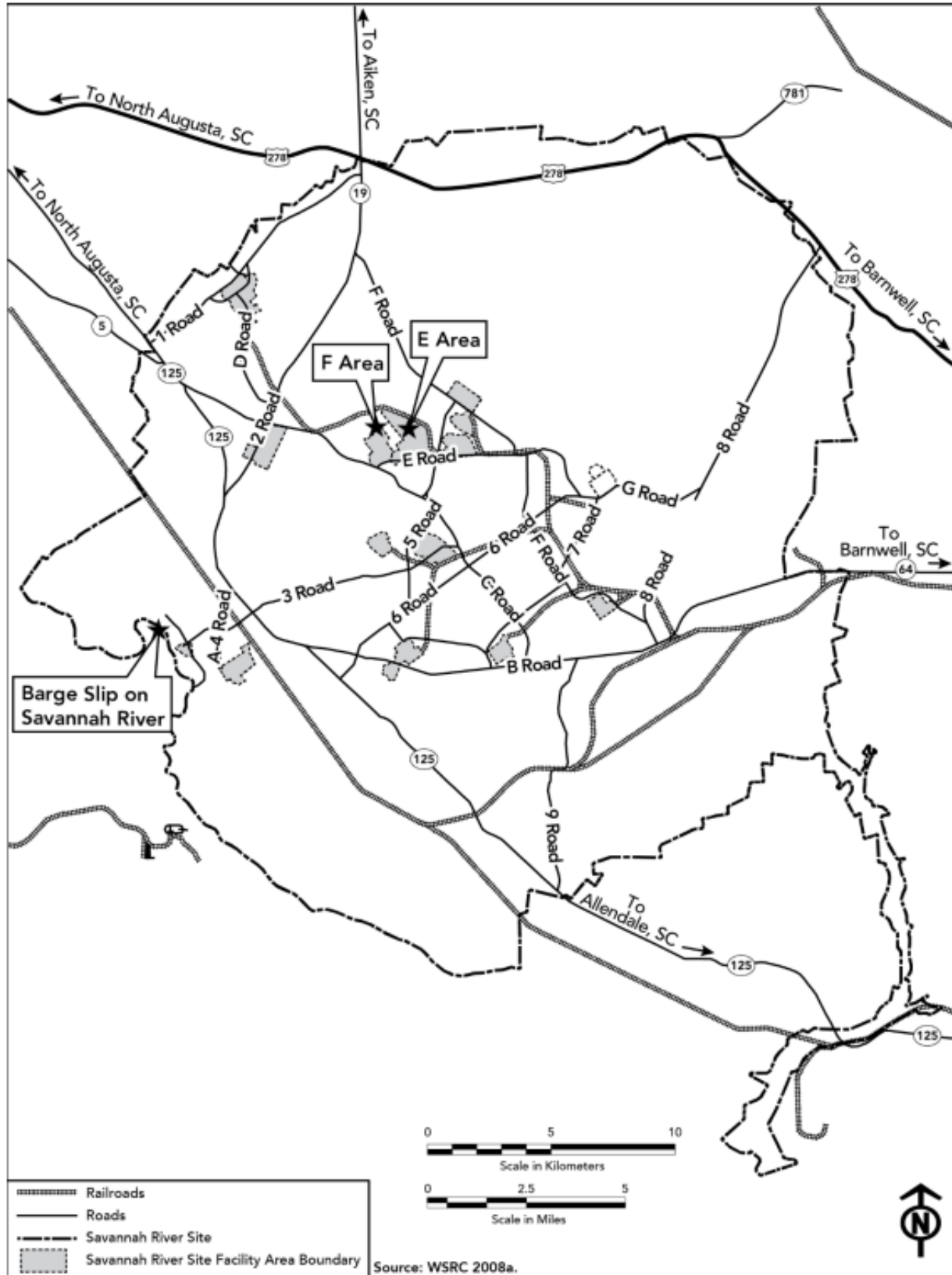


Figure C.2.10-2 Savannah River Site Local Transportation Infrastructure

Barge transportation via the Savannah River is available. The Savannah River is typically used primarily for recreation, and SRS has no commercial docking facilities abutting it; however, it does have a boat ramp (see Figure C.2.10-2) that is occasionally used for accepting large transport-barge shipments (NNSA 2020a).

Table C.2.10-1 summarizes the average daily traffic and truck volumes along SRS’s main access/egress locations.

**Table C.2.10-1 Annual Average Daily Traffic for Principal SRS Access Routes**

Access Route	AADT 2024 (all vehicles) <sup>a</sup>	AADT 2024 (trucks only) <sup>a</sup>	2024 LOS
SC 19/Oak Hill	15,000	600	C
SC 19/New Ellenton	1,600	64	B
SC 64/Snelling	1,600	160	B
SC 64/Patterson Mill Road	6,900	690	C
SC 125/Beech Island	16,300	980	D
SC 125/Jackson	14,100	850	C
SC 125/Hattieville	2,100	590	C
US 278/Talatha	2,400	96	C
US 278/SC 64	17,100	2,050	D
US 278/SC 781	1,900	420	B
US 278/US-301	4,900	690	C
SC 302 between US 278 and SC 125	1,450	87	B

AADT = Annual Average Daily Traffic; LOS = level of service (see definitions in the discussions for LOS above in Section C.1.10.1)

<sup>a</sup> SCDOT 2024

### C.2.10.2 Onsite Parking

There are several thousand parking spaces and areas (marked and unmarked) at SRS (exact number not published for public dissemination) that are designated as available to serve the approximately 13,000 employees. These marked stalls and other designated areas are provided throughout numerous institutional parking lots and structures distributed across the site and were placed with a goal of minimizing walking distances from vehicles to work locations to the greatest extent practicable.

### C.2.10.3 Traffic Accidents – Historical Data

Tables C.2.10-2 and C.2.10-3 list recent historical data related to motor vehicle accidents within SRS’s surrounding tri-county area of Aiken, Barnwell, and Allendale counties. In 2023, there were 4,725 motor vehicle accidents collectively within Aiken, Barnwell, and Allendale counties, resulting in 45 total fatalities. When accidents are considered per 100 million vehicle-miles traveled for this specific group of counties, travel in Aiken County was the most dangerous within the local transportation ROI corridor during 2023 (Barnwell County, however, had the highest fatality rate). As also depicted within Table C.2.10-2, if extending outward to the other surrounding counties within the full 50-mile ROI (which includes Edgefield, Saluda, Lexington, Orangeburg, and Bamberg counties in South Carolina, as well as Richmond, Burke, Screven, Columbia, and Jenkins counties in Georgia), the total collective number of motor vehicle accidents over the entire

ROI in 2023 increases to approximately 30,200, with an associated resulting 215 collective fatalities.

**Table C.2.10-2 Traffic Accidents and Fatalities in Nearby Counties, 2023**

County	Total Accidents	Crash Rate <sup>a</sup>	Fatalities	Death Rate <sup>b</sup>
Aiken (SC)	4,283	212	38	1.88
Barnwell (SC)	333	162	5	2.43
Allendale (SC)	109	105	2	1.93
Edgefield (SC)	346	148	4	1.71
Saluda (SC)	358	152	6	2.55
Lexington (SC)	8,162	241	47	1.39
Orangeburg (SC)	2,629	150	37	2.12
Bamberg (SC)	212	131	6	3.72
Richmond (GA)	8,512	N/A	52	N/A
Burke (GA)	573	N/A	6	N/A
Screven (GA)	162	N/A	4	N/A
Columbia (GA)	4,397	N/A	5	N/A
Jenkins (GA)	90	N/A	3	N/A
South Carolina (statewide)	145,761	239	1,047	1.72
Georgia (statewide)	184,718	146	1,615	1.28

GA = Georgia; N/A = not available; SC = South Carolina

a Crash rate represents crashes per 100 million vehicle-miles traveled.

b Death rate represents deaths per 100 million vehicle-miles traveled.

Source: SCDOT 2023; GDOT 2023; Georgia 2023; NHTSA 2025

Table C.2.10-3 summarizes the collective accident history for the three counties (Aiken, Barnwell, Allendale) directly adjacent to SRS from 2019 through 2023. As shown in the table, the crash rate within the collective tri-county area was significantly lower (about 15 percent lower) than the South Carolina state average crash rate during this period. The comparative accident fatality rates between the two, however, were essentially equivalent.

**Table C.2.10-3 Aiken, Barnwell, and Allendale County Traffic Accidents and Fatalities, 2019–2023**

Year	Total Accidents	Crash Rate <sup>a</sup>	Fatalities	Death Rate <sup>b</sup>
2019	4,479	199	35	1.52
2020	3,907	190	41	2.34
2021	4,852	221	45	2.18
2022	4,691	207	32	1.46
2023	4,725	206	45	1.94
Total County Average 2019–2023	4,531	<b>205</b>	40	<b>1.89</b>
State Average 2019–2023	139,848	<b>242</b>	1,082	<b>1.87</b>

a Crash rate measures crashes per 100-million vehicle-miles traveled and is proportionally weighted across the three counties for each of the five measured years.

b Death rate measures deaths per 100-million vehicle-miles traveled and is proportionally weighted across the three counties for each of the five measured years.

Source: SCDOT 2019, 2020, 2021, 2022, 2023

### **C.2.10.4 SRS Shipments**

Hazardous, radioactive, industrial, commercial, and recyclable materials, including wastes, are transported to, from, and on SRS during routine operations. Hazardous materials include nonradioactive commercial chemical products that are regulated and controlled based on whether they are listed materials or if they exhibit the hazardous characteristics of ignitability, toxicity, corrosivity, or reactivity. Radioactive materials primarily include SNM (i.e., pits, plutonium metals, plutonium oxides), as well as a host of other miscellaneous radioactive materials supporting defense and non-defense missions. Offsite shipments, both to and from SRS, are typically carried out by commercial carriers (including standard commercial truck, air-freight, and DOE secure tractor-trailer). Numerous regulations and requirements govern the transportation of hazardous and radioactive materials, including those of the USDOT, NRC, DOE, FAA, International Air Transport Association, and SRS.

#### **Onsite Shipments**

Onsite hazardous and radioactive material shipments are transported in conformance with USDOT regulations. A shipment is considered an onsite shipment if both the origin and destination are at SRS. These shipments are transported in a variety of site-operated vehicles depending on the quantity and radioactivity of the material shipped and range from contractor-owned pick-up trucks to DOE-owned safe-secure trailers. Maintenance of these vehicles is closely monitored for physical performance as well as security.

SRS primarily transports and disposes of its waste on site in various facilities, including landfills and specialized disposal units for different waste types. Specifically, the majority of construction and demolition (C&D) debris is transported to the onsite C&D Landfill, while sanitary waste and some other C&D wastes are sent offsite to the Three Rivers Solid Waste Authority Regional Landfill (Three Rivers Landfill).

Radioactive and hazardous wastes are transported onsite for management and/or disposal. Onsite radioactive material shipments are transported in conformance with federal regulations. A primary feature of these regulations is stringent packaging requirements governing shipments on public roads. While rare, it may not always be cost-effective for DOE to conform to these stringent packaging requirements; in such cases, site roads are temporarily closed during the shipments. Regardless, SRS/DOE safety requirements always fully apply.

#### **Offsite Shipments**

Offsite transportation of radioactive and other hazardous materials associated with present-day operations at SRS primarily occurs via the use of tractor-trailer trucks. The radioactive materials transported include, but are not limited to plutonium metals and oxides, LLW, MLLW, and TRU wastes; and nonradiological hazardous materials that are shipped include PCB-bearing wastes and infectious wastes. At SRS, DOE regularly transports and receives radioactive and other hazardous materials and waste shipments to and from other DOE facilities and commercial facilities nationwide. As discussed above, all shipments must meet applicable USDOT, NRC, FAA, and DOE regulations and requirements. Most unclassified shipments are transported via commercial carriers.

SRS has successfully completed undisclosed numerous shipments of non-waste radiological material (incoming and outgoing) annually over recent years (SRNS 2024; NNSA 2020a), primarily consisting of plutonium-based metals and oxides. During this same period, SRS

conducted numerous offsite waste shipments annually for MLLW, TRU waste, and hazardous waste, collectively (SRNS 2018a, 2019a, 2020a, 2021, 2022, 2023a, 2024).

As discussed in Section C.1.10.4.2, DOE regulations require that safe-secure trailers be used for offsite shipments of SNM, weapons components, and explosive-like assemblies in DOE custody. Classified shipments from SRS are also made in safe-secure trailers.

The type of packaging used for radiological shipments is determined by the total radioactive hazard presented by the material within the packaging. Just as the case for LANL, four distinct types of such packages are potentially used for SRS shipments: Excepted, Industrial, Type A, and Type B. Additional details with regard to packaging requirements are discussed in Appendix E.

SRS transfers the majority of its generated LLW to its onsite waste processing/disposal facility, with occasional shipments of unique LLW compositions instead sent off site to the NNSS in Nevada, as well as possibly to commercially licensed TSD facilities. Such offsite shipments, however, are infrequent. SRS sends MLLW to appropriately permitted offsite commercial TSD facilities for treatment and disposal. SRS typically sends hazardous waste (e.g., PCB-bearing materials and infectious wastes) to a variety of permitted, offsite commercial TSD facilities within 50 miles of the site. Over recent years, SRS has averaged about 15 annual shipments to these offsite facilities (SRNS 2018a, 2019a, 2020a, 2021, 2022, 2023a, 2024).

SRS regularly sends quantities of TRU waste to the WIPP facility for underground disposal. Over recent years, SRS has averaged about 11 annual shipments of TRU waste to WIPP (SRNS 2018a, 2019a, 2020, 2021, 2022, 2023a, 2024). For perspective, a single TRU waste truck shipment can carry between 2.8 and 3.7 cubic meters of TRU (*see* Section C.1.10.4).

The same regulatory standards and policies discussed in Section C.1.10.4.2, also apply for transporting radioactive and hazardous materials offsite to or from SRS.

### C.2.11 Infrastructure

Site infrastructure includes those basic resources and services required to support planned construction and operations activities and the continued operation of existing facilities. For the purposes of this PEIS, infrastructure is defined as electricity, fuel, water, sanitary wastewater, and steam. Table C.2.11-1 summarizes the current use of F Area resources (the SRPPF complex is in F Area). Table C.2.11-2 presents information about the SRS site-wide infrastructure and capacity.

**Table C.2.11-1 Current Use of Resources at F Area**

Resource	F Area
Electricity—power consumption (MW-hr/yr)	46,000
Electricity—peak load (MW)	10
Diesel/Fuel oil (GPY)	718
Domestic water (GPY)	61,000,000

GPY = gallons per year; MW = megawatts; MW-hr/yr = megawatt-hours per year

Sources: NNSA 2015; SRNS 2020b

Table C.2.11-2 SRS Site-Wide Infrastructure

Resource	Current Estimated Use	Capacity	Available Capacity <sup>a</sup>
Electricity–power consumption (MW-hr/yr) <sup>b</sup>	320,000 <sup>c</sup>	4,400,000 <sup>b</sup>	4,080,000
Electricity–peak load (MW) <sup>b</sup>	60	500	440
Fuel–Diesel and oil (GPY) (A, F, and K areas)	425,772 <sup>d</sup>	NA <sup>e</sup>	NA <sup>e</sup>
Biomass (tons per year)	300,000	20,000,000	19,700,000
Steam (million pounds per year)	571 <sup>c</sup>	2,628 <sup>c</sup>	2,057
Domestic water (GPY) <sup>c</sup>	288,000,000	788,000,000	500,000,000
Sanitary wastewater (GYP) <sup>b</sup>	115,000,000 <sup>c</sup>	383,000,000 <sup>f</sup>	133,000,000

GPY = gallons per year; MW = megawatts; MW-hr/yr = megawatt-hours per year; NA = not applicable.

a Available capacity equals capacity minus current estimated use.

b Source: NNSA 2015.

c Data are from SRNS 2023b.

d Fuel usage results from estimated oil use (NNSA 2015) and present diesel use (SRNS 2023b). Current use at F Area is 718 GPY (NNSA 2020a).

e Capacity is generally not limited, as delivery frequency can be increased to meet demand.

f Capacity includes the Central Sanitary Wastewater Treatment Facility and smaller treatment units in K Area and L Area.

### C.2.11.1 Electricity

Most of the electrical power consumed by SRS is generated by offsite coal-fired and nuclear power plants, supplied by Dominion Energy (formerly supplied by South Carolina Electric and Gas Company). Power is supplied by three transmission lines. SRS uses a 115-kilovolt power line system in a ring arrangement to supply electricity to the operations areas (DOE 2005b). Approximately 320,000 megawatt-hours per year of electricity is used at SRS, with an available capacity of 4,080,000 megawatt-hours per year (NNSA 2015). The peak load use is estimated to be 60 megawatts, with a peak load capacity of 500 megawatts.

F Area receives power from the 200-F power loop supplied by the 251-F electrical substation (NRC 2005). The current estimated power consumption for F Area is approximately 46,000 megawatt-hours per year, which accounts for approximately 14 percent of current site-wide electrical usage and represents about 1 percent of the site-wide capacity. The theoretical maximum peak load that F Area could experience is 10 megawatts, compared to a site-wide peak load of 60 megawatts. SRS has the capacity to deliver a peak load of up to 500 megawatts (NNSA 2015).

### C.2.11.2 Fuel

Biomass, backed up with fuel oil, is used at SRS to produce steam in boiler plants (SRNS 2018a). Fuel oil is also used to power emergency generators. Natural gas is not used at SRS (DOE 2005b). SRS uses an estimated 426,000 gallons of fuel oil per year (NNSA 2015; SRNS 2023b). Replenishment of onsite fuel oil supplies can be delivered by truck or rail as needed. Furthermore, temporary storage tanks can be installed to supplement fuel consumption needs during construction activities. Thus, the capacity for fuel is generally not considered to be limited.

### C.2.11.3 Domestic Water

Three large domestic water supply systems at SRS deliver the vast majority of the site's requirements. These water treatment facilities are located in A Area and K Area. A smaller system located in B Area is a backup to the facility in A Area. The A Area supply system supplies most

of the site and has a maximum capacity of 1.58 billion gallons per year when two wells are operating, but it normally operates one well at 788 million gallons per year (SRNS 2023b). Raw water is drawn from subsurface aquifers through 20-inch-diameter production wells using vertical turbine pumps. Once treated, the potable water is stored in five elevated storage tanks and distributed to the various facilities through a network of piping (DOE 2005b).

Approximately 288 million gallons of domestic water are used at SRS annually (SRNS 2023b), of which approximately 61 million gallons per year is consumed by the F Area (NNSA 2020a). F Area domestic water consumption accounts for 21 percent of the site-wide use and about 7.7 percent of site-wide capacity (NNSA 2015).

Process water for individual areas is supplied through separate deep groundwater wells or river intake systems (DOE 2005b). A, F, H, and S Areas have process water systems to meet SRS demands for boiler feedwater, equipment cooling water, facility washdown water, and makeup water (SRNS 2025).

#### **C.2.11.4 Sanitary Wastewater**

The Central Sanitary Wastewater Treatment Facility (CSWTF) collects and treats 97 percent of sanitary wastewater generated at SRS. The system includes 18 miles of pressurized sewer line and 12 lift stations that are used to transport sanitary wastewater to the CSWTF. The remaining balance of sanitary wastewater is treated at three smaller independent facilities located in D Area, K Area, and L Area (NNSA 2020a). The sanitary wastewater treatment systems, including the CSWTF and other facilities have a treatment capacity of 383 million gallons per year, of which 30 percent of its capacity, or 115 million gallons per year, are currently needed by the site (SRNS 2019c).

#### **C.2.11.5 Steam**

The current mission for the steam generation and distribution system is to provide customers an uninterrupted steam supply for chemical processing or building heat. The steam generation and distribution system at SRS is composed of four steam production facilities and multiple feed line headers. The Site Services' utilities group currently maintains approximately 10 miles of active steam lines and 283 trap stations at SRS. Site Services operates and maintains steam line supply headers and inner area distribution lines up to facility area boundary points (SRNS 2019c).

The site is estimated to use about 571 million lb of steam annually. The site capacity to produce steam is 300,000 lb/hr, or approximately 2,600 million lb/yr (SRNS 2023b). The 684-G Biomass Cogeneration Facility that produces steam at a daily average rate of 85,000 lb/hr supplies steam to the F Area (NNSA 2020a).

The 684-G Biomass Cogeneration Facility was constructed in 2012 to produce steam and electricity. In 2016, a new biomass boiler was added to the facility for additional steam security (no cogeneration). These facilities provide steam service to the F, H, and S areas (SRNS 2019c).

#### **C.2.12 Waste and Materials Management**

This section provides an overview of SRS waste management actions, presented by waste type or category and includes a description of the types of materials typically found in the waste, and how it is dispositioned (e.g., on or off site). Although the Proposed Action would not generate HLW; HLW management at SRS is a significant element of SRS waste management operations, and elements of HLW management are included in the management of other radioactive wastes.

Therefore, HLW is discussed in this section, but is not discussed in sections which address potential impacts to waste management associated with the Proposed Action.

### **C.2.12.1 Radioactive Waste**

#### **High-Level Radioactive Waste**

The primary materials managed as HLW at SRS are the radioactive liquid waste being held in the site's tank farm facilities and the solidified product generated from its treatment. The radioactive liquid waste was generated as a byproduct from processing nuclear materials; its management and treatment also generate several other non-HLW streams. Nuclear material and UNF processes are still performed at SRS, but much of the radioactive liquid waste inventory was generated from actions no longer being taken (NNSA 2015). SRS currently has about 34 million gallons of this waste stored in 43 underground tanks in F Area and H Area tank farms (SRS 2023b). An additional eight tanks in these two areas have already been operationally closed, and many of the active radioactive liquid waste tanks are scheduled for closure under the terms of the SRS Federal Facilities Agreement. Closure includes emptying the tanks to the extent practical and filling them with grout. Emptying the tanks and the complex process of treating the radioactive liquid waste to achieve more stable waste forms generates the other HLW addressed in this section. Once the radioactive liquid waste has been sitting in the tank for some time, it naturally separates into a sludge phase on the bottom of the tank and an overlying liquid phase. The volume of the liquid phase, once retrieved from a tank, is reduced through the use of two evaporators. Evaporator condensate is sent to the ETF, and the concentrate is sent back to the radioactive liquid waste tank. With the concentrate now having a much higher salt concentration, this mostly liquid phase in the tank is commonly referred to as salt waste and includes solid salt waste from material coming out of solution and crystallizing as the concentrated liquid cools. The main treatment process for radioactive liquid waste then involves treatment of the salt waste, making up more than 90 percent of the volume (SRS 2023b), and the underlying sludge. Salt waste from the tanks is sent through a two-step treatment process to remove radioactive contaminants such as plutonium, strontium and cesium. The material removed from the salt waste goes to the Defense Waste Processing Facility (DWPF), and the remaining, treated salt solution goes to the Saltstone Production Facility (SPF) for disposal in Saltstone Disposal Facility (SDF) as LLW. In 2024, the Salt Waste Processing Facility treated more than 3.1 million gallons of salt solution with more than 4.7 million gallons of waste being processed into grout and disposed of in the SDF (SRNS 2025). Waste going to the DWPF is mixed with borosilicate glass frit and melted to form molten glass that is poured into 10-foot-tall, 2-foot-diameter stainless steel canisters. Sludge waste is also transferred to the DWPF and solidified in a glass waste form in the same manner as described above for the specific waste streams separated from the salt waste. The canisters of solidified glass, or vitrified waste, are moved from the DWPF to one of two adjacent glass waste storage buildings where they are stored until a permanent disposal path is established. In 2024, DWPF filled 52 canisters with 214,721 pounds of glass waste mixture, immobilizing approximately 6.4 million Ci of activity in the HLW. Since DWPF began operating in March 1996, it has produced 4,452 canisters collectively, containing 17.0 million pounds of glass and immobilizing 78.8 million Ci of radioactivity (SRNS 2025).

#### **Low-Level Radioactive Waste**

DOE defines LLW as radioactive waste that does not meet the definition of HLW, UNF, TRU waste, byproduct materials, or naturally occurring radioactive material. At SRS, LLW produced

by most generators typically consists of miscellaneous job control waste, equipment, plastic sheeting, gloves, and soil that are contaminated with radioactive materials (SRNS 2025). Radioactivity in LLW is generally caused by isotopes that have relatively short half-lives, but this does not preclude the waste from being highly radioactive and in some cases even requiring remote handling. The LLW category also includes several waste streams from large-scale waste management operations. The discussion that follows addresses three LLW categories: liquid LLW going to the ETF, treated salt waste, and general LLW.

**Liquid LLW Going to the Effluent Treatment Facility.** Condensate from evaporators that are used to reduce the volume of the liquid phase of the tank waste is sent to the ETF which is located in H Area. In addition to evaporator overheads, wastewater going to the ETF includes segregated cooling water, contaminated surface water runoff, and transfer line catch tank streams. Treated wastewater which meets release criteria is sent to an outfall under an NPDES permit. The ETF is designed to process 100,000 to 250,000 gallons of liquid effluent per day but has a maximum permitted capacity of 430,000 gallons per day (SRR 2019). ETF processed approximately 4.3 million gallons of treated wastewater in 2024 (SRNS 2025).

**Treated Salt Waste.** The treated salt waste solution derived from reprocessing radioactive liquid waste in the tank farm facilities was historically managed as HLW. More recently, in accordance with Section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (Public Law 108-375), DOE determined, in consultation with NRC, that the low-activity salt waste stream, although generated from the reprocessing of HLW, does not require disposal in a deep geologic repository. As a result, treated salt waste can be disposed of in SRS’s SDF pursuant to an industrial landfill permit issued by the SCDES (SRNS 2025). Treated salt waste is sent to the SPF where it is mixed with cement, fly ash, and blast furnace slag to form grout (SRS 2023b). The saltstone mixture is sent directly from the SPF to one of the Saltstone Disposal Units for solidification and disposal. Once these units are filled, they will be capped with an engineered, multi-layer cover.

**General LLW.** The SRS solid waste management group is responsible for receiving LLW from site generators and, in some cases, from offsite generators, primarily the Naval Reactors Program. The group is also responsible for verifying waste received is as characterized by the generator and that the waste meets the receiving facility’s waste acceptance criteria. In most cases, newly generated LLW is taken directly to an onsite disposal unit in E Area (SRS 2023c). If a waste exceeds onsite disposal criteria or could adversely impact a unit’s disposal inventory, disposal at an approved offsite facility is pursued.

The volumes of LLW generated from operations, DD&D, and remediation across the site over the last 4 years (2020-2023) are presented in Table C.2.12-1. None of this past LLW generation was associated with pit production at SRS.

**Table C.2.12-1 LLW Generation at SRS, 2020–2023**

Waste Type (m <sup>3</sup> /yr)	2020	2021	2022	2023	Average (2020–2023)
LLW	4,533	4,398	5,329	4,445	4,681

LLW = low-level radioactive waste; m<sup>3</sup>/yr = cubic meters a year; SRS = Savannah River Site  
Source: SRNS 2026

### **Mixed Low-Level Radioactive Waste**

MLLW is radioactive LLW that also contains material regulated as hazardous waste. MLLW is generated by various SRS activities and operations, including environmental cleanup, D&D, and construction. Typical MLLW includes materials such as solvent-contaminated wipes, cleanup and construction debris, soils from spill remediation, RCRA metals, and laboratory samples (SRNS 2025). MLLW is sent off site to RCRA-regulated TSD facilities but may first be held in one of several SRS storage facilities that have the necessary permits to accept the waste. The volumes of MLLW generated across the site over the last 4 years (2020-2023) are presented in Table C.2.12-2. None of this past MLLW generation was associated with pit production at SRS.

**Table C.2.12-2 MLLW Generation at SRS, 2020–2023**

Waste Type (m <sup>3</sup> /yr)	2020	2021	2022	2023	Average (2020–2023)
MLLW	2.8	6.1	2.2	5.8	4.2

m<sup>3</sup>/yr = cubic meters a year; MLLW = mixed low-level radioactive waste; SRS = Savannah River Site  
Source: SRNS 2026

### **Transuranic Waste**

TRU waste is radioactive waste that is not HLW; UNF; byproduct material (as defined in Section 11e.(2) of the *Atomic Energy Act of 1954*, as amended); or naturally occurring radioactive material. TRU wastes contain manmade elements heavier than uranium on the periodic table (such as plutonium). TRU waste generated at SRS typically consists of radiologically contaminated items including clothing, tools, rags, residues, and debris (SRNS 2025). SRS packages its TRU waste for transport to the WIPP facility for disposal. The WIPP facility, located near Carlsbad, New Mexico, is DOE's deep geologic repository established for permanent disposal of TRU waste generated from defense activities (SRNS 2019a). The WIPP facility has the appropriate permits to accept TRU and mixed TRU waste. Further, the WIPP facility can accept TRU waste containing PCBs, which are regulated under the *Toxic Substances Control Act of 1976* (TSCA; 15 U.S.C. 2601–2629). SRS manages its TRU waste in accordance with DOE Orders, as well as federal and state hazardous and toxic waste regulations (SRNS 2025). SRS TRU waste is verified to meet WIPP's waste acceptance criteria and transportation requirements before being shipped. Preparation for shipping also includes packaging the waste in USDOT-approved containers, which are then placed in NRC-licensed casks. Transport is done in specifically designed trucks on routes approved by DOE and the impacted states along the route (SRS 2023c). The volumes of TRU waste generated across the site over the last 4 years (2020–2023) are presented in Table C.2.12-3. None of this past TRU waste generation was associated with pit production at SRS. The large increases in 2022 and 2023 were related to surplus plutonium disposition from K Area.

**Table C.2.12-3 TRU Waste Generation at SRS, 2020–2023**

Waste Type (m <sup>3</sup> /yr)	2020	2021	2022	2023	Average (2020–2023)
TRU Waste	32.7	68.5	166.9	244.6	128.2

m<sup>3</sup>/yr = cubic meters a year; SRS = Savannah River Site; TRU = transuranic  
Source: SRNS 2026

### C.2.12.2 Hazardous Waste

Hazardous waste is generated by multiple SRS activities and operations, including those noted above for MLLW. Typical hazardous waste at SRS includes RCRA metals, solvents, paints, pesticides, and hydrocarbons. PCB wastes, though regulated under TSCA rather than RCRA, are managed under the SRS Hazardous Waste Program. As with MLLW, hazardous waste is generally sent off site to commercial RCRA-regulated TSD facilities but may first be held in one of several SRS storage facilities that have the necessary permits to accept the waste. Certain hazardous wastes are recycled, including metals, excess chemicals, solvent, and chlorofluorocarbons. PCB wastes are generally sent off site for commercial treatment and disposal at TSCA-permitted facilities, but some meet restrictive regulatory standards to be disposed of in the local Three Rivers Landfill.

The volumes of hazardous waste generated across the site over the last 4 years (2020–2023) are presented in Table C.2.12-4. None of this past hazardous waste generation was associated with pit production at SRS.

**Table C.2.12-4 Hazardous Waste Generation at SRS, 2020–2023**

Waste Type (m <sup>3</sup> /yr)	2020	2021	2022	2023	Average (2020–2023)
Hazardous Waste	4.6	34.9	0.9	7.8	12.1

m<sup>3</sup>/yr = cubic meters per year; SRS = Savannah River Site

Source: SRNS 2026

### C.2.12.3 Other Waste

Waste described in this section is that which is neither hazardous nor radioactive and consists of C&D waste and sanitary waste.

#### Construction and Demolition Waste

C&D waste typically consist of bulky, inert debris and wood waste generated from land clearing, construction, site preparation, or demolition activities. SRS has operated its own C&D landfill near N Area since 2003 which is permitted and regulated by SCDES as a Part III Construction, Demolition, and Land-Clearing Debris Landfill. If C&D waste is determined to be noncompliant with the landfill’s waste acceptance criteria, it is sent to the Three Rivers Landfill for disposal. In addition to C&D waste, the Three Rivers Landfill is an SCDES-approved asbestos waste disposal site.

The volumes of C&D waste generated across the site over the last 4 years (2020–2023) are presented in Table C.2.12-5. None of this past C&D waste generation was associated with pit production at SRS.

**Table C.2.12-5 Waste Generation at SRS, 2020–2023**

Waste Type (MT/yr)	2020	2021	2022	2023	Average (2020–2023)
C&D Waste	41,073.0	38,292.0	39,882.0	40,477.0	39,931.0

C&D = construction and demolition; MT/yr = metric tons per year; SRS = Savannah River Site

Source: SRNS 2026 (SRS Dashbooks 2020–2023)

### **Solid Sanitary Waste**

At SRS, routine sanitary waste (e.g., office building and cafeteria waste) is collected in dumpsters at or near the point of origin, and a waste compactor truck picks up the dumpsters on a weekly basis. Trucks collecting office building waste take their loads to the North Augusta Material Recovery Facility for segregation into recycled and disposal streams. The disposal stream is then transported to the Three Rivers Landfill, a regional municipal and commercial landfill serving the nine counties that are members of the Three Rivers Solid Waste Authority as well as SRS (TRSWA 2019). Cafeteria waste is sent directly to the Three Rivers Landfill.

The volumes of solid sanitary waste generated across the site over the last 4 years (2020–2023) are presented in Table C.2.12-6. None of this past solid sanitary waste generation was associated with pit production at SRS.

**Table C.2.12-6 Solid Sanitary Waste Generation at SRS, 2020–2023**

Waste Type (MT/yr)	2020	2021	2022	2023	Average (2020–2023)
Solid Sanitary Waste	663.0	411.0	240.0	467.0	445.3

MT/yr = metric tons per year; SRS = Savannah River Site

Source: SRNS 2026

### **Liquid Sanitary Waste**

The CSWTF has a treatment capacity of 383 million gallons per year, receives and treats most of the sanitary wastewater generated on SRS, and discharges the output to NPDES-permitted outfalls (NNSA 2015).

#### **C.2.12.4 Materials Management**

SRS's materials management operations are conducted pursuant to DOE Orders and to various applicable federal, state, and local laws and regulations. Regulatory oversight lies with various federal, state, and local agencies. SRS uses radioactive materials and chemicals materials in a wide variety of operations.

The NRC categorizes quantities of SNM into three main levels according to the risk and potential for its use in a fissile explosive or in production of nuclear material for use in a fissile explosive. These safeguard categories are: SNM Category I designating strategic quantities; SNM Category II designating quantities of moderate strategic significance; and SNM Category III designating quantities of low strategic significance (NRC 2017). DOE/NNSA uses a similar approach to categorize the SNM managed at its locations. These groupings, again based on the mass and form of SNM present, are designated Security Categories I through IV, and are used to establish the types and levels of security, control, and accounting measures required in the management of these materials.

SRS uses a broad range of hazardous chemicals in both small and large quantities. The nature of SRS activities is also such that chemical inventories can change significantly over time and from facility to facility as programs change or research findings dictate changes in direction. The general following chemical types, many using DOE designations, are used and stored at SRS: corrosives (liquids, solids, and gases); toxic substances (including gases); flammables and combustibles

(including solids, liquids, and gases); nonflammable gases; water reactives/pyrophorics/spontaneous combustibles; oxidizing substances; organic peroxides; and explosives.

### C.2.13 Human Health and Safety

In accordance with DOE Order 450.2, DOE Order 458.1, and DOE Order 440.1B, operations at SRS are required to be conducted in a manner that protects the health and safety of workers and the public, preserves the quality of the environment, and prevents property damage. In addition, DOE Order 452.3 requires SRS operations to comply with applicable ES&H laws, regulations, and requirements and with directives promulgated by NNSA and DOE regarding occupational safety and health.

Routine operations at SRS have the potential to affect the health of the public and workers. Air emissions at SRS can lead to exposure to radioactive and nonradioactive materials. Liquid effluents discharged into waterbodies may affect downstream populations who use the water for drinking or recreation. Additionally, workers are exposed to radiation and occupational hazards similar to those experienced at many industrial work sites. This section characterizes the human health impacts from current operations at SRS. It is against this baseline that the potential incremental and cumulative health impacts associated with the alternatives are evaluated.

#### C.2.13.1 Public Health

##### Radiological

Table C.2.13-1 shows the major sources and levels of background radiation doses to an average individual in the vicinity of SRS, as well as the collective dose to the population within 50 miles of the site. Background radiation is attributed to naturally occurring radiation such as cosmic radiation from space and terrestrial gamma radiation and from radionuclides naturally in the environment, including radon. In addition, members of the population receive radiation doses from medical and dental uses of radiation and from manmade products. These sources and background radiation doses are unrelated to SRS operations.

**Table C.2.13-1 Background Radiation Dose Unrelated to SRS Operations<sup>a</sup>**

Source	Individual Dose (millirem per year)	Collective Dose <sup>b</sup> (person-rem per year)
<b><i>Natural Background Radiation at SRS</i></b>		
Cosmic and external terrestrial radiation	54	45,297
Internal terrestrial radiation	29	24,326
Radon-220 and radon-222 in homes (inhaled)	228	191,254
<b><i>Other Background Radiation</i></b>		
Diagnostic x-rays and nuclear medicine	300	251,650
Consumer products	13	10,905
Occupational	0.5	419
Industrial, security, medical, educational, and research	0.3	252
<b>TOTALS (rounded)</b>	<b>625</b>	<b>524,103</b>

SRS = Savannah River Site

a Average for the United States.

b The collective dose is the combined dose for all individuals residing within a 50-mile radius of SRS (approximately 838,833 people).

Source: SRNS 2024

Releases of radionuclides to the environment from SRS operations are another source of radiation dose to individuals in the vicinity of SRS. The environment potentially affected by radiological site releases includes air, water, and soil. These transport pathways (the environmental medium through which a contaminant moves) require an associated exposure pathway (e.g., inhaling air, drinking water, or dermal contact with soil) to affect human health. Monitoring of materials released from SRS and environmental monitoring and surveillance on and around the site are discussed in Sections C.2.3 (soils), C.2.4 (water resources), and C.2.5 (air quality) of this PEIS. A radiation dose is calculated to determine the health impact from exposure to radiation. Health impacts (i.e., LCFs) are calculated from the risk factor of 0.0006 LCF to the general population expected per rem (or person-rem) of radiation dose (DOE 2003). Table C.2.13-2 provides the various dose limits set for exposure pathways by DOE and the EPA for radiation workers and members of the public.

**Table C.2.13-2 Dose Limits for Members of the Public and Radiation Workers**

Guidance Criteria (organization)	Public Dose Limit	Worker Dose Limit
10 CFR Part 835 (DOE)	NA	5,000 millirem per year <sup>a</sup>
DOE Order 458.1 (DOE) <sup>b</sup>	10 millirem per year (all air pathways) 4 millirem per year (drinking water pathways) 100 millirem per year (all pathways)	NA
40 CFR Part 61 (EPA)	10 millirem per year (all air pathways)	NA
40 CFR Part 141 (EPA)	4 millirem per year (drinking water pathways)	NA

DOE = U.S. Department of Energy; CFR = Code of Federal Regulations; EPA = U.S. Environmental Protection Agency; NA = not applicable; SRS = Savannah River Site

a The regulatory dose limit for an individual worker is 5,000 millirem/year (10 CFR Part 835). At SRS, an administrative control level of 500 millirem per year has been established for external exposures.

b Derived from 40 CFR Part 61, 40 CFR Part 141, and 10 CFR Part 20.

Table C.2.13-3 presents the annual doses to the public from SRS emissions of radioactive materials to the air for the period 2020–2023. Doses are presented for an MEI,<sup>13</sup> a representative person living near the SRS boundary,<sup>14</sup> and the population within a 50-mile radius of SRS. These doses

<sup>13</sup> The MEI is a hypothetical member of the public (typically an adult male) who lives near the SRS boundary and would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible radiation dose. To demonstrate NESHAP compliance, the EPA requires using the MEI concept and not the representative person concept. For 2023, SRS calculated doses to two potential MEIs to demonstrate the Site complied with the EPA's 10 millirem-per-year public dose limit for air emissions from DOE sites. One potential MEI was near the Site's northern boundary. The second potential MEI was a worker at the Three Rivers Landfill. For 2023, SRS estimated the annual MEI dose at the Site boundary to be 0.0263 millirem and the MEI dose for the Three Rivers Landfill worker to be 0.028 millirem. SRS reported the slightly higher Three Rivers Landfill worker dose of 0.028 millirem for NESHAP compliance. This dose is 0.28 percent of the 10 millirem-per-year EPA limit (SRNS 2024).

<sup>14</sup> Since 2012, SRS has used the representative person (a hypothetical person) concept (instead of the MEI concept) to determine if the site is complying with the DOE public dose limit. SRS calculates the representative person dose using site-specific reference person parameters. The reference person is a hypothetical person with average physical and physiological characteristics—including factors such as age and gender—used internationally to standardize radiation dose calculations. The reference person accounts for the fact that younger people are generally more sensitive to radioactivity than older people. The SRS representative person falls at the 95th percentile of national and

fall within radiological exposure limits presented in Table C.2.13-2 and are much lower than the background radiation dose presented in Table C.2.13-1.

**Table C.2.13-3 Annual Radiation Doses to Public from SRS Operations, 2020–2023**

Members of the Public	Year	Dose from Atmospheric Radioactive Releases <sup>a</sup>	Dose from Liquid Radioactive Releases <sup>b,c</sup> (all liquid + irrigation)	Total Dose
Dose to the MEI (millirem)	2020	0.015	(d)	0.015
	2021	0.020	(d)	0.020
	2022	0.029	(d)	0.029
	2023	0.028	(d)	0.028
	<b>2020–2023 Average</b>	<b>0.023</b>	<b>(d)</b>	<b>0.023</b>
Dose to representative person living near the SRS boundary (millirem)	2020	0.012	0.35	0.36
	2021	0.017	0.28	0.30
	2022	0.016	0.17	0.19
	2023	0.016	0.14	0.16
	<b>2020–2023 Average</b>	<b>0.015</b>	<b>0.24</b>	<b>0.25</b>
Dose to population within 50 miles (person-rem) <sup>e</sup>	2020	0.54	3.7	4.2
	2021	0.73	3.3	4.0
	2022	0.74	2.0	2.7
	2023	0.73	2.3	3.1
	<b>2020–2023 Average</b>	<b>0.69</b>	<b>2.8</b>	<b>3.5</b>
Average annual dose to a person within 50 miles (millirem)	2020	$6.4 \times 10^{-7}$	$4.4 \times 10^{-6}$	$5.0 \times 10^{-6}$
	2021	$8.7 \times 10^{-7}$	$3.9 \times 10^{-6}$	$5.8 \times 10^{-6}$
	2022	$8.8 \times 10^{-7}$	$2.4 \times 10^{-6}$	$2.4 \times 10^{-6}$
	2023	$8.7 \times 10^{-7}$	$2.7 \times 10^{-6}$	$3.3 \times 10^{-6}$
	<b>2020–2023 Average</b>	<b><math>8.2 \times 10^{-7}</math></b>	<b><math>3.4 \times 10^{-6}</math></b>	<b><math>4.2 \times 10^{-6}</math></b>

CAA = Clean Air Act; CFR = Code of Federal Regulations; DOE = U.S. Department of Energy; MEI = maximally exposed individual; SRS = Savannah River Site

- a DOE Order 458.1 and CAA regulations in 40 CFR Part 61, Subpart H, establish a compliance limit of 10 millirem per year to a MEI.
- b Includes all water pathways, not just the drinking water pathway. Though not directly applicable to radionuclide concentrations in surface water or groundwater, an effective dose equivalent limit of 4 millirem per year for the drinking water pathway only is frequently used as a measure of performance. It is inspired by the National Primary Drinking Water Regulations maximum contaminant level for beta and photon activity that would result in a dose equivalent of 4 millirem per year (40 CFR 141.66).
- c DOE Order 458.1 establishes an all-pathways dose limit of 100 millirem per year to individual members of the public.
- d Per 40 CFR Part 61, Subpart H, the MEI dose is only calculated for atmospheric radioactive releases.
- e The population dose is the combined dose for all individuals residing within a 50-mile radius of SRS (approximately 838,833 people), calculated with respect to distance and direction from the site.

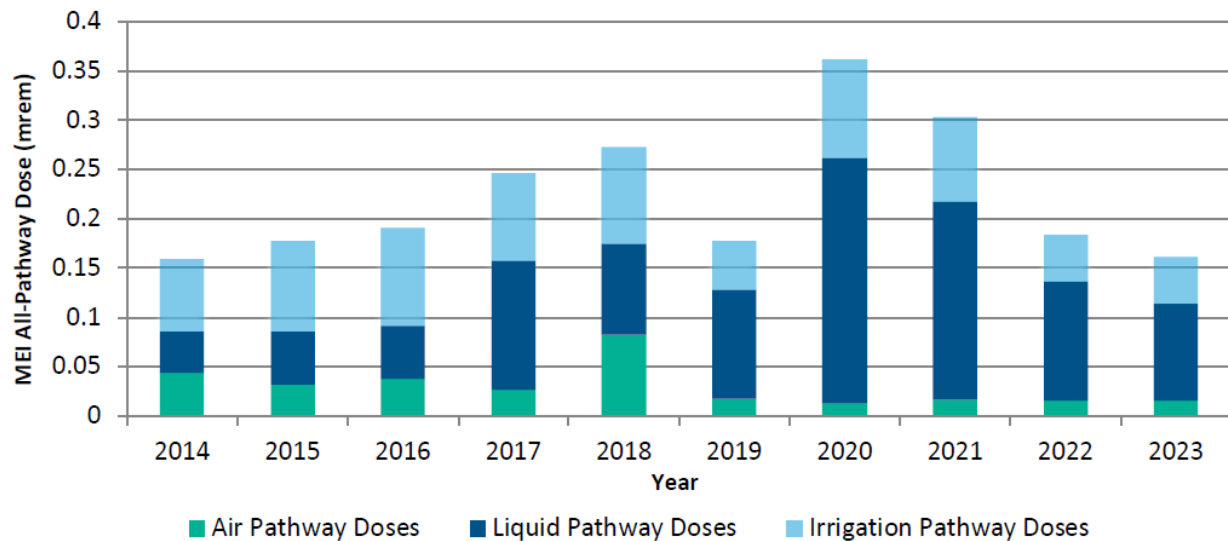
Source: SRNS 2021, 2022, 2023a, 2024

regional data. The 95th percentile of a set of data is the value at which 95 percent of the data are below it (SRNS 2024). (See Appendix D for a discussion of the impacts of radiation doses to other receptors.).

With regard to liquid radioactive releases, tritium accounts for more than 99 percent of the total amount of radioactivity released from the site to the Savannah River. In 2023, SRS released 378 Ci of tritium to the river, a 9 percent increase from the 2022 amount of 348 Ci. During 2023, in addition to the 378 Ci SRS released, the Georgia Power Company’s Vogtle Electric Generating Plant released 2,183 Ci of tritium to the Savannah River, and about 16.4 Ci migrated from the Barnwell Low-Level Disposal Facility. The fish consumption pathway accounted for 60 percent of the dose from the liquid pathway and the drinking water pathway accounted for 7 percent. About 32 percent of the 2023 total dose to the representative person was from consuming vegetables grown and meat and milk from animals raised using Savannah River water. Cesium-137 (65 percent), nonvolatile beta (8 percent), tritium (5 percent), uranium-234 (5 percent), and uranium-238 (5 percent) contributed the most to the liquid pathway dose (SRNS 2024).

With regard to atmospheric radiation releases, 72 percent of the air pathway dose to the representative person were due to tritium releases. Iodine-129 accounted for 16 percent of the dose. Krypton-85 (8 percent), cesium-137 (2 percent), and strontium-90 (1 percent) were the only other individual radionuclides that contributed 1 percent or more to the representative person dose. The predominant ways a representative person received radiation dose from air releases were consuming vegetables (35 percent), inhalation (32 percent), and consuming cow milk (21 percent).

Figure C.2.13-1 shows a 10-year history of SRS’s all-pathway (airborne pathways plus liquid pathways) doses to the representative person. As shown on that figure, the maximum potential all-pathway dose has ranged from about 0.16 millirem per year to 0.36 millirem per year over that period.



Source: SRNS 2024

**Figure C.2.13-1 10-Year History of SRS Maximum Potential All-Pathway Doses**

Based on the information presented in Table C.2.13-2 above, the risk of the representative person living near the SRS boundary developing an LCF from exposure to SRS radiological releases and emissions would be about  $9.0 \times 10^{-6}$  (or about 1 chance in 110,000). The projected number of LCFs to the population within a 50-mile radius of SRS would be about 0.0021 (or about 1 chance in about 500). For perspective, this number may be compared with the number of fatal cancers expected in the same population from all causes. The latest mortality rate associated with cancer

for the entire U.S. population in 2022 (for which final data are available) was 141.5 per 100,000 people (USCSWG 2025).<sup>15</sup> Based on this national cancer mortality rate, approximately 1,187 fatal cancers would be expected to occur annually in the population of approximately 838,833 people living within 50 miles of SRS.

As shown in Table C.2.13-3, the annual radiological dose from SRS is well below the applicable limits for radiation protection of the public. The dose to the MEI resulting from SRS operations is less than 1 percent of the NESHAP standard of 10 millirem per year. The dose to the MEI from SRS operations is also much less than one-tenth of one percent of the total dose from sources of natural radioactivity shown in Table C.2.13-1.

### **Nonradiological**

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media through which people may come in contact with hazardous chemicals (e.g., surface water during swimming or food through ingestion). Hazardous chemicals can cause cancer and noncancerous health effects. Sections C.2.3 (soils), C.2.4 (water resources), and C.2.5 (air quality) of this PEIS present the baseline data for assessing potential health impacts from the chemical environment.

Effective administrative and design controls that decrease hazardous chemical releases to the environment and help achieve compliance with permit requirements (e.g., via NPDES and NESHAP permits) contribute to minimizing health impacts on the public. The effectiveness of these controls is verified through the use of environmental monitoring information and inspection of mitigation measures.

Section C.2.5 of this PEIS addresses the baseline air emission concentrations and applicable standards for hazardous chemicals. The baseline concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. SRS's emissions of regulated pollutants are below the amounts allowed in SRS's CAA Title V Operating Permit.

### **Cancer Incidences**

The National Cancer Institute publishes national, state, and county incidence rates of various types of cancer (NCI 2025). However, the published information does not provide an association of these rates with their causes, (e.g., specific facility operations and human lifestyles). Table C.2.13-4 presents incidence rates for the U.S., South Carolina, Georgia, and the counties surrounding SRS. SRS is located primarily in Aiken and Barnwell counties.

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<sup>15</sup> In 2022, the latest year for which incidence data are available, for every 100,000 people, 141.5 died of cancer (USCSWG 2025).

**Table C.2.13-4 Cancer Incidence Rates<sup>a</sup> for the U.S., South Carolina, Georgia, and Adjacent Counties, 2017–2021**

Location	All Cancers	Thyroid	Breast	Lung and Bronchus	Leukemia	Prostate	Colon and Rectum
<b>United States</b>	<b>444.4</b>	<b>12.9</b>	<b>129.8</b>	<b>53.1</b>	<b>14.1</b>	<b>113.2</b>	<b>36.4</b>
<b>South Carolina</b>	<b>435.0</b>	<b>9.5</b>	<b>133.7</b>	<b>58.4</b>	<b>11.9</b>	<b>111.7</b>	<b>35.6</b>
Aiken County	387.6	8.9	112.3	48.4	13.0	109.6	33.0
Barnwell County	397.0	(b)	124.0	52.0	(b)	92.3	38.9
<b>Georgia</b>	<b>468.9</b>	<b>11.4</b>	<b>132.6</b>	<b>56.8</b>	<b>14.4</b>	<b>138.3</b>	<b>39.4</b>
Columbia County	435.7	9.1	133.0	47.9	14.7	128.0	29.6
Richmond County	476.3	8.8	135.7	66.4	12.9	151.3	37.7
Burke County	468.3	(b)	117.9	66.0	11.4	118.8	53.2

a Age-adjusted incidence rates; cases per 100,000 persons per year.

b Data has been suppressed to ensure confidentiality and stability of rate estimates. Counts are suppressed if fewer than 16 records were reported in a specific area-sex-race category.

Source: NCI 2025

### **C.2.13.2 Worker Health**

All employees at SRS are required to know and understand the ES&H requirements of their assignment, the potential hazards in the work area, and the controls necessary for working safely. Employees must participate in all required ES&H training and health monitoring programs. All work assignments must be performed in full compliance with applicable ES&H requirements as published in SRS policies and procedures and established in safety procedures. All employees are responsible for working in a manner that produces high-quality results, preserves environmental quality, and protects the health and safety of workers and members of the public.

When the SRS mission is fulfilled through collaborations, both onsite and offsite, potential impacts could also include worker exposure to electrical, low-level radiological, and transportation hazards. However, work activities would be performed in accordance with federal and state regulations, and the personnel safety exposures to radiological sources would be maintained within administrative limits. Additionally, offsite transport of radiological materials and wastes are performed in accordance with USDOT regulations, as well as DOE/NNSA and SRS procedures.

The regulations at 10 CFR Part 835 establish radiation protection standards, limits, and program requirements for protecting workers from ionizing radiation resulting from the conduct of DOE/NNSA activities and requires DOE/NNSA contractors to develop and maintain an approved radiation protection program. SRS's Radiation Protection Program governs radiological activities at SRS. Additionally, DOE Order 458.1 establishes requirements to protect the public and the environment against undue risk from radiation associated with DOE/NNSA-directed activities. Public radiological doses at SRS are reported in the SRS annual site environmental reports. Radiological doses generated by these operations are consistently found to be well below the applicable limits for radiation protection of the public.

#### **Radiological**

SRS workers receive the same dose as the general public from background radiation, but they also receive an additional dose from working in facilities with radiological materials or from

performing environmental remediation activities. Table C.2.13-5 presents the annual average individual and collective worker doses from SRS operations during the period 2020–2023. These doses fall within the regulatory limits presented in Table C.2.13-2 above.

**Table C.2.13-5 Radiation Doses to SRS Workers from Operations**

Occupational Personnel	From Outside Releases and Direct Radiation by Year				
	2020	2021	2022	2023	Average
Number of workers receiving a measurable dose	4,220	4,647	4,083	3,820	4,192
Total (collective) worker dose (person-rem)	112.2	137.8	128.1	155.3	133.3
Average worker dose (millirem) <sup>a</sup>	26.6	29.6	31.4	40.6	31.9

CFR = Code of Federal Regulations; DOE = U.S. Department of Energy; NNSA = National Nuclear Security Administration; SRS = Savannah River Site

a No standard is specified for an “average radiation worker”; however, the radiological limit for an individual worker is 5,000 millirem per year (10 CFR Part 835). At SRS, an administrative control level of 500 millirem per year has been established for external exposures.

Source: DOE 2023a, 2024

Based on the dose-to-risk conversion factor of 0.0006 LCF per 1 person-rem, the annual LCF risk to an average SRS worker due to radiation exposure from SRS operations is about  $1.9 \times 10^{-5}$ . Statistically, the probability of a worker developing a fatal cancer at some point in the future from radiation exposure associated with one year of SRS operations is about 1 in 52,000. No excess fatal cancers are projected in the total worker population from one year of normal operations. In 2023, no worker exceeded the 500 millirem per year SRS administrative control level established for external exposures.

### **Nonradiological**

SRS is an NNSA production site in which a large variety of hazardous materials are used. SRS operations represent a potential for exposure of some workers to hazardous materials (such as solvents, metals, and carcinogens). Typically, operations are controlled through specific work control documents so that those workers may be exposed to low levels of a wide variety of chemicals that are below a threshold of concern throughout the duration of their research.

Workers are provided with information and training on identified hazards and follow requirements in specific work control documents to protect them and minimize hazards and exposures. SRS has several programs and procedures in place to provide direction for monitoring, handling, storing, and using hazardous materials. Work activities are periodically monitored with measurements performed at personal breathing zones and general work areas. ES&H monitoring records indicate that personnel exposure to hazardous materials is maintained well below established regulatory requirements and exposure guidelines.

Under 10 CFR Part 851, DOE lists the requirements for a worker safety and health program to ensure that DOE contractors and their workers operate a safe workplace. It establishes procedures for investigating whether a violation of a requirement of this part has occurred, for determining the nature and extent of any such violation, and for imposing an appropriate remedy. In addition, 10 CFR Part 851 incorporates many OSHA requirements and other protections. Appropriate monitoring that reflects the frequency and quantity of chemicals used in the operational processes

ensures that these standards are not exceeded. DOE also requires that conditions in the workplace minimize recognized chemical hazards that cause, or are likely to cause, illness or physical harm.

### **Occupational Injuries**

SRS's occupational health and safety performance is measured by injury and illness rates (total recordable case and days away, restricted, or transferred) pursuant to DOE Orders that use OSHA criteria. As shown on Table C.2.13-6, the number of total recordable cases at SRS has varied between 50 and 87 over the period 2021–2024, averaging approximately 68 work-related injuries or illnesses annually that result in either death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. “Days away, restricted, or transferred” represent severe injuries annually. As shown in Table C.2.13-6, the number of “days away, restricted, or transferred” cases at SRS has varied between 21 and 43 over the past six years, averaging approximately 32 work-related severe injuries or illnesses annually that result in days away from work or days of job restriction or transfer.

**Table C.2.13-6 Occupational Injury Statistics for SRS**

Parameter	2021 <sup>c</sup>	2022	2023	2024	Average
Number of TRCs <sup>a</sup>	50	62	87	73	68
Number of DART Cases <sup>b</sup>	21	29	43	36	32

DART = days away, restricted time; SRS = Savannah River Site; TRCs = total recordable cases

a Number of TRCs: The total number of work-related injuries or illnesses that resulted in either death, days away from work, days of restricted work activity, or days of job transfer.

b DART Case: An injury or illness case where the most serious outcome of the case resulted in days away from work or days of job restriction or transfer.

c Cases from 2021 include work-related COVID-19 cases.

Source: DOE 2025a

During normal operations, SRS workers may be exposed to hazardous conditions that can cause injury or death. The potential for health impacts varies among facilities and workers. In 2024, the most common types of recordable injury cases resulted from three common causes: struck against/by, slip/trip/fall, overexertion, exposure to a caustic/noxious/allergenic substance, and repetitive motion. No work-related fatalities occurred at SRS between 2021 and 2024 (DOE 2025a).

Workers are protected from workplace hazards through appropriate training, protective equipment, monitoring, materials substitution, and engineering and management controls. Under 10 CFR Part 851, DOE lists the requirements for a worker safety and health program to ensure that DOE contractors and their workers operate a safe workplace. DOE establishes procedures for investigating whether a violation of a requirement of this part has occurred, for determining the nature and extent of any such violation, and for imposing an appropriate remedy. In addition, 10 CFR Part 851 incorporates many OSHA requirements and other protections. Appropriate monitoring that reflects the frequency and quantity of chemicals used in the operational processes ensures that these standards are not exceeded. DOE also requires that conditions in the workplace minimize hazards that cause, or are likely to cause, illness or physical harm.

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APPENDIX D  
Accidents and Intentional Destructive Acts

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## **ABBREVIATIONS AND ACRONYMS**

ALOHA	Areal Locations of Hazardous Atmospheres
DOE	U.S. Department of Energy
EIS	environmental impact statement
ERPG	Emergency Response Planning Guide
FR	Federal Register
HEPA	high-efficiency particulate air
kg	kilogram
km	kilometer
LANL	Los Alamos National Laboratory
LCF	latent cancer fatality
m	meter
MACCS	MELCOR Accident Consequence Code System
MAR	material-at-risk
MEI	maximally exposed individual
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NPH	natural phenomena hazard
PF-4	Plutonium Facility building 4
PEIS	programmatic environmental impact statement
ppm	parts per million
ppy	pits per year
ROD	Record of Decision
SPEIS	supplemental programmatic environmental impact statement
SRPPF	Savannah River Plutonium Processing Facility
SRS	Savannah River Site
SWEIS	Site-Wide Environmental Impact Statement
TA	technical area
TRU	transuranic (waste)

## D ACCIDENTS AND INTENTIONAL DESTRUCTIVE ACTS

### D.1 Introduction

An accident is a sequence of one or more unplanned events with potential unmitigated outcomes that endanger the health and safety of workers and/or the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The accident sequence begins with an initiating event, such as a human error, equipment failure, or natural phenomena hazard (NPH) (e.g., earthquake), followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression, and the extent of materials released. Initiating events fall into three categories:

1. **Internal initiators** originate in and around the plant or facility (for this PEIS, the Plutonium Facility 4 [PF-4] at LANL and the Savannah River Plutonium Processing Facility [SRPPF] at SRS) and are always the result of facility operations. Examples include equipment or structural failures and human errors.
2. **External initiators**, such as an aircraft crash, vehicle crash, wildland fire, or loss of onsite power, are independent of facility operations and originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage.
3. **NPH initiators** are natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, extreme winds, vulcanism, floods, lightning, and wildland fires. Although NPH initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident involving the release of radioactive or chemical materials were to occur, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurred would be particularly vulnerable to the effects of the accident. The offsite public also would be at risk of exposure, to the extent that weather conditions exist for airborne dispersion of released hazardous materials. While computer models can estimate the dispersion of released hazardous materials and their effects, prediction of latent potential health effects becomes increasingly difficult to quantify, especially when considering the distance between the accident location and the worker. This is because the individual worker exposure cannot be precisely defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident itself.

The potential for facility accidents and the magnitudes of their consequences are important factors in evaluating the alternatives addressed in this PEIS. The health risk issues are twofold:

- Whether accidents at any of the individual facilities (or reasonable combinations thereof) pose unacceptable health risks to workers or the general public; and
- Whether alternative locations for facilities (or reasonable combinations thereof) can result in smaller public or worker health risks. These lower risks may arise either from a greater distance of the facility from the public or from a reduced frequency of such external accident initiators as seismic events.

DOE is responsible under NEPA for analyzing reasonably foreseeable environmental effects (42 U.S.C. 4332(C)(i)) of a proposed action and alternatives. Reasonably foreseeable includes impacts that have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason (DOE 2002). Accordingly, this PEIS examines a range of reasonably foreseeable facility accidents.

Under the No-Action Alternative, NNSA would continue to implement the decision announced in its amended Record of Decision (ROD) (85 FR 54550, September 2, 2020) to produce 30 pits per year (ppy) at LANL with surge capability to produce up to 80 ppy. This decision was reaffirmed in the ROD (NNSA 2026b), based on the 2026 Final LANL SWEIS (NNSA 2026a). For the No-Action Alternative, the SRPPF would remain unused and would not contain any nuclear materials. There would be no notable accident risks or consequences from the SRPPF in such a configuration. NNSA has assessed the potential accident impacts of pit production at LANL in many NEPA documents, including the 1999 LANL SWEIS (DOE 1999), 2008 Complex Transformation SPEIS (NNSA 2008a), 2008 LANL SWEIS (NNSA 2008b), 2020 LANL SWEIS SA (NNSA 2020a), Radiological Laboratory/Utility/Office Building Environmental Assessment (NNSA 2018), and 2026 LANL SWEIS (NNSA 2026a). NNSA has reviewed these analyses and determined that they are valid and accurately represent the accident impacts at LANL. This PEIS summarizes these accident impacts for pit production at LANL.

For pit production at SRS, the identification of accident scenarios and associated data have been developed as a product of safety analysis documents prepared since publication of the 2020 SRS Pit EIS for the SRPPF. As of the writing of this PEIS, two safety analysis documents for the SRPPF have been completed: (1) *Preliminary Consolidated Hazards Analysis for the Savannah River Plutonium Processing Facility* (SRNS 2025a) and (2) *Preliminary Accident Analysis for SRPPF Project* (SRNS 2025b). These documents identify design-basis accidents that form the basis for the accident analysis of the SRPPF in this PEIS.

This PEIS presents the impacts of bounding accidents in each of several classes of events (e.g., fire, explosion, spill, mechanical, criticality, NPH initiators, and external initiators) applicable to pit production over the spectrum of high to low probability of occurrence in order to include high-consequence/low-probability and low-consequence/high-probability accidents. Accident frequencies are generally grouped as the following:

- “anticipated” (with estimated annual frequencies greater than or equal to 1 in 100 [ $\geq 1 \times 10^{-2}$ ]);
- “unlikely” (with estimated annual frequencies between 1 in 100 and 1 in 10,000 [ $\leq 1 \times 10^{-2}$  to  $1 \times 10^{-4}$ ]);
- “extremely unlikely” (with estimated annual frequencies between 1 in 10,000 and 1 in 1 million [ $\leq 1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ]); and
- “beyond extremely unlikely” (estimated annual frequencies less than 1 in 1 million [ $\leq 1 \times 10^{-6}$ ]). These accidents are not considered reasonably foreseeable and were not considered further in this analysis.

Generally, frequencies lower than  $1 \times 10^{-7}$  are not considered in NEPA documents (DOE 2002). As defined above, the accident frequencies are based on the frequency of the entire event sequence, not just the initiating event. For example, an accident may be initiated by an event, such as human error (e.g., 0.1 per year). For a hazardous material release to occur, that event must be followed by

another event, such as the failure of a valve to close (e.g., 0.01 per year). Therefore, this hypothetical accident scenario has a frequency (i.e.,  $0.1 \times 0.01$ ) of  $10^{-3}$  per year. This approach for determining the accident frequency is equivalent to that recommended in DOE-STD-3009-2014 “Preparation of Nonreactor Nuclear Facility Documented Safety Analysis” and ensures that this PEIS is consistent with safety basis documents. Frequencies for the accidents analyzed in this PEIS were derived from safety basis documents with the application of design features to establish realistic yet conservative estimates.

This PEIS analyzes applicable pit production accidents to estimate risk (i.e., mathematical product of an accident’s probability of occurrence and the accident’s consequences) and health consequences (e.g., latent cancer fatality [LCF]) to a noninvolved worker, maximally exposed offsite individual (MEI), and the projected 2032 surrounding population within 50 miles of PF-4 at LANL and the SRPPF at SRS.<sup>1</sup> The analysis considers the potential likelihood of various accident initiators (e.g., fires, seismic events). The calculations reflect the effects of site-specific parameters such as population size and distribution within a 50-mile radius, meteorology (weather), and distance to the MEI.

The selected accidents (identified and described in Sections D.3 and D.4) cover a wide spectrum of potential accident scenarios. The accident selection process, screening criteria used, and conservative estimates of material-at-risk (MAR) and source term ensure that the selected accidents bound the impacts of reasonably foreseeable accidents that could plausibly occur. Thus, if an accident that was not evaluated in this PEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated. All accidents are assumed to result in ground-level, one-hour duration releases unless indicated otherwise.

## D.2 Consequence Analysis Methodology for Radiological Accidents

Two computer codes from DOE’s toolbox were considered appropriate for calculating impacts from an accident involving the release of radioactive materials: HotSpot Version 2.07.1 and the MELCOR Accident Consequence Code System (MACCS) Version 3.10. The codes are similar in that they calculate doses to individuals based on the straight-line Gaussian plume dispersion and transport model. As such, both codes have been used in past DOE radioactive materials release accident analyses, and either code would be appropriate for performing analyses required for this PEIS. A description of HotSpot Version 2.07.1 is contained in Section D.3.1.3 of the 2025 LANL SWEIS (NNSA 2025a). A description of MACCS is contained in Appendix B, Section B.3.2 of the SRS Pit Production EIS (NNSA 2020b).

Because of assumptions used in this PEIS analysis, not all capabilities of the codes were used. For example, it was conservatively assumed that no special actions (e.g. shelter-in-place, evacuation) would be taken to avoid or mitigate exposure to the general population following an accidental release of radionuclides. Population and individual doses were statistically sampled by assuming an equally likely accident start time during any hour of the year. MEI and noninvolved worker doses were calculated using conservative assumptions, such as the wind blowing toward the MEI and locating the receptor along the plume centerline. The doses were converted to LCFs using the factor of 0.0006 LCF per person-rem for both members of the public and workers (DOE 2003); calculated LCFs were doubled for individual doses greater than 20 rem (NCRP 1993). The MEI

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<sup>1</sup> The year 2032 provides a comparable basis between LANL and SRS and is consistent with the recently prepared safety analyses documents for the SRPPF at SRS.

and noninvolved worker are assumed to be exposed for the duration of the release; it also is assumed that protective or mitigative actions would be taken thereafter if required by the size of the release.

### **D.2.1 Analysis Conservatism and Uncertainty**

The analysis of accidents is based on calculations relevant to hypothetical sequences of events and models of their potential impacts. The models use estimates of the frequencies, source terms, dispersion, and exposures to estimate the effects on human health and the environment. The estimates are as realistic as possible given the available data and design information. In many cases, the scarcity of experience and limited data associated with the postulated accidents leads to uncertainties in the calculation of the consequences and frequencies. This has promoted the use of models and/or input values that yield conservative estimates of consequences and frequency. Additionally, since no credit is taken for safety systems and controls that may function during an event, these events do not represent expected conditions within the facility at any point in its lifetime.

Due to the layers of conservatism built into the accident analysis for the spectrum of postulated accidents, the estimated consequences and risks to the public represent the upper limit for the individual classes of accidents. A conservative approach is appropriate and standard practice for analyses of this type, that is, analyses that involve high degrees of uncertainty associated with analytical factors such as accident frequency, MAR, damage ratio, airborne release factor, respirable fraction, and leak path factor.

### **D.2.2 Mitigation Measures**

Mitigation measures to limit exposure and dose that would affect the postulated consequences of the accident scenarios are discussed below. No mitigation was assumed for emergency response in the consequence analysis.

#### **D.2.2.1 Emergency Response and Protective Actions**

LANL and SRS have detailed plans for responding to accidents of the types described in this PEIS, and the response activities would be closely coordinated with the responses of local communities. NNSA personnel are trained and drilled in protective actions to be taken if a release of radioactive or otherwise toxic material occurs. The underlying principle for the protective action guides is that under emergency conditions, all reasonable measures should be taken to minimize the radiation exposure of the general public and emergency workers. In the absence of significant constraints, protective actions could be implemented when projected doses are lower than the ranges given in the protective action guides. No credit is taken to reduce the dose estimates with respect to emergency response and protective actions in the consequence analysis in this PEIS.

#### **D.2.2.2 High-Efficiency Particulate Air Filtration**

In all areas where unconfined plutonium or other radioactive materials can be handled and can exist in a dispersible form, high-efficiency particulate air (HEPA) filters provide a final barrier against the inadvertent release of radioactive aerosols into the outside environment.

HEPA filters (at LANL) and/or the sand filter (at SRS) have efficiencies of 99.99 percent or greater. LANL has multiple HEPA filters in PF-4, resulting in an efficiency of 99.9999 percent. These filters are protected by design features against the consequences of an earthquake or fire.

Credit was taken for filtration in the consequence analysis when ventilation and building containment were shown by analysis to survive during the accident.

### D.3 Radiological Accident Scenarios and Impacts for Pit Production at LANL

Postulated radiological accidents associated with pit production at LANL (Table D.3-1) are a subset of the suite of accidents identified and described in detail in Sections D.3.5.1 and D.3.10.1 of the 2026 LANL SWEIS (NNSA 2026a). The accident scenarios shown in Table D.3-1 include fires, natural phenomena events, and a nuclear criticality.<sup>2</sup> Because pit production generates transuranic (TRU) waste, accidents involving the onsite transport and management/storage of TRU wastes are included (Note: Offsite transport accidents associated with TRU waste are presented in the transportation analysis in Appendix E of this PEIS). For this range of radiological accidents, the MAR is based on plutonium-equivalent<sup>3</sup> activity, and the predominant form of exposure is through inhalation.<sup>4</sup> There are no differences in accident impacts among the LANL alternatives or pit production rates because the actions under each alternative would not affect the location, frequency, scenario, or MAR of the postulated accidents. Consequently, the impacts of potential accidents at LANL would be the same for all alternatives, and the information below is relevant to all LANL alternatives. This PEIS evaluates the accident impacts for 80 ppy because impacts would be driven by the MAR in PF-4, which is limited regardless of pit production rate.

Table D.3-1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of PF-4) and a hypothetical noninvolved worker for the production of 80 ppy. The accident with the highest potential unmitigated consequences to the offsite population is a fire in a TRU storage array caused by a vehicle crash and is thus considered the maximum reasonably foreseeable accident. Approximately 1.1 LCFs in the offsite population could result from such an accident in the absence of mitigation. This accident has a probability of occurring once every 100,000 years. An offsite MEI would receive a dose of approximately 69 rem. Statistically, the MEI would have a 0.083 chance of developing an LCF, or about 1 in 12. The accident with the highest potential consequences to the noninvolved worker is a facility-wide seismic event and fire in PF-4. A noninvolved worker located 100 meters from the accident would receive a dose of approximately 316 rem. Statistically, the noninvolved worker would have a 0.38 chance of developing an LCF, or about 1 in 3. For each of the accidents presented in Table D.3-1, fatal or serious non-fatal injuries to *involved* workers may be expected because of such a worker's proximity to an accident.

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<sup>2</sup> Due to the industrial setting and noncombustible construction of PF-4 and other passive design features such as waste containers, a wildland fire affecting MAR inside PF-4 is beyond extremely unlikely and thus, is not presented in this PEIS (NNSA 2026a).

<sup>3</sup> The concept of plutonium-equivalent activity (i.e., curies) is intended to eliminate the dependency of radiological analyses on specific knowledge of the radionuclide composition of a given radiological release. By normalizing all radionuclides to a common radiotoxic hazard index, radiological accident analyses that are essentially independent of radionuclide composition variations can be conducted. Plutonium was selected as the radionuclide to which the radiotoxic hazard of other radionuclides could be indexed.

<sup>4</sup> For a criticality accident, workers in the immediate vicinity could receive high to fatal radiation exposures from the initial burst.

Table D.3-1 Radiological Accident Frequency and Consequences at LANL – 80 ppy<sup>a</sup>

Accident	Frequency (per year)	MEI <sup>b,e</sup>		Offsite Population <sup>c</sup>		Noninvolved Worker <sup>d,e</sup>	
		Dose (rem)	LCF <sup>f</sup>	Dose (person-rem)	LCF <sup>f</sup>	Dose (rem)	LCF <sup>f</sup>
PF-4 glovebox fire	$3 \times 10^{-4}$	6.4	$3.84 \times 10^{-3}$	629	0.38	22	0.026
Vehicle crash while transporting TRU waste containers with ensuing fire	$1 \times 10^{-5}$	17	0.01	375	0.22	35	0.042
Refueling vehicle crash into TRU storage array with ensuing fire	$1 \times 10^{-5}$	69	0.083	1,800	1.1	120	0.14
Large combustible fire in TRU storage array	$1 \times 10^{-5}$	17	0.01	561	0.33	22	0.026
TA-55 facility-wide seismic event and fire in PF-4	$7.2 \times 10^{-6}$	8.57	$5.14 \times 10^{-3}$	945	0.57	316	0.38
Nuclear criticality in PF-4	$1 \times 10^{-2}$	0.00014	$8.4 \times 10^{-8}$	0.037	$2.2 \times 10^{-5}$	0.075	$4.5 \times 10^{-5}$

LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; PF-4 = Plutonium Facility building 4; ppy = pits per year; TA = technical area; TRU = transuranic (waste)

a Impacts presented for 80 ppy. Impacts for 80 ppy would bound impacts for 30 ppy.

b See Table D.3-6 of the 2026 LANL SWEIS (NNSA 2026a) for the specific distance of the MEI for each accident presented.

c Based on a projected future population (year 2032) of approximately 552,115 persons residing within 50 miles of PF-4.

d At a distance of 100 meters.

e The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

f The LCF values were calculated using a dose-to-LCF conversion factor of 0.0006 LCF per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012.

Source: NNSA 2008a, 2026; LANL 2026a

Table D.3-2 shows the accident risks (per year) of the production of 80 ppy, obtained by multiplying the consequences by the frequency of an accident occurring. As shown in that table, when frequencies are considered, the accident with the highest risk to the MEI is a glovebox fire at PF-4. For this accident, the LCF risk to the MEI would be  $1.2 \times 10^{-6}$  per year, or approximately one statistical fatality in 833,000 years. For the offsite population, the LCF risk would be approximately  $1.2 \times 10^{-6}$  per year, meaning that an LCF in the offsite population would statistically occur once every 9,000 years. A noninvolved worker would have a  $7.8 \times 10^{-6}$  chance of developing an LCF, or about 1 in 128,000.

**Table D.3-2 Annual LCF/Fatality Risks at LANL – 80 ppy<sup>a</sup>**

Accident	MEI <sup>b</sup>	Offsite Population <sup>c</sup>	Noninvolved Worker <sup>d</sup>
TA-55, PF-4 glovebox fire	$1.2 \times 10^{-6}$	$1.1 \times 10^{-4}$	$7.8 \times 10^{-6}$
Vehicle impact while transporting TRU waste containers with ensuing fire	$1.0 \times 10^{-7}$	$2.2 \times 10^{-6}$	$4.2 \times 10^{-7}$
Refueling vehicle crash into TRU storage array with ensuing fire	$8.3 \times 10^{-7}$	$1.1 \times 10^{-5}$	$1.4 \times 10^{-6}$
Large combustible fire in TRU storage array	$1.0 \times 10^{-7}$	$3.3 \times 10^{-6}$	$2.6 \times 10^{-7}$
Facility-wide seismic event and fire in PF-4	$3.7 \times 10^{-8}$	$4.1 \times 10^{-6}$	$2.7 \times 10^{-6}$
Nuclear criticality	$8.4 \times 10^{-10}$	$2.2 \times 10^{-7}$	$4.5 \times 10^{-7}$

LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; PF-4 = Plutonium Facility building 4; ppy = pits per year; TA = technical area; TRU = transuranic (waste)

a. Impacts presented for 80 ppy. Impacts for 80 ppy would bound impacts for 30 ppy.

b. See Table D.3-6 of the 2026 LANL SWEIS (NNSA 2026a) for the specific distance of the MEI for each accident presented.

c. Based on a projected future population (year 2032) of approximately 552,115 persons residing within 50 miles of PF-4.

d. At a distance of 100 meters.

Source: NNSA 2008a, 2026; LANL 2026a

## D.4 Radiological Accident Scenarios and Impacts for Pit Production at SRS

Postulated radiological accidents associated with pit production at SRS are identified in Table D.4-1 and are described in detail in SRNS (2025a, 2025b).<sup>5</sup> The accident scenarios shown in Table D.4-1 include fires, explosion events, natural phenomena events, and a criticality. For radiological accidents, the MAR is based on plutonium-equivalent activity, and the predominant form of exposure is through inhalation.<sup>6</sup> There are no meaningful differences in accident impacts among the SRS alternatives because the actions under each alternative would not have notable effects on the location, frequency, scenario, or MAR of the postulated accidents. Consequently, the impacts of potential accidents at SRS would be virtually the same for all alternatives, and the information below is relevant to all SRS alternatives. This PEIS evaluates the accident impacts for 125 ppy because impacts would be driven by the MAR in the building, and that production rate would bound impacts for other production rates.

Table D.4-1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the SRPPF) and a hypothetical noninvolved worker for the production of 125 ppy. The accident with the highest potential consequences to the offsite population (Table D.4-1) is an explosion in a laboratory enclosure and is thus considered the maximum reasonably foreseeable accident. Approximately 3 LCFs in the offsite population could result from such an accident in the absence of mitigation. This accident has a probability of occurring once every 10,000 years. An offsite MEI would receive a dose of approximately 0.96 rem. Statistically, the MEI would have a  $5.6 \times 10^{-4}$  chance of developing

<sup>5</sup> Because those documents are designated “Unclassified Controlled Nuclear Information” (UCNI), they cannot be released to the public.

<sup>6</sup> For a criticality accident, workers in the immediate vicinity could receive high to fatal radiation exposures from the initial burst.

an LCF, or about 1 in 1,800. For a noninvolved worker, the accident with the highest potential consequences would be the vehicle crash into waste storage pad with a subsequent fire. The noninvolved worker located 100 meters from the accident would receive a dose of approximately 116 rem. For each of the accidents presented in Table D.4-1, fatal or serious non-fatal injuries to *involved* workers may be expected because of such a worker's proximity to an accident.

**Table D.4-1 Radiological Accident Frequency and Consequences at SRS – 125 ppy<sup>a</sup>**

Accident	Frequency (per year)	MEI <sup>b,e</sup>		Offsite Population <sup>c</sup>		Noninvolved Worker <sup>d,e</sup>	
		Dose (rem)	LCF <sup>f</sup>	Dose (person-rem)	LCFs <sup>f</sup>	Dose (rem)	LCF <sup>f</sup>
Process module fire, initiated in a process enclosure	1×10 <sup>-2</sup>	0.15	8.8×10 <sup>-5</sup>	782	0.46	14	8.4×10 <sup>-3</sup>
Fire in shipping and receiving area	1×10 <sup>-2</sup>	0.93	5.5×10 <sup>-4</sup>	4,850	2.85	35	0.04
Explosion in a laboratory enclosure	1×10 <sup>-4</sup>	0.96	5.6×10 <sup>-4</sup>	5,006	2.94	3.5	1 <sup>g</sup>
Over-pressurization of a TRU waste enclosure	1×10 <sup>-4</sup>	8.7×10 <sup>-4</sup>	5.1×10 <sup>-7</sup>	5	2.7×10 <sup>-3</sup>	0.69	4.1×10 <sup>-4</sup>
Energetic impact and loss of confinement of molten plutonium	1×10 <sup>-2</sup>	0.18	1.1×10 <sup>-4</sup>	939	0.55	12	7.1×10 <sup>-4</sup>
Energetic impact and loss of confinement of material in container (within the SRPPF)	1×10 <sup>-2</sup>	0.037	2.2×10 <sup>-5</sup>	193	0.11	27	0.03
Nuclear criticality in solution systems	1×10 <sup>-2</sup>	3.4×10 <sup>-6</sup>	2.0×10 <sup>-9</sup>	0.018	1.0×10 <sup>-5</sup>	1.5×10 <sup>-3</sup>	9.0×10 <sup>-7</sup>
Loss of glovebox inerting system results in release	1×10 <sup>-2</sup>	0.23	1.4×10 <sup>-4</sup>	1,199	0.71	23	0.03
Loss of power with loss of vessel purge and ensuing fires	1×10 <sup>-4</sup>	0.51	3.0×10 <sup>-4</sup>	2,659	1.56	44	0.05
Vehicle crash into waste storage pad with ensuing fire	1×10 <sup>-2</sup>	0.35	2.1×10 <sup>-4</sup>	1,408	0.83	116	1 <sup>g</sup>
Seismic event with ensuing fires at the SRPPF	1×10 <sup>-4</sup>	0.91	5.5×10 <sup>-4</sup>	3,650	2.15	78	0.09

LCF = latent cancer fatality; MEI = maximally exposed individual; ppy = pits per year; SRPPF = Savannah River Plutonium Processing Facility; SRS = Savannah River Site; TRU = transuranic (waste)

a Impacts presented for 125 ppy; which bound impacts for 50 and 80 ppy.

b At site boundary, approximately 6.7 miles from release.

c Based on a projected future population (year 2032) of approximately 1.0 million persons residing within 50 miles of the SRPPF.

d At a distance of 100 meters.

e The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person, and the fatalities would be multiplied by the number of persons exposed.

f The LCF values were calculated using a dose-to-LCF conversion factor of 0.0006 LCF per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012.

g Considers prompt fatality (nonradiological) of a worker during event occurrence.

NOTE: Slight deviations in LCF calculations for the different scenarios may exist due to rounding.

Source: SRNS 2025a, 2025b, 2026

Table D.4-2 shows the accident risks (per year) of the production of 125 ppy, obtained by multiplying the consequences by the frequency of an accident occurring. As shown in that table, when frequencies are considered, the accident with the highest risk to the MEI is a fire in the shipping and receiving area. For this accident, the LCF risk to the MEI would be  $5.5 \times 10^{-6}$  per year, or approximately one statistical fatality in 182,000 years. This same accident would also be the highest risk event to the population, with the associated LCF risk being approximately 0.028 per year, meaning that an LCF in the population would statistically occur once every 36 years. For a noninvolved worker, the highest risk event would be a prompt fatality (nonradiological) resulting from a vehicle crash into a waste storage pad (with subsequent fire), which could be expected to occur once every 100 years.

**Table D.4-2 Annual LCF/Fatality Risks at SRS – 125 ppy<sup>a</sup>**

Accident	MEI <sup>b</sup>	Offsite Population <sup>c</sup>	Noninvolved Worker <sup>d</sup>
Process module fire, initiated in a process enclosure	$8.8 \times 10^{-7}$	$4.6 \times 10^{-3}$	$8.4 \times 10^{-5}$
Fire in shipping and receiving area	$5.5 \times 10^{-6}$	0.028	$4.0 \times 10^{-4}$
Explosion in a laboratory enclosure	$5.6 \times 10^{-8}$	$2.9 \times 10^{-4}$	$1.0 \times 10^{-4}$ <sup>e</sup>
Over-pressurization of a TRU waste enclosure	$5.1 \times 10^{-11}$	$2.7 \times 10^{-7}$	$4.1 \times 10^{-8}$
Energetic impact and loss of confinement of molten plutonium	$1.1 \times 10^{-6}$	$5.5 \times 10^{-3}$	$7.1 \times 10^{-5}$
Energetic impact and loss of confinement of material in container (within the SRPPF)	$2.2 \times 10^{-7}$	$1.1 \times 10^{-3}$	$3.0 \times 10^{-4}$
Nuclear criticality in solution systems	$2.0 \times 10^{-11}$	$1.0 \times 10^{-7}$	$9.0 \times 10^{-9}$
Loss of glovebox inerting system results in release	$1.4 \times 10^{-6}$	$7.1 \times 10^{-3}$	$3.0 \times 10^{-4}$
Loss of power with loss of vessel purge and ensuing fires	$3.0 \times 10^{-8}$	$1.6 \times 10^{-4}$	$5.0 \times 10^{-6}$
Vehicle crash into waste storage pad with ensuing fire	$2.1 \times 10^{-6}$	$8.3 \times 10^{-3}$	0.01 <sup>e</sup>
Seismic event with ensuing fires at the SRPPF	$5.5 \times 10^{-8}$	$2.2 \times 10^{-4}$	$9.0 \times 10^{-6}$

LCF = latent cancer fatality; MEI = maximally exposed individual; ppy = pits per year; SRPPF = Savannah River Plutonium Processing Facility; SRS = Savannah River Site; TRU = transuranic

a Impacts presented for 125 ppy; which bound impacts for 50 and 80 ppy.

b At site boundary, approximately 6.7 miles from release.

c Based on projected future population (year 2032) of 1.0 million persons residing within 50 miles of the SRPPF.

d Calculated at a distance of 100 meters.

e Considers prompt fatality (nonradiological) of a worker during event occurrence.

Source: SRNS 2025a, 2025b, 2026

## D.5 Chemical Releases

Consequences of accidental chemical releases were determined using the Areal Locations of Hazardous Atmospheres (ALOHA) computer code.<sup>7</sup> ALOHA is a U.S. Environmental Protection Agency/National Oceanic and Atmospheric Administration-sponsored computer code that has been used widely in support of chemical accident responses and also in support of safety and NEPA documentation for DOE facilities. A description of the ALOHA computer code modeling is contained in Appendix B, Section B.3.2.2 of the SRS Pit Production EIS (NNSA 2020b).

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this reason, allowable exposure levels differ from substance to substance. The impacts of chemical accidents are measured in terms of Emergency Response Planning Guide (ERPG)-2 and ERPG-3 concentration limits established by the American Industrial Hygiene Association. ERPG-2 is defined as the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their ability to take protective actions. ERPG-3 is defined as the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

### D.5.1 Chemical Accident Scenarios and Impacts for Pit Production at LANL

The accident scenarios postulate a major leak, such as a pipe or tank rupture, and the released chemical forming a pool about one inch deep in the area around the point of release. The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in parts per million. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at the noninvolved worker location (i.e., 100 meters from the accident) is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary is also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded off site. Conservative modeling of chemical release over the period of one hour was based on a spill and subsequent pool with evaporation resulting in calculated downwind concentrations.

Table D.5-1 shows the consequences of the dominant loss of containment accident scenarios. None of the chemicals released in the accident would exceed ERPG-2 limits off site. As shown in Table D.5-1, concentrations at the location of a noninvolved worker at a distance of 100 meters from any of the chemical releases would exceed ERPG-2 limits and would require mitigation and/or protective measures.

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<sup>7</sup> ALOHA® is the hazard modeling program for the CAMEO® software suite (<https://www.epa.gov/cameo/what-cameo-software-suite>), which is used widely to plan for and respond to chemical emergencies.

**Table D.5-1 Chemical Accident Frequency and Consequences at LANL – 80 ppy**

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency (per year)
		Limit (ppm)	Distance to Limit (km)	At 100 m (ppm)	At Site Boundary <sup>a</sup> (ppm)	
Nitric acid	3,420	10	0.38	110 (constant)	3.4 (constant)	$1 \times 10^{-4}$
Hydrofluoric acid	340	20	0.68	300–900 <sup>b</sup>	8–19 <sup>b</sup>	$1 \times 10^{-4}$
Hydrochloric acid	384	20	1.4	~0–4,200 <sup>c</sup>	~0–90 <sup>c</sup>	$1 \times 10^{-4}$

ERPG = Emergency Response Planning Guide; kg = kilogram; km = kilometer; LANL = Los Alamos National Laboratory; m = meter; MEI = maximally exposed individual; ppm = parts per million; ppy = pits per year

a Accident is assumed to occur at PF-4, which is a 0.7 mile from the site boundary.

b Concentrations for hydrofluoric acid vary considerably during the 60-minute period post release. As inferred by the presented values, the ERPG-2 limit for hydrofluoric acid will be exceeded for the noninvolved worker (at 100 meters) throughout the entire 60-minute period, whereas concentrations will exclusively remain under the limit for the MEI (at the site boundary) during the 60-minute measured period.

c Concentrations for hydrochloric acid vary considerably during the 60-minute period post release. As inferred by the presented values, the ERPG-2 limit for hydrochloric acid will be exceeded for a portion of the noninvolved worker's (at 100 meters) exposure time (i.e., during the first ~10 minutes post release, immediately followed by a rapid drop-off) and the MEI (at the site boundary) exposure time (i.e., during the period 5–15 minutes post release, followed by a rapid drop-off).

Source: NNSA 2008a; LANL 2026

## D.5.2 Chemical Accident Scenarios and Impacts for Pit Production at SRS

The analysis used estimated impacts of the potential release of the most hazardous chemicals used for pit production at SRS. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe or tank rupture, and the released chemical forms a pool about one inch deep in the area around the point of release. Table D.5-2 shows the consequences of the dominant loss of containment accident scenarios. Neither of the chemicals released in the accidents would exceed ERPG-2 limits off site. Concentrations at the location of the noninvolved worker (i.e., 100 meters) could exceed ERPG-2 limits and would require mitigation and/or protective measures.

**Table D.5-2 Chemical Accident Frequency and Consequences at SRS – 125 ppy**

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency (per year)
		Limit (ppm)	Distance to Limit (km)	At 100 m (ppm)	At Site Boundary <sup>a</sup> (ppm)	
Nitric acid	10,500	10	0.4	135 (constant)	0	$1 \times 10^{-4}$
Hydrochloric acid	600	20	1.0	~0 – 2,700 <sup>b</sup>	0	$1 \times 10^{-4}$

ERPG = Emergency Response Planning Guide; kg = kilogram; km = kilometer; m = meters; ppm = parts per million; ppy = pits per year

a. Site boundary is at a distance of 6.7 miles; no discernible concentration levels exist at this distance; moreover, any stray particulates theoretically reaching this distance would arrive well beyond one hour post release, which falls outside the 60-minute measurement window for ERPG values.

b. Concentrations for hydrochloric acid vary considerably during the 60-minute period post release. As inferred by the presented values, the ERPG-2 limit for hydrochloric acid will be exceeded for a portion of the noninvolved worker's (at 100 meters) exposure time (i.e., during the first ~10 minutes post release, immediately followed by a rapid drop-off).

Source: NNSA 2008b; SRNS 2026

## D.6 Intentional Destructive Acts

The Complex Transformation SPEIS (NNSA 2008a) and 2026 LANL SWEIS (NNSA 2026a) include classified appendices that analyze the potential impacts of intentional destructive acts (e.g., sabotage, terrorism). The classified appendix in the Complex Transformation SPEIS includes an analysis of site-specific consequences for an event at LANL and SRS. The impacts of some terrorist incidents would be similar to the accident impacts described in this accident analysis, while some incidents may have more severe impacts. The classified appendix in the 2026 LANL SWEIS addresses potential impacts from intentional destructive acts to human health and safety and other resource areas. The SWEIS appendix is directly applicable to this PEIS and is incorporated by reference. In preparing this PEIS to address intentional destructive acts, NNSA reviewed both classified appendices and concluded that they are reasonable and adequate to represent intentional destructive acts that could occur at LANL and SRS (NNSA 2026b). The information presented in the previously prepared appendices assists decision-makers in understanding the potential consequences of an incident at LANL and/or SRS.

## D.7 Emergency Management

Both LANL and SRS have an Emergency Preparedness Program to minimize accident consequences by ensuring that appropriate internal organizations (e.g., fire department, operations, medical, and security) and external organizations (e.g., county and State resources, DOE Radiological Assistance Program) are available to respond to emergency situations and take appropriate actions to assist LANL and SRS recovery and reentry efforts from anticipated events while reducing the spread of contamination and protecting facility personnel and the public. Details of the LANL Emergency Preparedness Program are found in the 2026 LANL SWEIS (NNSA 2026a). Details of the SRS Emergency Preparedness Program are found in the 2020 SRS Pit Production EIS (NNSA 2020b).

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APPENDIX E  
Transportation

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## ACRONYMS AND ABBREVIATIONS

ARF	airborne release fraction
CFR	Code of Federal Regulations
CH	contact-handled
DHS	U.S. Department of Homeland Security
DOE	U.S. Department of Energy
DPP	Defense Programs Package
FEMA	Federal Emergency Management Agency
HEU	highly enriched uranium
IDA	intentional destructive act
INL	Idaho National Laboratory
LANL	Los Alamos National Laboratory
LCF	latent cancer fatality
LLW	low-level radioactive waste
LOS	level of service
MEI	maximally exposed individual
mi	mile
MLLW	mixed low-level radioactive waste
NEPA	National Environmental Policy Act
NM	New Mexico
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Sites
NRC	U.S. Nuclear Regulatory Commission
NRF	National Response Framework
NV	Nevada
Pantex	Pantex Plant
PEIS	programmatic environmental impact statement
ppy	pits per year
RADTRAN	Radioactive Material Transportation Risk Assessment
RF	respirable fraction
RH	remote-handled
SNM	special nuclear material
SRS	Savannah River Site
SWEIS	site-wide environmental impact statement
TA	technical area
TRAGIS	Transportation Routing Analysis Geographic Information System
TRU	transuranic (waste)
TRUPACT-II	TRU Package Transporter-II
TSD	treatment, storage, and disposal
TX	Texas
USDOT	United States Department of Transportation
WCS	Waste Control Specialists
WIPP	Waste Isolation Pilot Plant
Y-12	Y-12 National Security Complex

## E TRANSPORTATION

### E.1 Overview

Transportation of any commodity involves a risk to both transportation crew members and members of the public. This risk results directly from transportation-related accidents and indirectly from increased levels of pollution from vehicle emissions, regardless of the cargo. The transport of certain materials, such as radiological materials (waste or other materials), can pose an additional risk due to the unique nature of the material itself. To permit a complete evaluation of the environmental impacts among the three alternatives, this programmatic environmental impact statement (PEIS) assesses the potential human health risks associated with the transportation of new and existing pits, pit-related special nuclear material (SNM), and pit-related wastes to and from the Los Alamos National Laboratory (LANL), Savannah River Site (SRS), and other sites on public roadways.

This appendix provides an overview of the approach used to assess the human health risks that could result from transportation of such radiological materials and wastes between LANL and/or SRS and several potential origins or destinations across the U.S. Department of Energy/National Nuclear Security Administration (DOE/NNSA) complex within the United States. The topics in this appendix include discussions of the overall scope of the subject transportation impact evaluation (Section E.2), packaging and determination of potential shipping routes (Sections E.2.2 and E.3/E.5.3, respectively), the specific analytical methods employed for the impact evaluation (e.g., computer models, scaling) (Section E.3), as well as other key supporting assumptions that were utilized in the analysis (Section E.3). In addition, to aid in the understanding and interpretation of the evaluation results, Section E.5 describes specific areas of uncertainty with an emphasis on how those uncertainties may affect comparisons among the distinct alternatives.

Title 49 *Code of Federal Regulations* (CFR) Parts 171–178 establish maximum permissible package dose rates, maximum permissible dose rates to vehicle crew members, exclusive-use shipment criteria, packaging certification conditions, and other features associated with radiological materials transportation. DOE/NNSA uses the Radioactive Material Transportation Risk Assessment (RADTRAN) code/model in the assessment of human health risks that may result from the transport of radiological material and waste cargo traveling along highway routes within rural, suburban, and urban population zones. Potential impacts are presented in this appendix in terms of cumulative risks for incident-free transportation conditions over a/the 50-year evaluation period, as well as annualized risks for postulated transportation accident scenarios. Assessed radiological and nonradiological impacts for either type of condition (i.e., incident-free or accident risks) relied upon calculated total shipment-miles to estimate overall risks to various receptors (e.g., public, crews, inspectors) between a given origin and destination. Calculated transportation impact risks in this PEIS used the same normalized RADTRAN-generated “risks-per-shipment” (per material form) as used for the 2026 LANL SWEIS (NNSA 2026), with associated presumed travel routes continuing to occur along interstate highways/freeways to the greatest extent practicable. The normalized risk values were then applied to the projected numbers of shipments, per material form, associated with each evaluated alternative in this PEIS.

### E.2 Assessment Scope

This section describes the scope of the transportation human health risk evaluation, including transportation-related activities, applicable packaging and transportation regulations,

transportation modes, and emergency response. The applied assessment methodology and derived radiological impacts are addressed below in Sections E.3 and E.4, respectively.

### **E.2.1 Transportation-Related Activities**

The transportation risk evaluation focuses upon the potential human health risks related to transportation for each PEIS alternative. This includes incident-free risks to persons in the vicinity of a shipment during transport or at vehicle stops, as well as accident risks. The impacts of increased transportation levels on local traffic flows or infrastructure are also addressed in Section E.4.2 of this appendix.

### **E.2.2 Packaging and Transportation Regulations**

The packaging and transportation of radiological materials and wastes are highly regulated. The U.S. Department of Transportation (USDOT) and the U.S. Nuclear Regulatory Commission (NRC) have primary responsibility for implementation of federal regulations governing commercial radiological materials and waste transportation. In addition, DOE works with USDOT and NRC in developing requirements and standards for radiological materials and waste transportation. DOE and NNSA have broad authority under the *Atomic Energy Act of 1954*, as amended, to regulate all aspects of activities involving radiological materials and wastes that are undertaken by DOE or on its behalf, including the transportation thereof within the United States. While DOE can regulate under the *Atomic Energy Act*, the vast majority of shipments are performed by approved commercial carriers operating under USDOT and NRC rules.

The regulatory standards for packaging and transporting radiological materials and waste cargo are designed to achieve the following four primary objectives:

- Protect persons and property from radiation emitted from packages during transportation by specific limitations on allowable radiation levels.
- Contain radiological material and waste in the package (achieved by packaging design requirements based on performance-oriented packaging integrity tests and environmental criteria).
- Prevent nuclear criticality (i.e., an unplanned nuclear chain reaction that could occur as a result of concentrating too much fissile material in a singular spatial location).
- Provide physical protection against theft and sabotage (including intentional destructive acts [IDAs]) during transit.

The regulations pertaining to the ground transportation of radiological materials and waste cargo are published by USDOT at 49 CFR Parts 106, 107, and 171–178 and the NRC at 10 CFR Parts 20, 61, 71, and 73. International Air Transport Association regulations for shipment via aircraft can be found in Association-published criteria regarding hazardous cargo protocols.

#### **E.2.2.1 Regulations Associated with Packaging**

Packaging represents the primary barrier between the radiological material and waste cargo being transported and radiation exposure to the public, workers, and the environment. Transportation packaging for radiological materials and waste must be designed, constructed, and maintained to contain/confine and shield its contents during normal transport conditions. For radiological material, such as SNM or waste, packaging must contain/confine and shield the contents in the event of severe accident conditions. The type of packaging employed is determined by the total

radiological hazard presented by the material or waste within the packaging. Four basic types of packaging are used: Excepted, Industrial, Type A, and Type B. Specific requirements for these packages are detailed in 49 CFR Part 173, Subpart I, Class 7, “Radioactive Materials.” All packages are designed to protect and retain their contents under normal shipping operations. Packages typically shipped from or received by LANL, SRS, or other sites, such as the Y-12 National Security Complex (Y-12), Pantex Plant (Pantex), Nevada National Security Sites (NNSS), Idaho National Laboratory (INL), or the Waste Isolation Pilot Plant (WIPP), are designated as Excepted, Type A, or Type B.

Excepted packaging is limited to transporting materials and waste that present a limited hazard to the public, workers, and the environment, because of their extremely low levels of radioactivity and very low external radiation dose.

Type A packaging, typically a 55-gallon drum or metal boxes, are commonly used to transport radiological materials or waste cargo with higher concentrations/quantities of radioactivity than that transported in Excepted packages. Type A packaging is designed to protect and retain its contents under normal transport conditions. Furthermore, it must maintain sufficient shielding to limit radiation exposure to handling personnel.

Type B packaging is used to transport material or waste with the highest radioactivity levels and is designed to protect and retain its contents under transportation accident conditions. In addition, it must maintain sufficient shielding to limit radiation exposure to handling personnel. There are numerous designs of Type B packages that DOE/NNSA uses for transporting radiological materials or waste. Packages are selected based on the purpose and contents for which they will be used.

DOE typically uses the TRU Package Transporter-II (TRUPACT-II) for transuranic (TRU) contact-handled (CH) waste shipments. The TRUPACT-II is a large cask that can contain multiple smaller packages. It includes armor, impact limiters, and thermal insulation. Other similarly robust transporters, such as the HalfPACT or TRUPACT-III, may also be used for CH TRU transport. For SNM transport, 9975 and 9977 containers are examples of Type B packages that are commonly used by DOE/NNSA (49 CFR Part 173, Subpart I; SIMCO 2023). Section E.4.2 provides additional information regarding the specific types of containers that will be used for transporting secure-shipment SNM evaluated under the scope of this PEIS.

In past years, DOE has used remote-handled (RH) packaging and shipping casks for higher-dose shipments that required specialized shielding, such as the RH-72B TRU cask for RH TRU waste. However, all TRU waste shipments associated with the Proposed Action are assumed to be CH only based on TRU waste shipment projections for WIPP (DOE 2024).

Compliance with packaging requirements is demonstrated by using a combination of simple calculation methods, computer simulation techniques, scale-modeling, or full-scale testing of transportation packages or casks.

### **E.2.2.2 Regulations Associated with Transportation**

USDOT regulates the transportation of hazardous materials in interstate commerce by land, air, and water. USDOT specifically regulates the carriers of radiological materials and waste cargo and the conditions of transport, such as routing, handling and storage, and vehicle and driver requirements. USDOT also regulates the labeling, classification, and marking of radiological material and waste packaging.

NRC regulates the packaging and transportation of radiological material and waste for its licensees, including commercial shippers of radiological materials and waste. In addition, under an agreement with USDOT, NRC sets the standards for packages containing fissile materials and Type B packaging.

DOE, through its Directives, Orders, and contractual agreements, ensures the protection of public health and safety by imposing on its transportation activities standards that meet those of USDOT and NRC. USDOT recognizes in 49 CFR 173.7(d) that packaging made by or under the direction of DOE may be used for transporting Class-7 materials (i.e., radioactive materials and radioactive wastes) when the packages are evaluated, approved, and certified by DOE against packaging standards equivalent to those specified in 10 CFR Part 71.

USDOT also has requirements that help reduce transportation impacts. Some requirements affect drivers, packaging, labeling, marking, and placarding, while other requirements specify the maximum dose rate of radiological materials and/or waste shipments to limit doses during incident-free transportation. The dose rate requirements for shipments are stated in 49 CFR 173.441.

In general, estimated numbers of shipping containers per shipment are based on the dimensions and weight of the containers, the Transport Index (which is the dose rate at 3.3 feet [1 meter] from the container), and the transport vehicle's dimensions and weight limits. The various materials assumed to be shipped under this PEIS's impact evaluation are all assumed to be transported in a single stack aboard a legal-weight transport vehicle.

### **E.2.3 Transportation Modes**

**Radiological Materials Transportation.** For radiological material (nonwaste) transportation scenarios evaluated in this PEIS, all such shipments are assumed to be performed by NNSA's Office of Secure Transportation, which consists of safeguard-truck-transport. Of note, such "secure-shipments," which involve the transport of SNM (such as plutonium, pits, or highly enriched uranium [HEU]), exclusively use safeguard-truck-transport, regardless of circumstance (NNSA 2023a).

**Radiological and Hazardous Waste Transportation.** For radiological waste and hazardous waste transportation scenarios evaluated in this PEIS, all shipments are conservatively assumed to use commercial tractor-trailer vehicles. TRU waste shipments to WIPP are typically transported via trucks with specially designed trailers to handle the heavy weight and large load dimensions of the shipments.

As discussed below in Section E.3.1, this PEIS's transportation analysis conservatively assumes all radiological shipments (i.e., materials and wastes) are to be transported exclusively by truck (i.e., no rail or air transport); as such, analyzed ground shipment scenarios (for all cases) bound all potential radiological transportation risks to both the general public and transport crews.

### **E.2.4 Emergency Response**

The U.S. Department of Homeland Security (DHS) is responsible for establishing policies for, and coordinating civil emergency management, planning, and interaction with, federal agencies that have emergency response functions in the event of a transportation incident. In the event a transportation incident involving radiological material or waste occurs, implementable guidelines for robust response actions are outlined in the Federal Emergency Management Agency's (FEMA's) National Response Framework (NRF) (FEMA 2019).

FEMA, an organization within DHS, coordinates federal and state participation in developing emergency response plans and is responsible for the development and the maintenance of the *Nuclear/Radiological Incident Annex* to the NRF. The NRF and its annex describe the policies, situations, concepts of operations, and responsibilities of the federal departments and agencies governing the immediate response and short-term recovery activities for incidents involving the release of radioactivity to address the consequences of the event (FEMA 2019).

DHS has the authority to activate nuclear incident response teams, which include DOE Radiological Assistance Program Teams that can be dispatched from regional DOE Offices in response to a radiological incident. These teams provide first responder radiological assistance to protect the health and safety of the public, responders, and the environment and to assist in the detection, identification and analysis, and response to events involving radiological/nuclear material or waste. Deployed teams provide traditional field monitoring and assessment support, as well as a search capability.

DOE Order 151.1E, “Comprehensive Emergency Management System,” provides the basis to establish a comprehensive emergency management program that provides detailed, hazard-specific planning and preparedness measures to minimize the health impacts of accidents involving loss of control over radiological material and hazardous chemicals. DOE provides technical assistance to other federal agencies and to state and local governments. Contractors are responsible for maintaining emergency plans and response procedures for all facilities, operations, and activities under their jurisdiction and for implementing those plans and procedures during emergencies. Contractor and state and local government plans are fully coordinated and integrated. In addition, DOE established the Transportation Emergency Preparedness Program<sup>1</sup> to ensure that its operating contractors and state, tribal, and local emergency responders are prepared to respond promptly, efficiently, and effectively to accidents involving DOE shipments of radiological material. This program is a component of the overall emergency management system established by DOE Order 151.1E.

In the event of a release of radiological cargo from a shipment along a route, local emergency response personnel would be first responders to the accident scene. NNSA expects that response actions would be taken in context of the centralized *Nuclear/Radiological Incident Annex*. In addition, the FEMA website ([fema\\_incident-annex\\_nuclear-radiological.pdf](http://www.fema.gov/incident-annex-nuclear-radiological.pdf)) also contains a radiological incident annex that is intended to provide vital information on any such event. Based on an initial assessment at the scene, their training, and available equipment, first responders would involve state and federal resources as necessary. First responders and/or state and federal responders would initiate actions in accordance with the USDOT *Emergency Response Guidebook*<sup>2</sup> to isolate the incident and perform any actions necessary to protect human health and the environment (i.e., evacuations or other means to reduce or prevent impacts to the public). Cleanup actions are the responsibility of the carrier. DOE would partner with the carrier, shipper, and applicable state and local jurisdictions (including tribal nations) to ensure cleanup actions meet regulatory requirements.

With specific regard to aspects of emergency *preparedness/prevention*, to reduce the possibility of an accident, DOE issued DOE Order 460.2B, “Departmental Materials Transportation Management.” As specified in this Order, carriers are expected to exercise due caution and care in

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<sup>1</sup> <http://teppinfo.com/>

<sup>2</sup> <https://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg>

dispatching shipments. According to the Order, the carrier has the responsibility to determine the acceptability of weather and road conditions, whether a shipment should be held before departure, and when actions should be taken while enroute. The Order emphasizes that shipments should not be dispatched if severe weather or dangerous road conditions could likely make travel hazardous. Conditions at the point of origin and along the entire route would be considered.

### **E.3 Impact Assessment Methodology**

#### **E.3.1 General Routing Assumptions**

Under the alternatives evaluated in this PEIS, all radiological shipments (materials and wastes) are conservatively assumed to be transported exclusively by truck (i.e., no rail or air transport). Section E.4 explains how uncertainties in the analysis are offset by conservatism. The truck-only assumption results in the highest estimated worker and population doses. No matter what distance is to be traveled for ground shipments, it would be expected that the most direct route(s) would be used and ultimately would result in the minimization of total radiological risk. Shipments leaving the immediate LANL and SRS areas for various other site destinations (e.g., NNSS, Pantex, Y-12, WIPP, INL) would be transported over federal highways for the vast majority of their routes. To most accurately predict anticipated shipment-miles (and potential health impacts) associated with the transportation of radiological materials to/from LANL and SRS, the analysis includes a wide variety of candidate origination and destination locations across the United States projected for each sites' pit production-related shipments. As alluded to above, these locations include quantities of pit production-related shipments between LANL/SRS and Pantex each year, as well as to Y-12. With regard to transport of radiological wastes, while other low-level radioactive waste/mixed low-level radioactive waste (LLW/MLLW) treatment, storage, and disposal (TSD) locations might be used in the future, for conservatism and consistency within the impacts evaluation, it is assumed that all such materials will be exclusively shipped to NNSS from LANL/SRS for the duration of the 50-year analytical period. Transport of TRU wastes is assumed to be exclusively shipped to the WIPP facility from LANL/SRS for disposition over the entire 50-year period, as it is presently the only approved disposal site/location for such wastes.

#### **E.3.2 Population Projections**

The Transportation Routing Analysis Geographic Information System (TRAGIS) code (Johnson and Michelhaugh 2003) was employed to select transportation routes in accordance with USDOT regulations. The accompanying data were used to develop the normalized, "per-shipment risk" values discussed earlier. TRAGIS data used in the evaluation were originally based on calendar year 2000 U.S. Census Bureau population estimates along the various shipping routes and were accordingly scaled upward in the 2008 LANL SWEIS to reflect population projections over future years (e.g., circa 2020) for its analysis. The inherent conservatism described in the sections below effectively compensate for any negligible reductions in population (or collective) dose that potentially could result from not projecting population numbers out to a later representative operational year/period (e.g., 2050).

#### **E.3.3 Receptors Evaluated**

Estimates of potential radiological impacts to various receptor groups (e.g., public, truck crews, inspectors) were set forth in this PEIS's transportation risk analysis. Specific cohorts within each of these receptor groups include (SNL 2000):

- Members of the public (or tribes) residing or temporarily situated near/along transportation routes (within 0.5 mile [800 meters] of each side of a traversed roadway),
- Nearby people in adjacent vehicles along shipping routes,
- Nearby people at rest areas and fuel stops (e.g., gasoline stations) along shipping routes,
- Truck transport crews (assumes two per shipment),
- Truck/cargo inspectors,
- A maximally exposed individual (MEI) located 330 feet (100 meters) directly downwind from a transportation accident location,
- Population within 50 miles of an accident location, and
- A first responder at a distance less than or equal to 10 meters of an accident location.

### E.3.4 Per-Shipment Scaling Approach

As mentioned above, this PEIS's transportation analysis employs the same public and crew *risk-per-shipment* values as the 2026 LANL SWEIS (NNSA 2026) for the various radiological material and waste cargo forms (e.g., SNM [freshly processed pits, legacy pits, HEU], LLW/MLLW, TRU waste) that would be shipped over the next 50 years. Specifically, the per-shipment values were directly applied to the number of estimated shipments (and thus the resulting associated number of miles to be ultimately traversed) per material form to and from LANL and SRS to attain radiological health risk estimates (in terms of latent cancer fatalities [LCFs]) for both the public and truck crews. The associated results from this assessment are summarized in Section E.3.8.

### E.3.5 Incident-Free Transportation Impact Analysis

For incident-free transportation, potential human health impacts from the radiation fields surrounding radiological packages were estimated for transportation workers and populations along routes, people sharing the routes, and people at rest-areas and stops along the routes. The RADTRAN Version 5 code (*see below*) (SNL 2000) was originally used in the development of estimated per-shipment impacts for transportation workers and populations (DOE 2008), as well as for the impact to an MEI (e.g., a person stuck in traffic, a gas station attendee, or an inspector), who may be a worker or a member of the public. In general, material containers to be shipped offsite or to LANL/SRS are expected to present low levels of radiation exposure to the public and truck crews. The radiological dose rates would be below the limiting provisions specified per 49 CFR 173.441 regarding transport-indexes and exclusive-use shipments. For incident-free transportation, the potential radiological exposure of truck crews and the public would be directly related to the external dose rates associated with such material packages.

All incident-free radiological health impacts are expressed as additional LCFs, which were estimated by multiplying occupational (worker) and public doses by  $6.0 \times 10^{-4}$  LCFs per rem for individuals or per person-rem for collective populations (DOE 2003).

### E.3.6 Transportation Accident Impact Analysis

Human health impacts can also result from a transportation-related accident. The impact of a specific radiological accident is expressed in terms of probabilistic risk, which is defined as the accident's probability (accident frequency) mathematically multiplied by the accident's consequences. The analysis of accident risks accounts for a spectrum of accidents ranging from high-probability accidents of low severity (e.g., a fender-bender) to hypothetical high-severity accidents that have a corresponding low probability of occurrence. Only as a result of a severe fire

or a powerful collision, both of which are of extremely low probability, could a transportation package of the type used to transport radiological material be damaged to the extent that radioactivity could be released to the environment with potentially significant consequences. In concert with calculating the individual radiological risks that could result from all reasonably conceivable accidents during transportation of radiological materials under the alternatives assessed in this PEIS, NNSA placed particular emphasis upon the consequences of maximum reasonably foreseeable accidents with conditional probabilities greater than  $1 \times 10^{-7}$  (i.e., 1 in 10 million) per year (DOE 2002a). Such consequences were determined under atmospheric conditions that would likely prevail during accidents (NNSA 2023a).

Potential accident damage to a transport container/cask is categorized according to the magnitude of the mechanical forces (impact) and thermal forces (fire) to which it may be subjected during an accident. Because all accidents can be described in these terms, severity is independent of the specific accident sequence. Accordingly, any sequence of events that results in an accident in which a container/cask is subjected to forces within a certain range of values is assigned to the accident severity category associated with that range. Accident severity assignment schemes are designed to account for all potential foreseeable transportation accidents, including accidents of low probability and high consequences and of high probability and low consequences (*see* discussion above).

Accident consequence assessments typically only consider the potential impacts of severe transportation accidents. In terms of risk, the severity of an accident must be viewed in terms of potential radiological consequences, which are directly proportional to the fraction of the radiological material within a container/cask that is released to the environment during the accident. Although accident severity categories span the entire range of *mechanical and thermal* accident loads, they are conventionally grouped into “assessment bins” that can be characterized by a single set of airborne release fractions (ARFs) and respirable fractions (RFs), and are, therefore, collectively evaluated within an accident consequence assessment. Accident “severity fractions” thus account for the sum of all conditional probabilities that exist within a particular accident bin.

This PEIS’s transportation accident risk evaluation emphasizes the importance of distinguishing between the ARFs and RFs of a released material in a scenario resulting from a transportation accident event. Radiological consequences typically are calculated by assigning radionuclide RFs based on the type of material (or waste form), the type of shipping container, and the accident severity category. The ARF is defined as the fraction of the radioactivity in the container that could be released to the atmosphere from a given severity of accident. ARFs vary according to the material or waste type and the physical or chemical properties of the radioisotopes. Most solid radionuclides are nonvolatile and are, therefore, relatively non-dispersible, with the notable exception of fine powders (*see* below). Such circumstances (i.e., little to no appreciable dispersion in air) are likely applicable for the vast majority of shipped materials (or wastes) evaluated in this PEIS. RFs, on the other hand, quantitatively represent a percentage of airborne radiological material that is estimated to be completely taken up into the human body via clearance through the lungs; airborne particulates (in powder form) with an activity-median-aerodynamic-diameter of 10 microns or less are probabilistically expected to be able to effectively reach the lungs’ alveoli region and deliver a large dose if the material is composed of alpha-emitting radionuclides (such as plutonium-239).

Potential public impacts from the unmitigated maximum foreseeable accident event involving the transport of pit-related plutonium-239 in the form of oxide/powder from LANL or SRS were evaluated in the *Final Environmental Impact Statement for the Surplus Plutonium Disposition Program* and estimated to be less than 4.4 rem (<0.003 LCF) to an MEI and less than 7,900 person-rem (less than 5 LCFs) to nearby populations (NNSA 2023b). This unmitigated accident also represents the maximum reasonably foreseeable accident event for this PEIS. The atmospheric environments assumed in the near- and far-field dispersion modeling for this event invoked both stable (e.g., E or F wind stability class) as well as neutral (e.g., D wind stability class) conditions. This approach provides suitable estimates of the potential dose to the MEI as well as nearby populations within a zone, respectively. The MEI was modeled under worst-case weather conditions (stable atmosphere, with minimum diffusion and dilution), while the population was modeled under average (i.e., neutral) weather conditions. Of note, the U.S. Environmental Protection Agency typically designates worst-case meteorological conditions (i.e., the 95<sup>th</sup> percentile) as an F stability class at a wind speed of 1.5 meters per second, and average/median meteorological conditions (i.e., the 50<sup>th</sup> percentile) as a D stability class at a wind speed of 4.5 meters per second.

Projected radiological health impacts to potential receptors for this accident evaluation are expressed as additional transportation accident risks, in terms of LCFs, and were derived by multiplying the anticipated doses discussed above by a dose conversion factor of  $6.0 \times 10^{-4}$  LCF per person-rem of exposure (DOE 2003).

For those accidents where a material or waste container (or cask shielding) was not breached and no radiological material or waste was released (i.e., damage ratio=0), it was assumed that it would take 12 hours to recover from such a scenario and resume shipments. During this period, no individual would remain close to a container/cask. A first responder is conservatively assumed to stay at a location 2 to 10 meters (6.6 to 33 feet) from a/the container(s) for 1 hour (DOE 2002b). As mentioned earlier, estimated impacts to collective populations from radiological transportation accidents include populations within 50 miles of an accident site as potential receptors and accordingly consider the following exposure pathways:

- External exposure to the passing radioactive cloud (plume),
- External exposure to contaminated ground,
- Internal exposure from inhalation of airborne contaminants, and
- Internal exposure from the ingestion of contaminated food.

Although emergency-response and remedial activities after such an event (e.g., evacuation or ground cleanup) would reduce the overall consequences to the collective population, as a conservative measure, these activities were generally not assumed to occur.

In general, LANL and SRS have carefully examined onsite transfers of radiological materials and have established engineered and administrative controls to minimize (i.e., mitigate) the impact and potential frequency/probability of theoretical accidents. LANL and SRS site documents describe the envelopes within which onsite shipping operations must occur in order to meet safety objectives. Such references/resources may include onsite hazardous materials packaging protocols, safety management plans, and transportation safety guides that address operational requirements.

For determining nonradiological traffic accident fatalities from offsite commercial truck transportation, separate accident rates and accident fatality risks were used for rural, suburban, and

urban population zones. Accident and fatality rate reference information were available from information provided in *State-Level Accident Rates for Surface Freight Transportation: A Reexamination*, ANL/ESD/TM-150 (Saricks and Tompkins 1999), with “mean” accident and fatality statistics broken down by “interstate,” “primary,” and “total” categorizations. Such values could then be assigned to the assessed rural, suburban, and urban population zones, respectively. Accident “rates” are generically defined as the number of accident involvements (or fatalities) in a given year per unit of travel in that same year. Therefore, the rate is a fractional value, with “accident involvement” depicting the numerator of the fraction and “vehicular activity” (i.e., total travel distance in truck-miles) as the denominator.

### E.3.7 Intentional Destructive Acts

With regard to the topic of transportation-related IDAs (also referred to as sabotage and/or terrorism), NNSA prepared a classified appendix to the 2026 LANL SWEIS (NNSA 2026a). That classified appendix includes a detailed analysis of potential IDAs involving shipments of special nuclear material and is applicable to national transportation related to either pit production facility (i.e., LANL and SRS). The analysis in that appendix includes an assessment of potential consequences to human health and safety and other environmental resource areas. The impacts of these potential events could be larger or smaller than the impacts presented in this appendix.

### E.3.8 Material and Waste Routing – Specific Locational Assumptions

For analysis purposes, this PEIS identifies primary transportation locations (origination and/or destination) that would represent the expected majority of shipments made during the 50-year analytical period. In theoretical practice, LANL and SRS could occasionally transport SNM and radiological wastes to other additional locations beyond those primarily assessed based on mission changes, new facility construction and operation, and similar actions. However, the selection of these primary locations likely would bound any such additional shipments. The primary locations are identified as follows and further detailed in Table E.3-1: NNSS for LLW/MLLW; WIPP for TRU waste; Y-12 for HEU; and SRS, LANL, NNSS, and Pantex for plutonium-based SNM (e.g., plutonium and new and existing pits).

**Table E.3-1 Candidate Locations for Transport of Radiological Materials and Wastes from/to LANL and SRS**

Transport Location	Route Distance to/from LANL (mi)	Route Distance to/from SRS (mi)	LLW/MLLW	TRU Waste	New Pits	Pu and Existing Pits	HEU
NNSS, NV	760	2,200	X			X	
WIPP, NM	340	1,400		X			
Pantex, TX	340	1,265			X	X	
Y-12, TN	1,400	320					X

HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; mi = miles; MLLW = mixed LLW; NM = New Mexico; NNSS = Nevada National Security Sites; Pu = plutonium; SRS = Savannah River Site; NV = Nevada; Pantex = Pantex Plant; TN = Tennessee; TRU = transuranic; TX = Texas; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Site

Note: An “X” indicates the SNM and waste type(s) that would be shipped to the corresponding designated locations.

Impacts from the possible periodic transportation of other incidental pit-related shipments (in addition to the above-listed categories and/or locations) would be bounded by the overall impact estimates from radiological transportation analyzed in this PEIS.

Table E.3-2 provides the estimated numbers of annual waste and material shipments to/from each destination/origination location under each alternative. The total number of radiological shipments over the 50-year analytical period would reflect the aggregation of annual shipment numbers over the period and would depend on the number of years with higher production rates (i.e., surge production cases). For example, the Savannah River Plutonium Processing Facility would not begin production as early as 2027 (anticipated completion of the PEIS and Record of Decision) and when it does, there would be a ramp-up until higher production rates could be realized. Additionally, surge production at LANL cannot be sustained for long periods without notable down time for maintenance or equipment replacement. Therefore, it is not reasonable to expect that impacts would be equivalent to 50 times the highest annual result.

**Table E.3-2 Range of Annual Shipments/Miles – Nuclear Materials and Waste Forms**

Alternative	Total Number of Shipments/(Total Miles Driven) per year			
	Radioactive Materials			Nonrad
	LLW/MLLW <sup>a</sup> (to NNSS)	TRU <sup>a</sup> (to WIPP)	Secure Shipments (pits, pit materials, HEU) to/from LANL, SRS, Pantex, NNSS, and Y-12 <sup>b</sup>	Hazardous <sup>a</sup> (to offsite TSD locations)
No-Action All LANL <b>30–80 ppy</b>	320–853/ (240,000– 640,000)	82-219/ (27,880–74,340)	90–173/ (110,950–242,950)	≤42/ (≤10,500)
Multi-Site LANL+SRS <b>80–205 ppy</b>	567–1,467/ (783,400– 1,990,800)	217-444/ (216,880– 389,340)	145–270/ (377,450–837,020)	≤67/ (≤11,750)
Single-Site SRS <b>60–135 ppy</b> (range includes an assumed continued 10 ppy ongoing nominal production contribution from LANL)	349–716/ (619,900– 1,427,300)	158-248/ (196,820– 322,820)	112–154/ (324,620–652,270)	≤35/ (≤3,750)

HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed LLW; NNSS = Nevada National Security Sites; nonrad = nonradiological; Pantex = Pantex Plant; ppy = pits per year; SRS = Savannah River Site; TRU = transuranic waste; TSD = treatment, storage, and disposal; WCS = Waste Control Specialists LLC; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

a Outbound only.

b Mileage estimates do not include contributions from security escort vehicles.

Notes: Although LLW/MLLW may ultimately be shipped to other locations for processing and disposition (e.g., Clive, Utah [EnergySolutions] or Andrews County, Texas [WCS]), all such shipments are conservatively assumed to be consistently transported to NNSS in the evaluation of assessed impacts. All TRU waste shipments are assumed to be contact-handled based on TRU waste shipment projections for WIPP (DOE 2024). “Secure-Shipments” may, by definition, include physical pits, pit materials, and/or HEU.

### E.3.9 Radiological and Nonradiological Transportation Impacts

Table E.3-3 summarizes the collective transportation impacts under each alternative. As discussed above, for consistency and conservatism within the PEIS transportation analysis, LLW and MLLW transported off site from LANL and SRS was assumed to be shipped exclusively to NNSS. Furthermore, all TRU wastes were assumed to be transported to WIPP, while SNM shipments were assessed to travel between LANL/SRS/NNSS and Pantex (for plutonium and pits) and Y-12 (for HEU).

To provide perspective, direct pit-related shipments represent only a modest fraction of the total impacts incurred by both the population and transport crews (*see* Table E.3-3) when all material and waste shipping streams are considered and aggregated. In quantitative terms, for example, in the roughly 2,180 estimated total annual radiological shipments (for secure shipments + TRU + LLW + MLLW collectively) under the Multi-Site Alternative maximum pit-processing case, only about 270 (12 percent) of these shipments per year would be attributable to secure shipping. Correspondingly, about 3.6 person-rem per year to the public (of the 22.8 person-rem per year for the collective population dose from all shipment types/sources under the Multi-Site Alternative) would be expected from incident-free secure shipping under the maximum production and transport case. This annual total collective dose of 22.8 person-rem to the public under the Multi-Site Alternative would be the highest under the three alternatives and would result in an associated 0.014 LCF to exposed populations across the nationwide transportation routes.

Table E.3-3 Collective Annual Impact Ranges of Transporting Pits, Pit Materials, and Waste Forms

Segments	Destina- tion	Rad Material (estimated shipments per year)	Segment Distance (miles)	Incident-Free <sup>a</sup>				Accident <sup>a</sup>	
				Crew		Population		Annualized Radiological Risk (LCF/yr)	Nonradiological Risk (# of traffic accident fatalities/yr)
				Total Dose (person- rem/yr)	Total Risk (LCF/yr)	Total Dose (person- rem/yr)	Total Risk (LCF/yr)		
<b><i>No-Action Alternative (30–80 ppy) → LANL only</i></b>									
LANL to NNSS	NNSS <sup>b</sup>	LLW/MLLW (320–853)	750	4.0–10.8	2.4×10 <sup>-3</sup> – 6.5×10 <sup>-3</sup>	1.3–3.5	7.8×10 <sup>-4</sup> –2.1×10 <sup>-3</sup>	5.9×10 <sup>-6</sup> –1.6×10 <sup>-5</sup>	8.0×10 <sup>-3</sup> –0.021
LANL to WIPP	WIPP	TRU (82–219)	340	1.9–5.0	1.1×10 <sup>-3</sup> – 3.0×10 <sup>-3</sup>	0.59–1.6	3.5×10 <sup>-4</sup> –9.6×10 <sup>-4</sup>	2.7×10 <sup>-9</sup> –7.2×10 <sup>-9</sup>	1.2×10 <sup>-3</sup> –3.2×10 <sup>-3</sup>
Secure Shipments	Pantex LANL Y-12 NNSS	Pits, pit material, and HEU (90–173)	1,233–1,404	0.57–1.1	3.4×10 <sup>-4</sup> – 6.6×10 <sup>-4</sup>	0.65–1.3	3.9×10 <sup>-4</sup> –7.8×10 <sup>-4</sup>	8.3×10 <sup>-9</sup> –1.6×10 <sup>-8</sup>	4.7×10 <sup>-4</sup> –9.0×10 <sup>-4(c)</sup>
<b>TOTALS (30–80 ppy)</b>				<b>6.5–16.9</b>	<b>3.9×10<sup>-3</sup>–0.010</b>	<b>2.5–6.4</b>	<b>1.5×10<sup>-3</sup>–3.8×10<sup>-3</sup></b>	<b>5.9×10<sup>-6</sup>–1.6×10<sup>-5</sup></b>	<b>9.7×10<sup>-3</sup>–0.025</b>
<b><i>Multi-Site Alternative (80–205 ppy) → LANL (30–80 ppy) + SRS (50–125 ppy)</i></b>									
LANL and SRS to NNSS	NNSS <sup>b</sup>	LLW/MLLW (567–1,467)	750–2,200	13.2–33.5	7.9×10 <sup>-3</sup> –0.020	4.3–10.9	2.6×10 <sup>-3</sup> –6.5×10 <sup>-3</sup>	1.9×10 <sup>-5</sup> –4.9×10 <sup>-5</sup>	0.026–0.066
LANL and SRS to WIPP	WIPP	TRU (217–444)	340–1,400	14.5–26.1	8.7×10 <sup>-3</sup> –0.016	4.6–8.3	2.8×10 <sup>-3</sup> –5.0×10 <sup>-3</sup>	2.1×10 <sup>-8</sup> –3.8×10 <sup>-8</sup>	9.2×10 <sup>-3</sup> –0.017
Secure Shipments	Pantex LANL SRS NNSS Y-12	Pits, pit material, and HEU (145–270)	1,233–6,125	1.8–3.2	1.1×10 <sup>-3</sup> – 1.9×10 <sup>-3</sup>	2.0–3.6	1.2×10 <sup>-3</sup> –2.2×10 <sup>-3</sup>	2.5×10 <sup>-8</sup> –4.6×10 <sup>-8</sup>	1.4×10 <sup>-3</sup> –2.6×10 <sup>-3(c)</sup>
<b>TOTALS (80–205 ppy)</b>				<b>29.5–62.8</b>	<b>0.018–0.038</b>	<b>10.9–22.8</b>	<b>6.5×10<sup>-3</sup>–0.014</b>	<b>1.9×10<sup>-5</sup>–4.9×10<sup>-5</sup></b>	<b>0.036–0.086</b>
<b><i>Single-Site Alternative (60–135 ppy) → LANL (10 ppy) + SRS (50–125 ppy)</i></b>									
LANL and/or SRS to NNSS	NNSS <sup>b</sup>	LLW/MLLW (349–716)	750–2,200	10.4–24.0	6.2×10 <sup>-3</sup> – 0.014	3.4–7.8	2.0×10 <sup>-3</sup> –4.7×10 <sup>-3</sup>	1.5×10 <sup>-5</sup> –3.5×10 <sup>-5</sup>	0.021–0.048
LANL and/or SRS to WIPP	WIPP	TRU (158–248)	340–1,400	13.2–21.7	7.9×10 <sup>-3</sup> –0.013	4.2–6.9	2.5×10 <sup>-3</sup> –4.1×10 <sup>-3</sup>	1.9×10 <sup>-8</sup> –3.2×10 <sup>-8</sup>	8.3×10 <sup>-3</sup> –0.014

Segments	Destina- tion	Rad Material (estimated shipments per year)	Segment Distance (miles)	Incident-Free <sup>a</sup>				Accident <sup>a</sup>	
				Crew		Population		Annualized Radiological Risk (LCF/yr)	Nonradiological Risk (# of traffic accident fatalities/yr)
				Total Dose (person- rem/yr)	Total Risk (LCF/yr)	Total Dose (person- rem/yr)	Total Risk (LCF/yr)		
Secure Shipments	Pantex, LANL SRS NNSS Y-12	Pits, pit material, and HEU (112–154)	1,020–6,125	1.5–2.5	$9.0 \times 10^{-4}$ – $1.5 \times 10^{-3}$	1.8–2.8	$1.1 \times 10^{-3}$ – $1.7 \times 10^{-3}$	$2.2 \times 10^{-8}$ – $3.5 \times 10^{-8}$	$1.3 \times 10^{-3}$ – $2.0 \times 10^{-3}$ (c)
<b>TOTALS (60–135 ppy)</b>				<b>25.1–48.2</b>	<b>0.015–0.029</b>	<b>9.4–17.5</b>	<b><math>5.6 \times 10^{-3}</math>–0.011</b>	<b><math>1.5 \times 10^{-5}</math>–<math>3.5 \times 10^{-5}</math></b>	<b>0.031–0.064</b>

HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NNSS = Nevada National Security Sites; Pantex = Pantex Plant; ppy = pits per year; SRS = Savannah River Site; TRU = transuranic waste; WIPP = Waste Isolation Pilot Plant;

Y-12 = Y12 National Security Complex; yr = year.

- a Annual risks from shipments are shown for both incident-free transportation and for accidents.  
 b All LLW/MLLW shipment impacts are conservatively and consistently evaluated by assuming such materials are exclusively transported to NNSS.  
 c Includes risks associated with two potential escort vehicles (per shipment) accompanying all secure shipments.

Note: Presented values may be subject to slight deviations from calculated values due to rounding.

The potential annual bounding dose to a hypothetical MEI from incident-free transportation at any point along a route is estimated to be 0.18 millirem per year, with an associated increased risk of an LCF to that individual of  $1.1 \times 10^{-7}$  per year (DOE 2008).

The highest theoretical collective dose on an annual basis to transportation crews (truck drivers) would be 62.8 person-rem from incident-free shipments during the analytical period for the Multi-Site Alternative, with an associated 0.038 additional annualized LCFs among the collective worker population. It should be noted that because the potential for a trained radiation worker truck-crew member developing a fatal latent cancer from a maximum allowable annual exposure is 0.0012, an individual worker would not be statistically expected to develop a lifetime latent fatal cancer even if that (single) worker were exposed to a continual 50-year maximum allowable annual exposure associated with these activities (0.018 LCF total over the 50-year period). Moreover, a maximally exposed inspector would be expected to receive 19 millirem per hour of inspection duty performed and, likewise, would be limited to the administrative annual dose limit of 2 rem per year (DOE 2017; SNL 2000).

Table E.3-3 above also presents the annualized risk of traffic accident fatalities for each of the alternatives. In all cases, the annualized risk of a traffic accident direct fatality is greater than the annualized risk of an additional LCF due to potential radiological exposure from an accident. For example, the highest potential annualized LCF risk among exposed populations from an accident occurring over the Multi-Site Alternative period would be  $4.9 \times 10^{-5}$ , while the estimated annualized number of traffic accident fatalities associated with these shipments over the same period would be 0.086 (a factor of roughly 1,750 higher).

### **E.3.10 Onsite Traffic and Parking-Capacity Impacts**

Both LANL and SRS would be expected to generally see increases in traffic and parking demands over the 50-year analytical period. The associated projections are briefly summarized below for each site.

#### **LANL**

During the 50-year period under the No-Action Alternative, it is estimated that an additional 864–2,083 pit production workers (corresponding to the alternative’s 30–80 pit-per-year [ppy] production target range) could potentially be commuting to LANL year-over-year on a regular basis, as compared to the present-day baseline number of pit production workers of 1,745. It is expected that any associated incremental annual increases in traffic due to this employment growth over the period would not change the level of service (LOS) designation on roads in the immediate vicinity of LANL. This was evaluated in the 2026 LANL SWEIS (NNSA 2026). Within the LANL site boundary itself, any resulting traffic increases due to the presence of more pit production-related staff would be expected to pose small to moderate impacts on the site’s existing road network. The potential addition of up to 2,083 pit production workers over the 50-year period under this alternative would represent about a 12-percent increase over the present-day number of workers site-wide at LANL. As addressed in Chapter 2, Section 2.4, the dedicated use of busing and carpooling by LANL site workers could help to alleviate such potential traffic increases due to increased employment needs.

This estimated increase in traffic would be the same for the Multi-Site and Single-Site alternatives, although there is the possibility on the lower end of the range that LANL could see a reduction in

total workers for pit production if production rates dropped to a “capability-based production level” of only 10 ppy (*see* Chapter 2, Section 2.5 of this PEIS).

A recent analysis of the LANL road network concluded that the onsite primary and secondary road networks are at relative capacity and can therefore benefit from additional improvements along the network to better facilitate traffic efficiency and flows. Any annualized increase in LANL’s pit production-related workforce during the 50-year analytical period under any of the alternatives would not be expected to significantly adversely impact operation of the primary and secondary road networks at LANL. Regarding prospective infrastructure upgrades for improving both onsite vehicular flows and parking space shortages, undertakings such as LANL’s proposed parking structure in TA-48 and offsite parking and shuttle services, would help accommodate any increased levels of onsite traffic and parking. Additionally, the Laboratory is planning to deploy 26 acres of new or reconfigured roads and 18 additional acres of site-wide parking. Moreover, the replacement of the Los Alamos Canyon bridge and the associated reconfiguration of the intersections north and south of the bridge should improve traffic flow, although during construction, minor increases in traffic congestion would be expected within the area. These planned improvements were all analyzed in the 2026 LANL SWEIS (NNSA 2026). Implementation of shift-based work at the site would be expected to help mitigate peak vehicle traffic patterns and periods.

### **SRS**

Under the Multi-Site or Single-Site alternatives at SRS, it is estimated that 1,705–2,840 additional workers would commute to the site on a regular basis year-over-year due to expected annual workforce growth associated with SRS’s new pit production mission. The precise number of required additional workers within the above denoted range would depend on actual pit production rates. It is expected that any associated incremental annual increases in traffic due to this employment growth over the period would not change the LOS’s on major roads in the immediate vicinity of SRS. Within the SRS site boundary itself, traffic increases due to the presence of new pit production-related staff would be expected to pose moderate impacts to the site’s existing road network. The potential addition of up to 2,840 workers over the 50-year analytical period under either alternative would represent a 20-percent increase over the present-day number of workers at SRS that primarily support the site’s environmental cleanup mission (approximately 13,000).

Recent civil/infrastructural evaluations of the SRS road network concluded that the onsite primary and secondary road networks operate at a relatively efficient capacity; however, there are several high-demand areas that could potentially benefit from additional improvements along the road network to better facilitate overall traffic efficiency and flows.

## **E.4 Uncertainties and Conservatisms in Estimated Impacts**

The sequence of analysis usually performed to generate estimates of radiological risk for transportation endeavors typically includes the following items: (1) determination of material inventories and characteristics, (2) estimation of shipment requirements, (3) determination of route characteristics, (4) calculations of radiation doses to exposed individuals (including estimation of environmental transport and uptake of radionuclides), and (5) estimation of associated health effects (LCFs). Uncertainties, however, are inherently associated with each of these items. Uncertainties exist in the way that the physical systems being analyzed are essentially represented/depicted by the computational models used for characterizing them; either by the data required to exercise such models (due to measurement errors, sampling errors, natural variability,

or unknowns caused simply by the future nature of the actions being analyzed), or within the calculations themselves (e.g., algorithm approximations used within the computer codes; rounding errors).

In principle, one can estimate the uncertainty associated with each input or computational source and predict the resultant uncertainty in each set of calculations. Thus, one can propagate the uncertainties from one set of calculations to the next and estimate the uncertainty in the final result; however, conducting such a full-scale quantitative uncertainty-analysis is often impractical and sometimes impossible, especially for actions to be initiated at an unspecified time in the future. Instead, transportation risk analysis was designed to ensure through uniform, judicious, and conservative selection of scenarios, models, and input parameters, that relative comparisons of risk among candidate alternatives provide meaningful results. Within a specific transportation risk assessment, this design is accomplished by uniformly applying common input parameters and assumptions to all evaluated alternatives. Therefore, although considerable uncertainty is inherent in the absolute magnitude of the transportation risk for each alternative, much less uncertainty is associated with the relative differences between the alternatives for each calculated measure of risk (DOE 2002b).

As such, the following sections briefly discuss typical areas of uncertainty that are addressed within each of the assessment steps listed above. Special emphasis is placed on identifying whether the uncertainties affect relative or absolute measures of risk. Moreover, the reality and conservatism of the assumptions are addressed, and where practical, the parameters that most significantly affect the overall risk assessment results are identified.

#### **E.4.1 Uncertainties in Material Inventories and Characterization**

Material inventories and their physical and radiological characteristics are important input parameters to a transportation risk assessment. The potential numbers of shipments under each considered alternative are primarily based on the projected dimensions of package contents, radiation-field strength/intensity, and assumptions concerning shipment capacities. Physical and radiological characteristics are important in determining the amount and nature of material that potentially could be released during accidents and the subsequent doses to exposed individuals through multiple environmental exposure pathways.

Uncertainties in material inventories and characterization are directly reflected in transportation risk results. If an inventory is overestimated (or underestimated), the resulting transportation risk estimates are also overestimated (or underestimated) by roughly the same factor. However, the same inventory estimates (on a per-unit basis) are used in this analysis to evaluate shipping impacts under each of the alternatives; therefore, for comparative purposes, the observed differences in transportation risks among alternatives are believed to represent unbiased, reasonably accurate estimates based on the most current assessment information available. DOE/NNSA has used historical shipment inventories for nuclear materials and radiological waste to provide the most realistic estimate of inventories and their characterization. Considering that the analysis deploys the same unit risk factors as used in the 2026 LANL SWEIS, the inventories remain consistent with materials that would be shipped during pit production activities at both LANL and SRS.

#### E.4.2 Uncertainties in Containers, Shipment Capacities, and Number of Shipments

The extent of transportation required under each alternative is based in part on assumptions concerning the packaging characteristics and shipment capacities for transport vehicles. Representative shipment capacities have been defined for assessment purposes based on probable future shipment capacities. In reality, the actual shipment capacities may differ from the predicted capacities throughout the evaluated 50-year analytical period such that the projected number of shipments and, consequently, the total transportation risk, would change. While the predicted transportation risks would increase or decrease accordingly, the relative *differences in such risks among the alternatives* would remain about the same since these risks (in terms of LCFs) to the public and shipping-crews are not overly sensitive to these factors (USDOT 2008).

NNSA has used a best-estimate projection of potential shipment numbers for each alternative to provide a realistic expectation of potential impacts as opposed to a highly conservative bounding projection that would grossly overestimate potential results.

DOE/NNSA is considering the option of initially shipping future operational TRU waste quantities to INL for size-reduction/compaction prior to sending to WIPP for disposal. This effort would ultimately reduce the number of waste packages (and associated volumes) of LANL and/or SRS TRU wastes ultimately emplaced at WIPP and would accordingly serve to increase the remaining overall available capacity for future TRU waste disposal at the site under the established WIPP Land Withdrawal Act volume limit. This transportation action would only occur if DOE was confident that TRU waste generated from pit production activities are accepted at WIPP.

The tradeoff for these size-reduction efforts, however, could be an increase in the total number of shipment-miles associated with TRU waste transportation. While there could be a net reduction in the number of *compacted* TRU waste shipments (INL to WIPP) as compared to the number of *non-compacted* shipments (LANL and/or SRS to WIPP), such undertakings ultimately would be determined on a case-by-case basis and would consider such factors as radionuclide content and mass of each package relative to transportation limits. The TRUPACT-II or -III TRAMPAC would ensure compliance of the payload with parameters of the packaging. These would include container and physical properties, nuclear properties, chemical properties, gas generation properties, and payload assembly criteria. Compaction would theoretically reduce the overall number of trips required to transport waste to WIPP. The supercompactor at INL has compacted more than 275,000 55-gallon drums of TRU waste debris. Using compaction, the Advanced Mixed Waste Treatment Project at INL has saved more than 6,000 truck shipments that would have been required for sending to WIPP. Furthermore, supercompaction has led to more efficient and effective use of available disposal space at WIPP.

NNSA's estimates of secure shipments (to and from LANL or SRS) account for a pending NNSA change in specific shipping containers. The Model FL shipping container, which has been in use since the Cold War, will be replaced by the new Defense Programs Package (DPP)-1 for shipping of war reserve pits. The MD-2 shipping container, originally designed to ship surplus plutonium items for conversion to mixed-oxide fuel, will continue in service for the pit production program transport of other SNM (e.g., old pits, plutonium). Both the DPP-1 and MD-2 containers are larger and heavier than the Model FL and cause an increase in the number of transportation trips between the pit production facility and other destinations (e.g., Pantex) because of their size relative to the FL.

NNSA expects the new DPP-1 package to be implemented within the next 2–10 years. The estimated number of annual secure shipments for each site thus reflects these smaller-capacity packages.

The differences in projected numbers of secure shipments between LANL and SRS (on a per-pit basis) are due to three potential contributive factors: (1) changes in secure transporter<sup>3</sup> trucks may affect eventual payload and shipment counts, (2) changes to the DPP-1 shipping container (discussed above) may affect the total number of shipments, and (3) existing infrastructure at LANL may not allow full efficiency in the loading/unloading of packages and trucks and may therefore allow only *partial* shipments. In summary, without changes to the secure transporters and shipping containers, total numbers of shipments would be expected to be lower and more consistent between the sites.

### E.4.3 Uncertainties in Route Determinations

TRAGIS-analyzed routes were initially determined between most likely origin and destination locations (DOE 2008) from which per-shipment dose/risk factors (per-shipment material type) were evaluated for this PEIS's projected numbers of shipments under each of the alternatives. The routes were determined to be consistent with current guidelines, regulations, and practices, but nevertheless may not end up being the actual routes used for some future shipments (for example, shipments of LLW to the NNSW likely would not be following the *most-direct* route to the site due to the provision within the NNSW Waste Acceptance Criteria requiring the avoidance of the Las Vegas metropolitan area for such shipments). As such, notable differences in shipment-miles and nearby populations along route lines could potentially occur over the 50-year horizon. Because materials could be transported over an extended period starting at some time in the future, highway infrastructure and core demographics along routes could likewise change from what was originally anticipated. Although these effects have not been accounted for in this analysis via any type of sensitivity study, it is not anticipated that such changes would significantly affect relative comparisons of risk among the alternatives considered in this PEIS.

### E.4.4 Uncertainties in the Calculation of Radiation Doses

The models originally used to calculate radiation doses from transportation activities introduce an inherent degree of uncertainty within the risk assessment process. Estimating the accuracy or absolute uncertainty of the risk assessment results is generally difficult. The accuracy of the calculated results is closely related to the limitations of the computational models and to the uncertainties in each of the input parameters that the model requires. The single greatest limitation facing users of RADTRAN, or any code of this type, is the accuracy of data for certain input parameters. Populations along the transportation routes, shipment surface dose rates, and individuals residing near anticipated routes are the most uncertain data in shipping dose calculations. In preparing these data, the analysis uses assumptions that potentially affected populations are uniformly distributed and are proportional to traffic density, with an assumed occupancy of two persons per car; that the shipment surface dose rate is the maximum allowable dose rate per USDOT standards; and that the potential exists for an individual to be residing at the edge of a highway. Although best practices have been undertaken to define these parameters, not all assumptions are in fact completely accurate within the effort of attempting to best depict/mirror

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<sup>3</sup> NNSA's Office of Secure Transportation currently uses Safeguards Transporters and are developing the Mobile Guardian Transporters for future use.

real-life transportation conditions, nor would such inaccuracies be realized (or altogether observable/distinguishable) during the continuity of an entire 50-year analytical period. For example, off-link populations are predominantly heterogeneous, and on-link traffic densities typically vary widely within a geographic zone (i.e., urban, suburban, or rural). Finally, added to this complexity are the assumptions regarding the expected distances between the public and the shipment at a traffic stop, rest stop, or during stalled traffic, and the afforded degree of shielding that may be available (but not credited) at such times.

Uncertainties associated with these computations are reduced by using state-of-the-art computer codes that have undergone extensive peer review and software quality assurance. Because many uncertainties are recognized but difficult to quantify, assumptions are made at each step of the risk assessment process that are intended to ultimately produce conservative results (i.e., overestimations of calculated dose and radiological risk). Because conservative parameters and bounding assumptions were applied consistently to each alternative in this transportation analysis whenever possible, such model bias is not expected to affect the fidelity of relative comparisons of risk; however, it should be expected that results may not ultimately represent risks in an absolute sense.

#### **E.4.5 Uncertainties in Future Traffic Fatality Rates**

Future accident and fatality rate data may change as a result of vehicle and highway improvements that are quite difficult to project over a 50-year period. Such uncertainties are challenging to accurately predict due to rapidly changing/evolving safety technologies continually being deployed within the motor-vehicle industry, available/allocated funding for capital road-improvement projects, future levels of law-enforcement for instances of impaired driving, potential changes to speed limits and other road rules/restrictions, as well as possible improvements in the level of rigor required for driver licensing and training.

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APPENDIX F  
Public Notices

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## **CONTENTS**

Notice of Intent to Prepare a Programmatic Environmental Impact Statement for Plutonium Pit Production

maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on May 5, 2025.

**Jennifer Hartzell,**

*Alternate Federal Register Liaison Officer,  
U.S. Department of Energy.*

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## DEPARTMENT OF ENERGY

### National Nuclear Security Administration

#### Notice of Intent To Prepare a Programmatic Environmental Impact Statement for Plutonium Pit Production

**AGENCY:** National Nuclear Security Administration, Department of Energy.

**ACTION:** Notice of intent.

**SUMMARY:** The National Nuclear Security Administration (NNSA), a semi-autonomous agency within the United States (U.S.) Department of Energy (DOE), announces its intent to initiate a National Environmental Policy Act of 1969 (NEPA) programmatic environmental impact statement (PEIS) process to ensure NEPA compliance for the production of plutonium pits in support of NNSA's Stockpile Stewardship and Management Program. The PEIS will evaluate the programmatic environmental impacts of producing pits at the Congressionally mandated rate (and potentially other reasonable rates) using various single site and multi-site alternatives; associated activities at other NNSA sites; and associated waste management and transportation activities. The purpose of this Notice is to invite public participation in the PEIS process and to solicit public comment on the scope, environmental issues, and alternatives for consideration by NNSA in the draft PEIS.

**DATES:** NNSA will hold initial virtual public scoping meetings and subsequent public hearings on the draft PEIS. During scoping, NNSA invites other Federal agencies, Native American Tribes, State and local governments, industry, other organizations, and members of the public to review and

submit comments on the scope and alternatives of the PEIS. The deadline to submit these comments will be 45 days after the final public scoping meeting. As noted, the final public scoping meeting is currently scheduled for May 28, 2025, and therefore, the current deadline for comments is July 14, 2025. Comments received after this date will be considered to the extent practicable. NNSA will hold two virtual public scoping meetings. The information about the scoping meetings (*i.e.*, date, time, phone number, and accessible hyperlink) is provided in the table below. If there are future changes to this information, it would be provided in a future notice posted on the following website: <https://www.energy.gov/nnsa/nnsa-nepa-reading-room>, no fewer than 15 days from the planned meeting date.

Virtual scoping meeting dates and times	Hyperlink
Tuesday, May 27, 2025, 5–7:30 p.m. ET.	<a href="https://bit.ly/PuPEISMtg1">https://bit.ly/PuPEISMtg1</a> . Dial in by Phone: (571) 429–4592. Phone conference ID: 808 821 801#.
Wednesday, May 28, 2025, 7–9:30 p.m. ET.	<a href="https://bit.ly/PuPEISMtg2">https://bit.ly/PuPEISMtg2</a> . Dial in by Phone: (571) 429–4592. Phone conference ID: 989 289 432#.

**ADDRESSES:** Written comments on the scope of the PEIS, requests to be placed on the PEIS distribution list, and comments or questions on the scoping process should be sent to: Ms. Jade Fortiner, NEPA Document Manager, National Nuclear Security Administration, Office of Pit Production Modernization, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585 or email to [PitPEIS@nnsa.doe.gov](mailto:PitPEIS@nnsa.doe.gov). Before including your address, phone number, email address, or other personal identifying information in your comment, please be advised that your entire comment—including your personal identifying information—may be made publicly available. If you wish for NNSA to withhold your name and/or other personally identifiable information, please state this prominently at the beginning of your comment. You may also submit comments anonymously. NNSA requests all Federal, State, Native American Tribes, and local agencies that desire to be designated as cooperating agencies on the PEIS to contact the NEPA Document Manager at the address listed in this section by the end of the scoping period.

**FOR FURTHER INFORMATION CONTACT:** For further information about this Notice, please contact Ms. Kristen M. Dors, NEPA Compliance Officer, NNSA Office

of Environment, Safety and Health, Los Alamos Field Office, 3747 West Road, Los Alamos, NM 87544; telephone: 505–606–8953; or email to: [PitPEIS@nnsa.doe.gov](mailto:PitPEIS@nnsa.doe.gov).

This Notice will be available on the internet at: <https://www.energy.gov/nepa/listings/notices-intent-noi> and <https://www.energy.gov/nnsa/nnsa-nepa-reading-room>.

#### SUPPLEMENTARY INFORMATION:

##### Background

NNSA is responsible for meeting the national security requirements established by the President and Congress to maintain and enhance the safety, reliability, and performance of the U.S. nuclear weapons stockpile. Plutonium pits are critical components of every nuclear weapon; nearly all current stockpile pits were produced from 1978 to 1989. The United States' capability to produce plutonium pits is limited and does not meet Federal requirements.

Per title 50 United States Code (U.S.C.) 2538a, NNSA is mandated to manufacture no fewer than 80 war reserve pits per year by 2030. This number is driven by the stockpile's size, the need to replace existing pits as they age, and the requirement for the United States to have a flexible and resilient manufacturing capability with the capacity to produce a variety of pits to meet current and planned military stockpile requirements and ensure the safety, security, and effectiveness of the nation's nuclear stockpile.

Previously, NNSA prepared the 2008 Complex Transformation Supplemental PEIS (DOE/EIS–0236–S4) to analyze the potential environmental impacts associated with pit production at different site alternatives: Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico; Savannah River Site (SRS) near Aiken, South Carolina; Pantex Plant near Amarillo, Texas; Y–12 National Security Complex in Oak Ridge, Tennessee; and the Nevada Test Site (now named the Nevada National Security Site) north of Las Vegas, Nevada. At SRS, the Complex Transformation Supplemental PEIS also evaluated a pit production facility that would use the Mixed-Oxide Fuel Fabrication Facility and Pit Disassembly and Conversion Facility infrastructure. Additionally, pit production at LANL has been analyzed in several NEPA documents over the past two decades, including the 2008 Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EIS–0380) and the 2020 Final Supplement Analysis of the 2008

Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory for Plutonium Operations (DOE/EIS-380-SA-06). On September 2, 2020, NNSA published a record of decision (ROD) stating LANL will implement actions to produce a minimum of 30 war reserve pits per year during 2026 for the national pit production mission and implement surge efforts to exceed 30 pits per year up to the analyzed limit (80 war reserve pits per year) as necessary (85 FR 54550).

### Purpose and Need for Agency Action

The national security policies of the United States require a safe, secure, and reliable nuclear weapons stockpile and the maintenance of core competencies to design, manufacture, and maintain nuclear weapons. The 2022 Nuclear Posture Review identified plutonium pit production as one of the highest priorities in the modernization of the nuclear security enterprise over the next ten years. To meet the need outlined in Federal legislation and requirements delineated by the U.S. Department of Defense, NNSA must establish a workforce and infrastructure capable of producing no fewer than 80 pits per year as soon as possible, while eliminating single point failures and providing flexible capacity options. The PEIS process is to ensure NEPA compliance for production of plutonium pits in support of these requirements and NNSA's Stockpile Stewardship and Management Program. The PEIS will evaluate the programmatic environmental impacts of producing pits at the Congressionally mandated rate needed to meet Federal requirements (and potentially other reasonable rates) using various single site and multi-site alternatives; associated activities at other NNSA sites; and associated waste management and transportation activities.

### Requirements To Fulfill DOE NEPA Compliance

NNSA is responsible for management and implementation of the requirements of NEPA, and the regulations and policies promulgated thereunder, including, but not limited to the National Environmental Policy Act of 1969, DOE NEPA implementing procedures (10 CFR part 1021), the Amendments to NEPA from the Fiscal Responsibility Act of 2023 (H.R. 3746), DOE Order 451.1B NEPA Compliance Program, and NNSA Policy (NAP) 451.1 NEPA Compliance Program. The PEIS will be prepared pursuant to NEPA and applicable regulations and policies promulgated thereunder. The PEIS will

be prepared in the same manner as a draft or final EIS and will provide the public with an analysis of the potential environmental impacts, at a programmatic level, associated with the reasonable alternatives.

### Preliminary Alternatives

The PEIS will evaluate NNSA's proposal to produce plutonium pits at required quantities to meet national security requirements and the potential environmental impacts associated with a range of reasonable alternatives for achieving the necessary pit production capabilities and operations at a programmatic level. For analytical purposes, this PEIS will evaluate potential impacts over a 50-year period, through approximately 2075.

In the PEIS, NNSA intends to analyze: (1) site alternatives; and (2) capacity alternatives for the near term (producing pits at the current Congressionally mandated rate) and the long term (to account for potential changes in future national security requirements for pits). With regard to site alternatives, NNSA considers LANL and SRS to be reasonable alternatives because of the available facilities and infrastructure at those sites that is being/could be used to produce pits to meet the mandated schedule and capacity requirements. NNSA will evaluate other potential site alternatives in the PEIS if they are determined to be reasonable. Construction of a new facility (greenfield) is likely to be considered unreasonable because it would not meet the federally mandated pit production rate in the near term and is likely cost prohibitive, however, NNSA has not decided to exclude greenfield alternatives at this time.

The No-Action Alternative will be based on NNSA's prior decision to produce 30 pits per year at LANL with surge efforts to produce up to 80 pits per year (85 FR 54544, September 2, 2020). NNSA welcomes input on alternatives to be analyzed in the PEIS.

### Preliminary Environmental Analysis

The following issues have been identified for analysis in the PEIS. The list is tentative and intended to facilitate public comment on the scope of the PEIS. It is not intended to be all-inclusive, nor does it imply any predetermination of potential impacts. NNSA specifically invites suggestions for the addition or deletion of items on this list.

1. Impacts on land use and applicable plans and policies.
2. Impacts on visual aesthetics.
3. Impacts on geology and soil.

4. Impacts on water resources, including floodplains and wetlands.

5. Impacts on air quality and noise.

6. Impacts to plants and animals and their habitat, including species which are federally- or State-listed as threatened or endangered, or of special concern.

7. Impacts to cultural resources such as those that are historic and paleontological.

8. Socioeconomic impacts to affected communities.

9. Impacts from traffic and transportation of radiological and hazardous materials and waste.

10. Impacts from use of utilities, including water and electricity consumption, fuel use, sewer discharges, and resource conservation.

11. Impacts on the public and workers from exposures to radiological and hazardous materials during construction and normal operations.

12. Impacts on the public and workers from exposures to radiological and hazardous materials from reasonably foreseeable accidents, and intentional destructive acts.

13. Impacts on waste management activities and capacities at on-site and off-site locations.

### PEIS Process

The scoping process is intended to involve all interested agencies (Federal, State, Native American Tribes, county, and local), public interest groups, businesses, and members of the public. Interested parties are invited to participate in the PEIS process, both to refine the preliminary alternatives and environmental issues to be analyzed in depth and to eliminate from detailed study those alternatives and environmental issues that are not reasonable or pertinent. Input from the scoping process will assist NNSA in formulating the proposed action, refining the alternatives, and defining the scope of PEIS analyses.

Following the scoping period announced in this Notice, and after consideration of comments received during scoping, NNSA will prepare a draft PEIS for pit production. NNSA will announce the availability of the draft PEIS in the **Federal Register** and through other means, including media outlets in the areas around planned hearing locations. The comment period on the draft PEIS will be at least 90 days. NNSA will hold public hearings on the draft PEIS in Aiken, South Carolina; Kansas City, Missouri; Livermore, California; Santa Fe, New Mexico; Washington DC; and any other location NNSA deems relevant to the PEIS. Details related to those hearings

will be provided in NNSA's public notices. Comments received on the draft PEIS will be considered and addressed in the Final PEIS. NNSA will issue a ROD no sooner than 30 days after publication by the Environmental Protection Agency of a Notice of Availability of the final PEIS.

### PEIS Preparation and Schedule

NNSA expects to issue the draft PEIS within approximately one year of this NOI and complete the final PEIS and ROD within approximately 2 years.

### Signing Authority

This document of the Department of Energy was signed on April 22, 2025, by Teresa M. Robbins, Acting Under Secretary for Nuclear Security and NNSA Administrator, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the **Federal Register**.

Signed in Washington, DC, on May 6, 2025.

#### Jennifer Hartzell,

Alternate Federal Register Liaison Officer,  
U.S. Department of Energy.

[FR Doc. 2025-08140 Filed 5-8-25; 8:45 am]

BILLING CODE 6450-01-P

## DEPARTMENT OF ENERGY

### Federal Energy Regulatory Commission

[Project No. 2365-060]

#### Eagle Creek Madison Hydro, LLC; Notice of Application for Project Boundary Amendment Accepted for Filing, Soliciting Comments, Motions To Intervene, and Protests

Take notice that the following hydroelectric application has been filed with the Commission and is available for public inspection:

- a. *Application Type*: Project Boundary Amendment.
- b. *Project No*: 2365-060.
- c. *Date Filed*: October 31, 2024, and supplemented November 19, 2024, and May 2, 2025.
- d. *Applicant*: Eagle Creek Madison Hydro, LLC (licensee).

e. *Name of Project*: Anson Hydroelectric Project.

f. *Location*: The project is located on the Kennebec River in Somerset County, Maine. There are no Federal lands associated with the project.

g. *Filed Pursuant to*: Federal Power Act, 16 U.S.C. 791a-825r.

h. *Applicant Contact*: David Fox, 7315 Wisconsin Ave., Suite 1100W, Bethesda, MD 20814, (201) 306-5616 or [david.fox@eaglecreekre.com](mailto:david.fox@eaglecreekre.com).

i. *FERC Contact*: Jeremy Jessup, (202) 502-6779, [Jeremy.Jessup@ferc.gov](mailto:Jeremy.Jessup@ferc.gov).

j. *Cooperating agencies*: With this notice, the Commission is inviting Federal, State, local, and Tribal agencies with jurisdiction and/or special expertise with respect to environmental issues affected by the proposal, that wish to cooperate in the preparation of any environmental document, if applicable, to follow the instructions for filing such requests described in item k below. Cooperating agencies should note the Commission's policy that agencies that cooperate in the preparation of any environmental document cannot also intervene. See 94 FERC ¶ 61,076 (2001).

k. *Deadline for filing comments, motions to intervene, and protests*: June 4, 2025.

The Commission strongly encourages electronic filing. Please file comments, motions to intervene, and protests using the Commission's eFiling system at <https://www.ferc.gov/docs-filing/efiling.asp>. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at <https://www.ferc.gov/docs-filing/ecomment.asp>. For assistance, please contact FERC Online Support at [FERCOnlineSupport@ferc.gov](mailto:FERCOnlineSupport@ferc.gov), (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Debbie-Anne A. Reese, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426. Submissions sent via any other carrier must be addressed to: Debbie-Anne A. Reese, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, MD 20852. The first page of any filing should include the docket number P-2365-060. Comments emailed to Commission staff are not considered part of the Commission record.

The Commission's Rules of Practice and Procedure require all intervenors filing documents with the Commission to serve a copy of that document on each person whose name appears on the

official service list for the project.

Further, if an intervenor files comments or documents with the Commission relating to the merits of an issue that may affect the responsibilities of a particular resource agency, they must also serve a copy of the document on that resource agency.

l. *Description of Request*: The licensee proposes to amend the project boundary and relocate approximately 1,250 feet of the project transmission line. The transmission line is bordered by lands owned by the Anson-Madison Sanitary District (District). Due to an expansion and upgrade of the District's facilities, it has requested that the licensee's 1,250-foot section of transmission line be relocated a negligible distance southwest of its current location. The relocation would not change the length of the transmission line or quantity of lands within the project boundary. There would be minor ground disturbance in a previously disturbed area with the installation of six new transmission line poles. The District would be the lead for all other agency consultation and would manage construction activities associated with the transmission line.

m. *Locations of the Application*: This filing may be viewed on the Commission's website at <http://www.ferc.gov> using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access the document. You may also register online at <http://www.ferc.gov/docs-filing/esubscription.asp> to be notified via email of new filings and issuances related to this or other pending projects. For assistance, call 1-866-208-3676 or email [FERCOnlineSupport@ferc.gov](mailto:FERCOnlineSupport@ferc.gov), for TTY, call (202) 502-8659. Agencies may obtain copies of the application directly from the applicant.

n. Individuals desiring to be included on the Commission's mailing list should so indicate by writing to the Secretary of the Commission.

o. *Comments, Protests, or Motions to Intervene*: Anyone may submit comments, a protest, or a motion to intervene in accordance with the requirements of Rules of Practice and Procedure, 18 CFR 385.210, .211, .214, respectively. In determining the appropriate action to take, the Commission will consider all protests or other comments filed, but only those who file a motion to intervene in accordance with the Commission's Rules may become a party to the proceeding. Any comments, protests, or motions to intervene must be received on or before the specified comment date for the particular application.

APPENDIX G  
Glossary

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## G GLOSSARY

**absorbed dose**—For ionizing radiation, the energy imparted to matter by ionizing radiation per unit mass of the irradiated material (such as biological tissue). The units of absorbed dose for this PEIS are rad. (*See rad.*)

**accident sequence**—With regard to nuclear facilities, an initiating event followed by system failures or operator errors, which can result in confinement system failure, and/or radionuclide releases.

**actinide**—Any member of the group of elements with atomic numbers from 89 (actinium) to 103 (lawrencium) including uranium and plutonium. All members of this group are radioactive.

**activation products**—Nuclei, usually radioactive, formed by the bombardment and absorption in material with neutrons, protons, or other nuclear particles.

**administrative control level**—A dose level that is established well below the regulatory limit to administratively control and help reduce individual and collective radiation doses. Facility management should establish an annual facility administrative control level that should, to the extent feasible, be more restrictive than the more general administrative control level.

**air pollutant**—Generally, an airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance for which emissions or atmospheric concentrations are regulated, or for which maximum guideline levels have been established because of potential harmful effects on human health and welfare.

**air quality control region**—Geographic subdivisions of the U.S., designed to deal with pollution on a regional or local level. Some regions span more than one state.

**alluvium**—Sediment deposited by flowing water, as in a riverbed, flood plain, or delta.

**alpha particle**—A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus and has a mass number of 4 and an electrostatic charge of +2. It has low penetrating power and a short range (a few centimeters in air).

**alpha radiation**—A strongly ionizing, but weakly penetrating, form of radiation consisting of positively charged alpha particles emitted spontaneously from the nuclei of certain elements during radioactive decay. Alpha radiation is the least penetrating of the three common types of ionizing radiation (alpha, beta, and gamma). Even the most energetic alpha particle generally fails to penetrate the dead layers of cells covering the skin and can be easily stopped by a sheet of paper. Alpha radiation is most hazardous when an alpha-emitting source resides inside an organism.

**ambient**—Relating to the immediate surroundings of an environmental setting.

**ambient air**—The surrounding atmosphere as it exists around people, plants, and structures.

**ambient air quality standards**—The level of pollutants in the air prescribed by regulations that may not be exceeded during a specified time in a defined area. Air quality standards are used to provide a measure of the health-related and visual characteristics of the air.

**analytical chemistry**—The branch of chemistry that deals with the separation, identification, and determination of the components of a sample.

**aquatic**—Living or growing in, on, or near water.

**aquifer**—An underground geological formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to wells or springs.

**archaeological sites (resources)**—Any location where humans have altered the terrain or discarded artifacts during either precontact or historic times.

**artifact**—An object produced or shaped by human workmanship of archaeological or historical interest.

**atmospheric dispersion**—The process of air pollutants being dispersed in the atmosphere. This occurs by the wind that carries the pollutants away from their source, by turbulent air motion that results from solar heating of Earth's surface, and air movement over rough terrain and surfaces.

**Atomic Energy Act**—A law originally enacted in 1946 and replaced in 1954 that placed nuclear production and control of nuclear materials within a civilian agency, originally the Atomic Energy Commission (42 U.S.C. § 2011 et seq.). The functions of the Atomic Energy Commission were replaced by the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy.

**Atomic Energy Commission**—A five-member commission, established by the Atomic Energy Act of 1946, to supervise nuclear weapons design, development, manufacturing, maintenance, modification, and dismantlement. In 1974, the Atomic Energy Commission was abolished, and all functions were transferred to the Nuclear Regulatory Commission and the Administrator of the Energy Research and Development Administration. The Energy Research and Development Administration was later terminated, and functions vested by law in the Administrator were transferred to the Secretary of Energy.

**atomic number**—The number of positively charged protons in the nucleus of an atom or the number of electrons on an electrically neutral atom.

**attainment area**—An area that the U.S. Environmental Protection Agency has designated as being in compliance with one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants but not for others. (See National Ambient Air Quality Standards, nonattainment area, and particulate matter.)

**backfill**—The replacement of excavated earth or other material into an open trench, cavity, or other opening in the earth.

**background radiation**—Radiation from (1) cosmic sources, (2) naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material), and (3) global fallout as it exists in the environment (such as from the testing of nuclear explosive devices).

**barrier**—Any material or structure that prevents or substantially delays movement of pollutants or materials containing radionuclides toward the accessible environment.

**basalt**—The most common volcanic rock, dark gray to black in color, high in iron and magnesium and low in silica. It is typically found in lava flows.

**baseline**—The existing environmental conditions against which impacts of the Proposed Action and its alternatives can be compared. The environmental baseline is the site environmental conditions as they exist or are estimated to exist in the absence of the Proposed Action.

**basin**—Geologically, a circular or elliptical downwarp or depression in the earth’s surface that collects sediment. Younger sedimentary beds occur in the center of basins. Topographically, a depression into which water from the surrounding area drains.

**bedrock**—The solid rock that lies beneath soil and other loose surface materials.

**BEIR VII**—Biological Effects of Ionizing Radiation; referring to the seventh in a series of committee reports from the National Research Council.

**beryllium**—An extremely light-weight element with the atomic number 4. It is metallic and is used in nuclear reactors as a neutron reflector. It is also used in weapons systems.

**best management practices (BMPs)**—Standard measures and procedures that are implemented to avoid, minimize, or mitigate adverse environmental effects associated with the Proposed Action. These are generally accepted practices that are typically used to reduce impacts and ensure compliance with environmental requirements.

**beta particle**—A particle emitted in the radioactive decay of many radionuclides. A beta particle is identical to an electron. It has a short range in air and a small ability to penetrate other materials.

**biota (biotic)**—The plant and animal life of a region (pertaining to biota).

**block**—U.S. Bureau of the Census term describing small areas bounded on all sides by visible features or political boundaries; used in tabulation of census data.

**borrow**—Excavated material that has been taken from one area to be used as raw material or fill at another location.

**bound**—To use simplifying assumptions and analytical methods in analyzing potential impacts or risks such that the result provides an overestimate or upper limit that “bounds” the potential impacts or risks.

**bounded**—Producing the greatest consequences of any assessment of impacts associated with normal or abnormal operations.

**cancer**—The name given to a group of diseases characterized by uncontrolled cellular growth, with cells having invasive characteristics such that the disease can transfer from one organ to another.

**canister**—A general term for a container, usually cylindrical, used in handling, storage, transportation, or disposal of waste.

**capable fault**—A fault that has exhibited one or more of the following characteristics: (1) movement at or near the ground surface at least once within the past 35,000 years, or movement of a recurring nature within the past 500,000 years; (2) macro-seismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault; (3) a structural relationship to a capable fault according to characteristic (1) or (2) above, such that movement on one could be reasonably expected to be accompanied by movement on the other.

**carbon dioxide**—A colorless, odorless gas that is a normal component of ambient air; it results from fossil fuel combustion and is an expiration product.

**carbon dioxide equivalent**—Is the unit of measurement for the impacts of different greenhouse gases on global warming in terms of the amount of carbon dioxide calculated on the basis of the global warming potential index.

**carbon monoxide**—A colorless, odorless, and poisonous gas produced by incomplete fossil fuel combustion.

**carcinogen**—An agent that may cause cancer. Ionizing radiation is a physical carcinogen; there are also chemical and biological carcinogens. Biological carcinogens may be external (such as viruses) or internal (such as genetic defects).

**cask**—A heavily shielded container used to store or ship radioactive materials.

**categories of special nuclear material (Categories I, II, III, and IV)**—A designation determined by the quantity and type of special nuclear material or a designation of a special nuclear material location based on the type and form of the material and the amount of nuclear material present. A designation of the significance of special nuclear material based upon the material type, form of the material, and amount of material present in an item, grouping of items, or in a location

**chain reaction**—A reaction that initiates its own repetition. In nuclear fission, a chain reaction occurs when a neutron induces a nucleus to fission and the fissioning nucleus releases one or more neutrons which induce other nuclei to fission.

**chemical wastes**—Defined as hazardous waste (designated under RCRA regulations); toxic waste (asbestos and polychlorinated biphenyls, designated under the Toxic Substances Control Act); and, in New Mexico, special waste (designated under the New Mexico Solid Waste Regulations and including industrial waste, infectious waste, and petroleum contaminated soils).

**classified information**—(1) Information that has been determined pursuant to Executive Order 12958, any successor order, or the Atomic Energy Act of 1954 (42 U.S.C. § 2011) to require protection against unauthorized disclosure; (2) certain information requiring protection against unauthorized disclosure in the interest of national defense and security or foreign relations of the U.S. pursuant to federal statute or Executive Order.

**clay**—The name for a family of finely crystalline sheet silicate minerals that commonly form as a product of rock weathering. Also, any particle smaller than or equal to about 0.002 millimeters (0.00008 inches) in diameter.

**Clean Air Act**—This Act mandates and provides for enforcement of regulations to control air pollution from various sources (42 U.S.C. § 7401 et seq.).

**Clean Water Act of 1972, 1987**—This Act regulates the discharge of pollutants from a point source into navigable waters of the U.S. in compliance with a National Pollutant Discharge Elimination System permit and regulates discharges to or dredging of wetlands (33 U.S.C. § 1251 et seq.).

**Code of Federal Regulations (CFR)**—All federal regulations in effect are published in codified form in the CFR. References to the CFR usually take the form of XX CFR Part YY, where XX refers to Title (major division) and YY refers to Part (section).

**collective dose**—The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem.

**colluvium (colluvial)**—A loose deposit of rock debris accumulated at the base of a cliff or slope.

**committed dose equivalent**—The dose equivalent to organs or tissues that will be received by an individual during the 50-year period following the intake of radioactive material. It does not

include contributions from radiation sources external to the body. Committed dose equivalent is expressed in units of rem.

**committed effective dose equivalent**—The dose value obtained by—(1) multiplying the committed dose equivalents for the organs or tissues that are irradiated and the weighting factors applicable to those organs or tissues, and (2) summing all the resulting products. Committed effective dose equivalent is expressed in units of rem. (*See* committed dose equivalent and weighting factor.)

**community (biotic)**—All plants and animals occupying a specific area under relatively similar conditions.

**Compliance Order on Consent (Consent Order)**—Originally, an enforcement document signed by the New Mexico Environment Department (NMED), DOE, and the Regents of the University of California on March 1, 2005, which prescribed the requirements for corrective action at LANL. In June 2016, NMED and DOE entered into a new Consent Order (2016 Consent Order) that superseded the 2005 Consent Order. The Consent Order was modified again in August 2024. Changes from the 2005 Consent Order included removal of many of the detailed technical requirements and, instead, focused on the cleanup process itself. In addition, the fixed corrective action schedules contained in the 2005 Consent Order were replaced with an annual work prioritization and planning process with enforceable milestones to be met on a yearly basis. Requirements for investigation and cleanup as well as enforceable deadlines for achieving desired remediation end-states and for submitting documents such as investigation work plans, investigation reports, periodic monitoring reports, and corrective measures evaluation reports were broken down into a “campaign approach” to identify specific cleanup projects, facilitate project coordination, and promote focused attention on cleanup activities and attainable results.

**conformity**—Conformity is defined in the Clean Air Act as the action's compliance with an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards, and achieving expeditious attainment of such standards; and that such activities will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reduction, or other milestones in any area.

**contact-handled waste**—Radioactive waste or waste packages whose external dose rate is low enough to permit contact handling by humans during normal waste management activities, (such as waste with a surface dose rate not greater than 200 millirem per hour). (*See* remote-handled waste.)

**container**—With regard to radioactive wastes, the metal envelope in the waste package that provides the primary containment function of the waste package.

**contamination**—The deposition of undesirable radioactive material on the surfaces of structures, areas, objects, or personnel.

**criteria pollutants**—An air pollutant that is regulated by National Ambient Air Quality Standards. The U.S. Environmental Protection Agency must describe the characteristics and potential health and welfare effects that form the basis for setting, or revising, the standard for each regulated pollutant. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than or equal to 10 micrometers (0.0004 inch)

in diameter, and less than or equal to 2.5 micrometers (0.0001 inch) in diameter. New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available. (See National Ambient Air Quality Standards.)

**critical habitat**—Habitat essential to the conservation of an endangered or threatened species that has been designated as critical by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). The lists of Critical Habitats can be found in 50 CFR 17.95 (fish and wildlife), and 50 CFR 17.96 (plants). (See endangered species and threatened species.)

**critical mass**—The smallest mass of fissionable material that will support a self-sustaining nuclear chain reaction.

**criticality**—The condition in which a system is capable of sustaining a nuclear chain reaction.

**cultural resources**—Archaeological materials (artifacts) and sites that date to the pre-contact, historic, and ethnohistoric periods and that are currently located on the ground surface or buried beneath it; standing structures and/or their component parts that are over 50 years of age and are important because they represent a major historical theme or era, including the Manhattan Project and the Cold War era and structures that have an important technological, architectural, or local significance; cultural and natural places, select natural resources, and sacred objects that have importance for American Indians; American folklife traditions and arts; “historic properties” as defined in the National Historic Preservation Act; “archaeological resource” as defined in the Archaeological Resources Protection Act; and “cultural items” as defined in the Native American Graves Protection and Repatriation Act.

**cumulative impacts (effects)**—These are effects that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives.

**curie (Ci)**—A unit of radioactivity equal to 37 billion disintegrations per second; also a quantity of any radionuclide or mixture of radionuclides having 1 curie of radioactivity.

**deactivation**—The placement of a facility in a radiologically and industrially safe shutdown condition that is suitable for a long-term surveillance and maintenance phase prior to final decontamination and decommissioning.

**decay (radioactive)**—The decrease in the amount of any radioactive material with the passage of time due to spontaneous nuclear disintegration (the emission from atomic nuclei of charged particles, photons, or both).

**decibel (dB)**—A unit for expressing the relative intensity of sounds on a logarithmic scale where 0 is below human perception and 130 is above the threshold of pain to humans. For traffic and industrial noise measurements, the A-weighted decibel, a frequency-weighted noise unit, is widely used. The A-weighted decibel scale corresponds approximately to the frequency response of the human ear and thus correlates well with loudness.

**decibel, A-weighted (dBA)**—A unit of frequency-weighted sound pressure level, measured by the use of a metering characteristic and the “A” weighting specified by the American National

Standards Institute (ANSI S1.4-1983 [R1594]) that accounts for the frequency response of the human ear.

**decommissioning**—Retirement of a facility, including any necessary decontamination and dismantlement.

**decontamination**—The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination, from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

**decontamination, decommissioning, and demolition (DD&D)** – actions taken at the end of the useful life of a building or structure to reduce or remove substances that pose a substantial hazard to human health or the environment, retire it from service, and ultimately eliminate all or a portion of the structure.

**degrees C (degrees Celsius)**—A unit for measuring temperature using the centigrade scale in which the freezing point of water is 0 degrees and the boiling point is 100 degrees.

**degrees F (degrees Fahrenheit)**—A unit for measuring temperature using the Fahrenheit scale in which the freezing point of water is 32 degrees and the boiling point is 212 degrees.

**depleted uranium**—Uranium whose content of the fissile isotope uranium-235 is less than the 0.7 percent (by weight) found in natural uranium, so that it contains more uranium-238 than natural uranium. (*See* enriched uranium, highly enriched uranium, natural uranium, low enriched uranium, and uranium.)

**deposition**—In geology, the laying down of potential rock-forming materials; sedimentation. In atmospheric transport, the settling on ground and building surfaces of atmospheric aerosols and particles (“dry deposition”) or their removal from the air to the ground by precipitation (“wet deposition” or “rainout”).

**design basis**—For nuclear facilities, information that identifies the specific functions to be performed by a structure, system, or component, and the specific values (or ranges of values) chosen for controlling parameters for reference bounds for design. These values may be: (1) restraints derived from generally accepted state-of-the-art practices for achieving functional goals; (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals; or (3) requirements derived from federal safety objectives, principles, goals, or requirements.

**discharge**—In surface water hydrology, the amount of water issuing from a spring or in a stream that passes a specific point in a given period of time.

**disposition**—The ultimate “fate” or end use of a surplus U.S. Department of Energy facility following the transfer of the facility to the Office of the Assistant Secretary for Environmental Management.

**diversion**—The unauthorized removal of nuclear material from its approved use or authorized location.

**DOE Orders**—Requirements internal to the U.S. Department of Energy (DOE) that establish DOE policy and procedures, including those for compliance with applicable laws.

**dose (radiological)**—A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose, as defined elsewhere in this glossary. It is a measure of the energy imparted to matter by ionizing radiation. The unit of dose is the rem or rad.

**dose equivalent**—A measure of radiological dose that correlates with biological effect on a common scale for all types of ionizing radiation. Defined as a quantity equal to the absorbed dose in tissue multiplied by a quality factor (the biological effectiveness of a given type of radiation) and all other necessary modifying factors at the location of interest. The units of dose equivalent are rem.

**dose rate**—The radiation dose delivered per unit of time (such as rem per year).

**dosimeter**—A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (such as a film badge or ionization chamber).

**drinking water standards**—The level of constituents or characteristics in a drinking water supply specified in regulations under the *Safe Drinking Water Act* (now referred to as the *Safety of Public Water Systems*) as the maximum permissible.

**ecology**—A branch of science dealing with the interrelationships of living organisms with one another and with their nonliving environment.

**ecosystem**—A community of organisms and their physical environment interacting as an ecological unit.

**effective dose equivalent**—The dose value obtained by multiplying the dose equivalents received by specified tissues or organs of the body by the appropriate weighting factors applicable to the tissues or organs irradiated, and then summing all of the resulting products. It includes the dose from radiation sources internal and external to the body. The effective dose equivalent is expressed in units of rem. (*See* committed dose equivalent and committed effective dose equivalent.)

**effluent**—A waste stream flowing into the atmosphere, surface water, groundwater, or soil. Most frequently the term applies to wastes discharged to surface waters.

**electron**—An elementary particle with a mass of  $9.107 \times 10^{-28}$  gram (or 1/1,837 of a proton) and a negative charge. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.

**emission**—A material discharged into the atmosphere from a source operation or activity.

**emission standards**—Legally enforceable limits on the quantities and/or kinds of air contaminants that can be emitted into the atmosphere.

**endangered species**—Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). The lists of endangered species can be found in 50 CFR 17.11 for wildlife and 50 CFR 17.12 for plants. (*See* threatened species.)

**enriched uranium**—Uranium whose content of the fissile isotope uranium-235 is greater than the 0.7 percent (by weight) found in natural uranium. (*See* depleted uranium, uranium, natural uranium, low-enriched uranium, and highly enriched uranium.)

**Environment, Safety, and Health Program**—In the context of the U.S. Department of Energy (DOE), encompasses those requirements, activities, and functions in the conduct of all DOE/NNSA and DOE/NNSA-controlled operations that are concerned with impacts to the biosphere; compliance with environmental laws, regulations, and standards controlling air, water, and soil pollution; limiting the risks to the well-being of both operating personnel and the general public; and protecting property against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, process and facility safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

**environmental impact statement (EIS)**—The detailed written statement required by the National Environmental Policy Act (NEPA) section 102(2)(C) for a proposed major federal action significantly affecting the quality of the human environment. The statement includes, among other information, discussions of the environmental impacts of the Proposed Action and a range of reasonable alternatives, adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources.

**ephemeral water course**—A water course (or stream) that flows only after a period of heavy precipitation.

**epidemiology**—Study of the occurrence, causes, and distribution of disease or other health-related states and events in human populations, often as related to age, sex, occupation, ethnicity, and economic status, to identify and alleviate health problems and promote better health.

**excavation**—A cavity in the earth’s surface formed by cutting, digging, or scooping by hand or with the use of heavy construction equipment for the purpose of removing soil, rock, minerals, or artifacts. With regard to archaeological excavation, the careful exposure, documentation, and collection of buried material remains related to past human activities.

**exposure limit**—The level of exposure to a hazardous chemical (set by law or a standard) at which or below which adverse human health effects are not expected to occur.

**fault**—A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred.

**fissile materials**—An isotope that readily fissions after absorbing a neutron of any energy, either fast or slow. Fissile materials are uranium-235, uranium-233, plutonium-239, and plutonium-241. Uranium-235 is the only naturally occurring fissile isotope. Although sometimes used as a synonym for fissionable material, this term has acquired a more restricted meaning, namely, any material fissionable by thermal (slow) neutrons.

**fission**—The splitting of the nucleus of a heavy atom into two lighter nuclei. It is accompanied by the release of neutrons, gamma rays, and kinetic energy of fission products.

**fission products**—Nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments’ radioactive decay.

**floodplain**—The lowlands and relatively flat areas that include, at a minimum, that area with at least a 1.0 percent chance of being inundated by a flood in any given year.

The *base floodplain* is defined as the area that has a 1.0 percent or greater chance of being flooded in any given year. Such a flood is known as a 100-year flood.

The *critical action floodplain* is defined as the area that has at least a 0.2 percent chance of being flooded in any given year. Such a flood is known as a 500-year flood. Any activity for which even a slight chance of flooding would be too great (such as storage of highly volatile, toxic, or water-reactive materials) should not occur in the critical action floodplain.

The *probable maximum flood* is the hypothetical flood considered to be the most severe reasonably possible flood, based on the comprehensive hydrometeorological application of maximum precipitation and other hydrological factors favorable for maximum flood runoff (such as sequential storms and snowmelts). It is usually several times larger than the maximum recorded flood.

**formation**—In geology, the primary unit of formal stratigraphic mapping or description. Most formations possess certain distinctive features.

**fugitive emissions**—(1) Emissions that do not pass through a stack, vent, chimney, or similar opening where they could be captured by a control device, or (2) any air pollutant emitted to the atmosphere other than from a stack. Sources of fugitive emissions include pumps; valves; flanges; seals; area sources such as ponds, lagoons, landfills, piles of stored material (such as coal); and road construction areas or other areas where earthwork is occurring.

**gamma radiation**—High-energy, short wavelength, electromagnetic radiation emitted from the nucleus of an atom during radioactive decay. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or depleted uranium. Gamma rays are similar to, but are usually more energetic than, x-rays.

**genetic effects**—Inheritable changes (chiefly mutations) produced by exposure to ionizing radiation or other chemical or physical agents of the parts of cells that control biological reproduction and inheritance.

**geology**—The science that deals with Earth—the materials, processes, environments, and history of the planet, including rocks and their formation and structure.

**glovebox**—Large enclosure that separates workers from equipment used to process hazardous material, while allowing the workers to be in physical contact with the equipment; normally constructed of stainless steel, with large acrylic/lead glass windows. Workers have access to equipment through the use of heavy-duty, lead-impregnated rubber gloves, the cuffs of which are sealed in portholes in the glovebox windows.

**grading**—Any stripping, cutting, filling, stockpiling, or combination thereof that modifies the land surface.

**groundwater**—Water below the ground surface in a zone of saturation.

**habitat**—The environment occupied by individuals of a particular species, population, or community.

**half-life**—The time in which one-half of the atoms of a particular radioactive isotope disintegrate to another nuclear form. Half-lives vary from millionths of a second to billions of years.

**Hazard Category 1**—Per DOE-STD-1027, DOE nuclear facility with the potential for significant offsite consequences. An example would be a nuclear reactor, 20 megawatt or greater in size.

**Hazard Category 2**—Per DOE-STD-1027, DOE nuclear facility with the potential for significant onsite consequences beyond localized consequences. An example would be a facility with sufficient hazardous material and energy that an unmitigated release would require an emergency plan for onsite evacuation. Examples include nuclear R&D and nuclear material processing.

**Hazard Category 3**—Per DOE-STD-1027, DOE nuclear facility with the potential for only local consequences. Examples include lab operations, low-level waste handling facilities, or research machines with inventories of nuclear materials above HC-3 threshold quantities, but less than HC-2 threshold quantities.

**hazardous air pollutants**—Air pollutants not covered by ambient air quality standards but which may present a threat of adverse human health effects or adverse environmental effects. Those specifically listed in 40 CFR 61.01 are asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. More broadly, hazardous air pollutants are any of the 189 pollutants listed in or pursuant to the Clean Air Act, 42 U.S.C. § 7412(b). Very generally, hazardous air pollutants are any air pollutants that may realistically be expected to pose a threat to human health or welfare.

**hazardous chemical**—Under 29 CFR Part 1910 Subpart Z, hazardous chemicals are defined as “any chemical which is a physical hazard or a health hazard.” Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

**hazardous material**—A material, including a hazardous substance, as defined by 49 CFR 171.8, that poses a risk to health, safety, and property when transported or handled.

**hazardous waste**—A category of waste regulated under the *Resource Conservation and Recovery Act* (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20–24 (ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.31–33.

**hazards classification**—The process of identifying the potential threat to human health of mechanical energy, electrical energy, and radioactive materials.

**high-efficiency particulate air (HEPA) filter**—An air filter capable of removing at least 99.97 percent of particles 0.3 micrometers (about 0.00001 inches) in diameter. High-efficiency particulate air filters include a pleated fibrous medium (typically fiberglass) capable of capturing very small particles.

**high-level radioactive waste**—High level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation.

**highly enriched uranium**—Uranium whose content of the fissile isotope uranium-235 has been increased through enrichment to 20 percent or more (by weight). (*See* uranium, natural uranium, enriched uranium, highly enriched uranium, and depleted uranium.)

**historic artifact scatter/trash scatter**—A concentration of items, including Euro-American artifacts, produced and deposited after AD 1600 and at least 50 years old.

**historic resources**—Archaeological sites, architectural structures, and objects produced after the advent of written history, dating to the time of the first European-American contact in an area.

**historic structure**—A building or other structure constructed after AD 1593.

**Holocene**—An epoch of the Quaternary period that began at the end of the Pleistocene, or the “Ice Age,” about 10,000 years ago and continuing to the present.

**hydrology**—The science dealing with the properties, distribution, and circulation of natural water systems.

**Idaho National Laboratory (INL)**—A DOE laboratory complex located in southeast Idaho about 25 miles west of Idaho Falls, managed and operated by a private consortium under contract to DOE.

**incident-free risk**—The radiological or chemical impacts resulting from emissions during normal operations and packages aboard vehicles in normal transport. This includes the radiation or hazardous chemical exposure of specific population groups and workers.

**injection wells**—A well that takes water from the surface into the ground, either through gravity or by mechanical means.

**ionizing radiation**—Alpha particles, beta particles, gamma rays, high-speed electrons, high-speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions.

**irradiated**—Exposure to ionizing radiation. The condition of reactor fuel elements and other materials in which atoms bombarded with nuclear particles have undergone nuclear changes.

**isotope**—Any of two or more variations of an element in which the nuclei have the same number of protons (and thus the same atomic number), but different numbers of neutrons so that their atomic masses differ. Isotopes of a single element possess almost identical chemical properties, but often different physical properties (for example, carbon-12 and -13 are stable; carbon-14 is radioactive).

**joule**—A metric unit of energy, work, or heat, equivalent to one watt-second, 0.737 foot-pound, or 0.239 calories.

**landscape character**—The arrangement of a particular landscape as formed by the variety and intensity of the landscape features (land, water, vegetation, and structures) and the four basic elements (form, line, color, and texture). These factors give an area a distinctive quality that distinguishes it from its immediate surroundings.

**latent cancer fatality (LCF)**—A death from cancer that was caused by an earlier exposure, such as to radiation, after a period during which the cancer was undetectable. This “latent period” can be years or decades, and the risk from exposure is often too small to be statistically detected above

the normal rate of cancer in a population. This is different from “early” or “acute” fatalities that can result from high doses of radiation.

**lithic scatter**—Cluster of chipped-stone tools, groundstone tools, and/or pieces of chipped stone produced during the manufacturing of chipped-stone tools.

**loam**—Soil material that is composed of 7 percent to 27 percent clay particles, 28 percent to 50 percent silt particles, and less than 52 percent sand particles.

**long-lived radionuclides**—Radioactive isotopes with half-lives greater than 30 years.

**long-term impact**—In general, an impact that endures beyond the timeframe of the action or activity that causes the impact.

**low-level radioactive waste**—Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or byproduct material as defined by the *Atomic Energy Act of 1954*, as amended, found at 42 U.S.C. § 2014(e). Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level radioactive waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram.

**material access area**—A type of security area that is authorized to contain a security Category I quantity of special nuclear material and which has specifically defined physical barriers, is located within a Protected Area, and is subject to specific access controls.

**material characterization**—The measurement of basic material properties, and the change in those properties as a function of temperature, pressure, or other factors.

**material control and accountability**—The part of safeguards that detects or deters theft or diversion of nuclear materials and provides assurance that all nuclear materials are accounted for appropriately.

**material disposal area (MDA)**—An area used any time between the beginning of Los Alamos National Laboratory operations in the early 1940s and the present for disposing of chemically, radioactively, or chemically and radioactively contaminated materials, pre-dating waste regulations or in compliance with current waste regulations.

**maximally exposed individual (MEI)**—A hypothetical individual whose location and habits result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposure routes (inhalation, ingestion, direct exposure).

**maximally exposed individual (transportation analysis)**—A hypothetical individual receiving radiation doses from transporting radioactive materials on the road. For the incident-free transport operation, the maximally exposed individual would be an individual stuck in traffic next to the shipment for 30 minutes. For accident conditions, the maximally exposed individual is assumed to be an individual located approximately 33 meters (100 feet) directly downwind from the accident.

**maximum contaminant level (MCL)**—The designation for U.S. Environmental Protection Agency standards for drinking water quality under the *Safe Drinking Water Act* (42 U.S.C. § 300f et seq.; now referred to as the *Safety of Public Water Systems*). The MCL for a given substance is the maximum permissible concentration of that substance in water delivered by a public water system. The primary MCLs (40 CFR Part 141) are intended to protect public health and are federally enforceable. They are based on health factors but are also required by law to reflect the

technological and economic feasibility of removing the contaminant from the water supply. Secondary MCLs (40 CFR Part 143) are set by the U.S. Environmental Protection Agency to protect the public welfare. The secondary drinking water regulations control substances in drinking water that primarily affect aesthetic qualities (such as taste, odor, and color) relating to the public acceptance of water. These regulations are not federally enforceable, but are intended as guidelines for the states.

**Megawatt (MW)**—A unit of power equal to 1 million watts. Megawatt thermal is commonly used to define heat produced, while megawatt-electric defines electricity produced.

**MeV (mega-electron volts)**—A unit used to quantify energy. In this PEIS, it describes a particle’s kinetic energy, which is an indicator of particle speed.

**micron**—One-millionth of 1 meter.

**migration**—The natural movement of a material through the air, soil, or groundwater; also, seasonal movement of animals from one area to another.

**Migratory Bird Treaty Act**—This Act, found at 16 U.S.C. § 703(a), states that it is “unlawful at any time, by any means and in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, kill. . . any migratory bird, any part, nest, or egg of any such bird” other than permitted activities.

**millirem**—One-thousandth of 1 rem.

**mitigation**—Mitigation includes: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

**mixed waste**—Waste that contains both nonradioactive hazardous waste and radioactive waste, as defined in this glossary.

**National Ambient Air Quality Standards**—Standards defining the highest allowable levels of certain pollutants in the ambient air (the outdoor air to which the public has access). Because the EPA must establish the criteria for setting these standards, the regulated pollutants are called *criteria* pollutants. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter (less than or equal to 10 micrometers [0.0004 inches] in diameter and less than or equal to 2.5 micrometers [0.0001 inches] in diameter). Primary standards are established to protect public health; secondary standards are established to protect public welfare (such as visibility, crops, animals, buildings). (*See* criteria pollutant.)

**National Emission Standards for Hazardous Air Pollutants (NESHAP)**—Emissions standards set by the EPA for air pollutants which are not covered by National Ambient Air Quality Standards and which may, at sufficiently high levels, cause increased fatalities, irreversible health effects, or incapacitating illness. These standards are given in 40 CFR Parts 61 and 63. NESHAPs are given for many specific categories of sources (such as equipment leaks, industrial process cooling towers, dry cleaning facilities, petroleum refineries). (*See* hazardous air pollutants.)

**National Environmental Policy Act (NEPA)**—This Act, found at 42 U.S.C. § 4321 et seq., is the basic statute for protection of the environment. It establishes policy, sets goals, and provides

the means for carrying out policy. 42 U.S.C. § 4332 contains “action-forcing” provisions to ensure that federal agencies follow the letter and spirit of the Act. For major federal actions significantly affecting the quality of the human environment, 42 U.S.C. § 4332(C) requires federal agencies to prepare a detailed statement that includes the environmental impacts of the Proposed Action and other specified information.

**National Historic Preservation Act (NHPA)**—This Act provides cultural resources with significant national, state, or local historic value be evaluated for listing on the National Register of Historic Places. It does not require any permits; however, if a federal action might affect a historic property, it mandates consultation with the proper agencies and interested parties to determine the effect and develop measures to avoid, minimize, or mitigate adverse effects (54 U.S.C. § 300101 et seq. and 36 CFR 800.1).

**National Pollutant Discharge Elimination System (NPDES)**—A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the U.S. unless a special permit is issued by the U.S. Environmental Protection Agency, a state, or, where delegated, a tribal government on an Indian reservation. The National Pollutant Discharge Elimination System permit lists either permissible discharges, the level of cleanup technology required for wastewater, or both.

**National Register of Historic Places (NRHP)**—The official list of the Nation’s cultural resources that are worthy of preservation. The National Park Service maintains the list under direction of the Secretary of the Interior. Buildings, structures, objects, sites, and districts are included in the NRHP for their importance in American history, architecture, archaeology, culture, or engineering. The listed properties can be significant at the federal, state, or local level. Procedures for listing properties on the NRHP are found in 36 CFR Part 60.

**natural phenomena accidents**—Accidents that are initiated by phenomena such as earthquakes, tornadoes, floods, etc.

**natural uranium**—Uranium with the naturally occurring distribution of uranium isotopes (approximately 0.7-weight percent uranium-235, and the remainder essentially uranium-238). (*See* uranium, depleted uranium, enriched uranium, highly enriched uranium, and low-enriched uranium.)

**neutron**—An uncharged elementary particle with a mass slightly greater than that of the proton. Neutrons are found in the nucleus of every atom heavier than hydrogen-1.

**nitrogen**—A natural element with the atomic number 7. It is diatomic in nature and is a colorless and odorless gas that constitutes about four-fifths of the volume of the atmosphere.

**nitrogen oxides**—Oxides of nitrogen, primarily nitrogen oxide and nitrogen dioxide. These are produced in the combustion of fossil fuels and can constitute an air pollution problem. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone.

**noise**—Undesirable sound that interferes or interacts negatively with the human or natural environment. Noise may disrupt normal activities (hearing, sleep), damage hearing, or diminish the quality of the environment.

**noise pollution**—Any sound that is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying or undesirable.

**nonattainment area**—An area that the EPA has designated as not meeting (not being in attainment of) one or more of the National Ambient Air Quality Standards for sulfur dioxide,

nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants, but not for others. (See attainment area, National Ambient Air Quality Standards, and particulate matter.)

**nonproliferation**—Preventing the spread of nuclear weapons, nuclear weapon materials, and nuclear weapon technology.

**normal operations**—All normal (incident-free) conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

**Notice of Availability (NOA)**—Public announcement that an EIS has been prepared and published by an agency (either in draft or final form). It describes the Proposed Action, possible alternatives, and the process for submitting comments (for a Draft EIS), including whether, when, and where any hearings will be held (for a Draft EIS). Any comment period on the Draft EIS officially begins with publication of the EPA NOA for the Draft EIS.

**Notice of Intent (NOI)**—Public announcement that an environmental impact statement will be prepared and considered. It describes the Proposed Action, possible alternatives, and scoping process, including whether, when, and where any scoping meetings will be held. The scoping process includes holding at least one public meeting and requesting written comments on issues and environmental concerns that an environmental impact statement should address.

**nuclear criticality**—See criticality.

**nuclear explosive**—Any assembly containing fissionable and/or fusionable materials and main-charge high-explosive parts or propellants capable of producing a nuclear detonation.

**nuclear facility**—A facility that is subject to requirements intended to control potential nuclear hazards. Defined in U.S. Department of Energy directives as any nuclear reactor or any other facility whose operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists to the workers or the general public.

**nuclear material**—Composite term applied to—(1) special nuclear material; (2) source material such as uranium or thorium or ores containing uranium or thorium; and (3) byproduct material, which is any radioactive material that is made radioactive by exposure to the radiation incident to the process of producing or using special nuclear material.

**Nuclear Regulatory Commission (NRC)**—The federal agency that regulates the civilian nuclear power industry in the U.S.

**nuclear weapon**—The general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, either fission, fusion, or both.

**nuclear weapons complex**—The sites supporting the research, development, design, manufacture, testing, assessment, certification, and maintenance of the Nation's nuclear weapons and the subsequent dismantlement of retired weapons.

**nuclide**—A species of atom characterized by the constitution of its nucleus and hence by the number of protons, the number of neutrons, and the energy content.

**Oak Ridge National Laboratory (ORNL)**—A DOE laboratory complex located in eastern Tennessee about 25 miles west of Knoxville, managed and operated by a private consortium under contract to DOE.

**Occupational Safety and Health Administration (OSHA)**—The federal agency that oversees and regulates workplace health and safety; created by the Occupational Safety and Health Act of 1970.

**offsite**—The term denotes a location, facility, or activity occurring outside the site boundary.

**onsite**—The term denotes a location or activity occurring within the boundary of a DOE/NNSA complex site.

**outfall**—The discharge point of a drain, sewer, or pipe as it empties into the environment.

**ozone**—The triatomic form of oxygen; in the stratosphere, ozone protects Earth from the sun’s ultraviolet rays, but in lower levels of the atmosphere, ozone is considered an air pollutant.

**package**—For radioactive materials, the packaging, together with its radioactive contents, as presented for transport (the packaging plus the radioactive contents equals the package).

**packaging**—With regard to hazardous or radionuclide materials, the assembly of components necessary to ensure compliance with federal regulations. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle tie-down system and auxiliary equipment may be designated as part of the packaging.

**paleontological resources**—The physical remains, impressions, or traces of plants or animals from a former geologic age; may be sources of information on ancient environments and the evolutionary development of plants and animals.

**particulate matter (PM)**—Any finely divided solid or liquid material, other than uncombined (pure) water. A subscript denotes the upper limit of the diameter of particles included. Thus, PM<sub>10</sub> includes only those particles equal to or less than 10 micrometers (0.0004 inches) in diameter; PM<sub>2.5</sub> includes only those particles equal to or less than 2.5 micrometers (0.0001 inches) in diameter.

**perennial stream**—A stream that flows throughout the year.

**permeability**—In geology, the ability of rock or soil to transmit a fluid.

**person-rem**—A unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in a specified population or group. (See collective dose.)

**Perimeter Intrusion Detection and Assessment System (PIDAS)**—A mutually supporting combination of barriers, clear zones, lighting, and electronic intrusion detection, assessment, and access control systems constituting the perimeter of the Protected Area and designed to detect, impede, control, or deny access to the Protected Area.

**pit**—The central core of a primary assembly in a nuclear weapon typically composed of plutonium-239 and/or highly enriched uranium and other materials.

**Pleistocene**—The geologic time period of the earliest epoch of the Quaternary period, spanning between about 1.6 million years ago and the beginning of the Holocene epoch at 10,000 years ago. It is characterized by the succession of northern glaciations and also called the “Ice Age.”

**plume**—The elongated volume of contaminated water or air originating at a pollutant source such as an outlet pipe or a smokestack. A plume eventually diffuses into a larger volume of less contaminated material as it is transported away from the source.

**plutonium**—A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years.

**plutonium-238**—An isotope with a half-life of 87.74 years used as the heat source for radioisotope power systems. When plutonium-238 undergoes radioactive decay, it emits alpha particles and gamma rays. Plutonium-238 may fission if exposed to neutrons. The likelihood of plutonium-238 undergoing fission is dependent upon many factors including the number and energy of neutrons, temperature, plutonium-238 purity and shape, and the presence and proximity of other elements.

**plutonium-239**—An isotope with a half-life of 24,110 years that is the primary radionuclide in weapons-grade plutonium. When plutonium-239 decays, it emits alpha particles. Plutonium-239 may fission if exposed to neutrons. The likelihood of plutonium-239 undergoing fission is dependent upon many factors including the number and energy of neutrons, temperature, plutonium-239 purity and shape, and the presence and proximity of other elements.

**plutonium coupon**—A small sample of plutonium metal prepared for R&D, testing, and certification activities.

**population dose**—*See* collective dose.

**pounds per square inch**—A measure of pressure; atmospheric pressure is about 14.7 pounds per square inch.

**Prevention of Significant Deterioration**—Regulations established to prevent significant deterioration of air quality in areas that already meet National Ambient Air Quality Standards. Specific details of Prevention of Significant Deterioration are found in 40 CFR 51.166. Among other provisions, cumulative increases in sulfur dioxide, nitrogen dioxide, and PM<sub>10</sub> levels after specified baseline dates must not exceed specified maximum allowable amounts. These allowable increases, also known as increments, are especially stringent in areas designated as Class I areas (such as national parks, wilderness areas) where the preservation of clean air is particularly important. All areas not designated as Class I are currently designated as Class II. Maximum increments in pollutant levels are also given in 40 CFR 51.166 for Class III areas, if any such areas should be so designated by EPA. Class III increments are less stringent than those for Class I or Class II areas. (*See* National Ambient Air Quality Standards.)

**prime farmland**—Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oil-seed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, without intolerable soil erosion, as determined by the Secretary of Agriculture (Farmland Protection Act of 1981, 7 CFR Part 7, paragraph 658).

**probabilistic risk assessment**—A comprehensive, logical, and structured methodology that accounts for population dynamics and human activity patterns at various levels of sophistication, considering time-space distributions and sensitive subpopulations. The probabilistic method results in a more complete characterization of the exposure information available, which is defined by probability distribution functions. This approach offers the possibility of an associated quantitative measure of the uncertainty around the value of interest.

**Protected Area**—A type of security area defined by physical barriers (walls or fences), to which access is controlled, used for protection of security Category II special nuclear materials and classified matter and/or to provide a concentric security zone surrounding a Material Access Area (security Category I nuclear materials) or a Vital Area.

**proton**—An elementary nuclear particle with a positive charge equal in magnitude to the negative charge of the electron; it is a constituent of all atomic nuclei, and the atomic number of an element indicates the number of protons in the nucleus of each atom of that element.

**Quaternary**—The third and last of the three periods of the Cenozoic Era, which began 2.58 million years ago. The Quaternary Period is divided into two epochs: the Holocene (earlier) and Pleistocene (later). A thin layer of sediments deposited during the Quaternary covers much of Earth's land surface. The Quaternary Period is famous for the many cycles of glacial growth and retreat, the extinction of many species of large mammals and birds, and the spread of humans.

**rad**—*See* radiation absorbed dose.

**radiation (ionizing)**—*See* ionizing radiation.

**radiation absorbed dose (rad)**—The basic unit of absorbed dose equal to the absorption of 0.01 joules per kilogram (100 ergs per gram) of absorbing material.

**radioactive waste**—In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or byproduct material is subject to regulation as radioactive waste under the Atomic Energy Act. Also, waste material that contains accelerator-produced radioactive material or a high concentration of naturally occurring radioactive material may be considered radioactive waste.

**radioactivity**—

Defined as a *process*: The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation.

Defined as a *property*: The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

**radioisotope or radionuclide**—An unstable isotope that undergoes spontaneous transformation, emitting radiation. (*See* isotope.)

**radon**—A gaseous, radioactive element with the atomic number 86, resulting from the radioactive decay of radium. Radon occurs naturally in the environment and can collect in unventilated enclosed areas, such as basements. Large concentrations of radon can cause lung cancer in humans.

**RADTRAN**—A computer code combining user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences and accident risk of transporting radioactive material.

**Record of Decision (ROD)**—A document prepared in accordance with the requirements of the DOE NEPA Implementing Procedures that provides a concise public record of the DOE decision on a Proposed Action for which an environmental impact statement was prepared. A ROD identifies the alternatives considered in reaching the decision; factors balanced by DOE in making the decision; and whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, the reason why they were not.

**reference dose**—The chronic-exposure dose (milligram or kilogram per day) for a given hazardous chemical at which or below which adverse human noncancer health effects are not expected to occur.

**region of influence (ROI)**—A site-specific geographic area in which the principal direct and indirect effects of actions are likely to occur.

**rem (roentgen equivalent man)**—A unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rad in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Derived from “roentgen equivalent man,” referring to the dosage of ionizing radiation that will cause the same biological effect as one roentgen of x-ray or gamma-ray exposure. (*See* absorbed dose and dose equivalent.)

**remediation**—The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

**remote-handled waste**—In general, refers to radioactive waste that must be handled at a distance to protect workers from unnecessary exposure (waste with a dose rate of 200 millirem per hour or more at the surface of the waste package). (*See* contact-handled waste.)

**Resource Conservation and Recovery Act (RCRA), as amended**—A law that gives the U.S. Environmental Protection Agency the authority to control hazardous waste from “cradle to grave” (from the point of generation to the point of ultimate disposal), including its minimization, generation, transportation, treatment, storage, and disposal. The Resource Conservation and Recovery Act also sets forth a framework for the management of nonhazardous solid wastes. (*See* hazardous waste.)

**riparian**—Of, on, or relating to the banks of a natural course of water.

**risk**—The probability of a detrimental effect of exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (in other words, the product of these two factors). However, separate presentation of probability and consequence is often more informative.

**risk assessment (chemical or radiological)**—The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

**roentgen**—A unit of exposure to ionizing x- or gamma radiation equal to or producing one electrostatic unit of charge per cubic centimeter of air.

**runoff**—The portion of rainfall, melted snow, or irrigation water that flows across the ground surface, and eventually enters streams.

**Safe Drinking Water Act**—This Act (42 U.S.C. § 300f et seq.; now referred to as the *Safety of Public Water Systems*) protects the quality of public water supplies, water supply and distribution systems, and all sources of drinking water.

**safeguards**—An integrated system of physical protection, material accounting, and material control measures designed to deter, prevent, detect, and respond to unauthorized access, possession, use, or sabotage of nuclear materials.

**Safety Analysis Report**—A report that systematically identifies potential hazards within a nuclear facility, describes and analyzes the adequacy of measures to eliminate or control identified hazards,

and analyzes potential accidents and their associated risks. Safety analysis reports are used to ensure that a nuclear facility can be constructed, operated, maintained, shut down, and decommissioned safely and in compliance with applicable laws and regulations. Safety analysis reports are required for U.S. Department of Energy nuclear facilities and as a part of applications for U.S. Nuclear Regulatory Commission licenses. The U.S. Nuclear Regulatory Commission regulations or DOE Orders and technical standards that apply to the facility type provide specific requirements for the content of safety analysis reports. (*See nuclear facility.*)

**sand**—Loose grains of rock or mineral sediment formed by weathering that range in size from 0.0625 to 2.0 millimeters (0.0025 to 0.08 inches) in diameter and often consists of quartz particles.

**sandstone**—A sedimentary rock composed mostly of sand-size particles cemented usually by calcite, silica, or iron oxide.

**sanitary waste**—Wastes generated by normal housekeeping activities, liquid or solid (includes sludge), that are not hazardous or radioactive.

**Savannah River Site (SRS)**—A DOE industrial complex located in southwestern South Carolina about 20 miles southeast of Augusta, Georgia, managed and operated by a private consortium under contract to DOE.

**scope**—In a document prepared pursuant to the National Environmental Policy Act, the range of actions, alternatives, and impacts to be considered.

**scoping**—An early and open process, including public notice and involvement, for determining the scope of issues to be addressed in an EIS and for identifying the significant issues related to a Proposed Action. The scoping period begins after publication in the *Federal Register* of a Notice of Intent to prepare an EIS. The public scoping process is that portion of the process where the public is invited to participate. The U.S. Department of Energy’s scoping procedures are found in the DOE NEPA Implementing Procedures.

**security**—An integrated system of activities, systems, programs, facilities, and policies for the protection of Restricted Data and other classified information or matter, nuclear materials, nuclear weapons and nuclear weapons components, and/or U.S. Department of Energy or contractor facilities, property, and equipment.

**sediment**—Soil, sand, and minerals washed from land into water that deposit on the bottom of a water body.

**seismic**—Pertaining to any earth vibration, especially an earthquake.

**seismicity**—The frequency and distribution of earthquakes.

**shielding**—With regard to radiation, any material of obstruction (bulkheads, walls, or other construction) that absorbs radiation to protect personnel or equipment.

**short-lived nuclides**—Radioactive isotopes with half-lives no greater than about 30 years (such as cesium-137 and strontium-90).

**short-term impact**—In general, an impact that occurs during or for a short time after the action or activity that causes the impact.

**silt**—A sedimentary material consisting of fine mineral particles, intermediate in size between sand and clay. In general, soils categorized as silt show greater rates of erosion than soils categorized as sand.

**soils**—All unconsolidated materials above bedrock. Natural earthy materials on the earth’s surface, in places modified or even made by human activity, containing living matter, and supporting or capable of supporting plants out of doors.

**source material**—Depleted uranium, normal uranium, thorium, or any other nuclear material determined, pursuant to Section 61 of the Atomic Energy Act of 1954, as amended, to be source material, or ores containing one or more of the foregoing materials in such concentration as may be determined by regulation.

**source term**—The amount of a specific pollutant (chemicals, radionuclides) emitted or discharged to a particular environmental medium (air, water, earth) from a source or group of sources. It is usually expressed as a rate (amount per unit time).

**special nuclear material(s)**—A category of material subject to regulation under the Atomic Energy Act, consisting primarily of fissile materials. It is defined to mean plutonium, uranium-233, uranium enriched in the isotopes of uranium-233 or -235, and any other material that the NRC determines to be special nuclear material, but it does not include source material.

**stockpile**—The inventory of active nuclear weapons for the strategic defense of the U.S.

**stockpile stewardship program**—A program that ensures the operational readiness (safety and reliability) of the U.S. nuclear weapons stockpile by the appropriate balance of surveillance, experiments, and simulations.

**sulfur oxides**—Common air pollutants (primarily sulfur dioxide), a heavy, pungent, colorless gas (formed in the combustion of fossil fuels, considered a major air pollutant) and sulfur trioxide. Sulfur dioxide is involved in the formation of acid rain. It can also irritate the upper respiratory tract and cause lung damage.

**surface water**—All bodies of water on the surface of Earth and open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

**target**—A tube, rod, or other form containing material that, on being irradiated in a nuclear reactor or an accelerator, would produce a desired end product.

**technical area (TA)**—Geographically distinct administrative units established for the control of LANL operations. There are currently 50 active TAs; 47 in the 40 square miles of the LANL site, one at Fenton Hill, west of the main site, one comprising leased properties in town, and one comprising leased properties in Santa Fe, NM.

**tectonic**—Of or relating to motion in Earth’s crust and occurring on geologic faults.

**Tertiary**—The first geologic time period of the Cenozoic era (after the Mesozoic era and before the Quaternary period), spanning between about 66 million and 1.6 million years ago. During this period, mammals became the dominant life form on Earth.

**threatened species**—Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service

following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR Part 424). (*See* endangered species.)

**total effective dose equivalent**—The sum of the effective dose equivalent from external exposures and the committed effective dose equivalent from internal exposures.

**Toxic Substances Control Act of 1976 (TSCA)**—This Act authorizes the U.S. Environmental Protection Agency (EPA) to secure information on all new and existing chemical substances and to control any substances determined to cause an unreasonable risk to public health or the environment. This law requires that the health and environmental effects of all new chemicals be reviewed by the EPA before they are manufactured for commercial purposes.

**transuranic**—Refers to any element whose atomic number is higher than that of uranium (atomic number 92), including neptunium, plutonium, americium, and curium. All transuranic elements are produced artificially and are radioactive.

**transuranic waste**—Radioactive waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for: (1) HLW; (2) waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the EPA, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations; or (3) waste that the NRC has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61 (DOE Order 435.1).

**tuff**—A fine-grained rock composed of ash or other material formed by volcanic explosion or aerial expulsion from a volcanic vent.

**Type B packaging**—A regulatory category of packaging for transportation of radioactive material. The U.S. Department of Transportation and U.S. Nuclear Regulatory Commission require Type B packaging for shipping highly radioactive material. Type B packages must be designed and demonstrated to retain their containment and shielding integrity under severe accident conditions, as well as under the normal conditions of transport. The current U.S. Nuclear Regulatory Commission testing criteria for Type B package designs (10 CFR Part 71) are intended to simulate severe accident conditions, including impact, puncture, fire, and immersion in water. The most widely recognized Type B packages are the massive casks used for transporting spent nuclear fuel. Large-capacity cranes and mechanical lifting equipment are usually needed to handle Type B packages.

**Type B shipping cask**—A U.S. Nuclear Regulatory Commission-certified cask with a protective covering that contains and shields radioactive materials, dissipates heat, prevents damage to the contents, and prevents criticality during normal shipment and accident conditions. It is used for transport of highly radioactive materials and is tested under severe, hypothetical accident conditions that demonstrate resistance to impact, puncture, fire, and submersion in water.

**uranium**—A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. Uranium has 14 known isotopes, of which uranium-238 is the most abundant in nature. Uranium-235 is commonly used as a fuel for nuclear fission. (*See* natural uranium, enriched uranium, highly enriched uranium, and depleted uranium.)

**vadose zone**—The portion of Earth between the land surface and the water table.

**vault (special nuclear material)**—A penetration-resistant, windowless enclosure having an intrusion alarm system activated by opening the door and which also has—walls, floor, and ceiling

substantially constructed of materials that afford forced-penetration resistance at least equivalent to that of 20-centimeter- (8-inch-) thick reinforced concrete; and a built-in combination-locked steel door, which for existing structures is at least 2.54-centimeters (1-inch) thick exclusive of bolt work and locking devices, and which for new structures meets standards set forth in federal specifications and standards.

**viewshed**—The extent of an area that may be viewed from a particular location. Viewsheds are generally bounded by topographic features such as hills or mountains.

**volatile organic compounds**—A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol. With regard to air pollution, any organic compound that participates in atmospheric photochemical reaction, except for those designated by the EPA Administrator as having negligible photochemical reactivity.

**waste acceptance criteria**—The requirements specifying the characteristics of waste and waste packaging acceptable to a disposal facility, and the documents and processes the generator needs to certify that the waste meets applicable requirements.

**waste classification**—Wastes are classified according to DOE Order 435.1, Radioactive Waste Management, and include high-level, transuranic, and low-level wastes.

**Waste Isolation Pilot Plant (WIPP)**—A U.S. Department of Energy facility designed and authorized to permanently dispose of defense-related transuranic waste in a mined underground facility in deep geologic salt beds. It is located in southeastern New Mexico, 26 miles east of the city of Carlsbad.

**waste management**—The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

**waste minimization and pollution prevention**—An action that economically avoids or reduces the generation of waste and pollution by source reduction, reducing the toxicity of hazardous waste and pollution, improving energy use, or recycling. These actions will be consistent with the general goal of minimizing present and future threats to human health, safety, and the environment.

**water table**—The boundary between the unsaturated zone and the deeper, saturated zone. The upper surface of an unconfined aquifer.

**watt**—A unit of power equal to 1 joule per second. (*See* joule.)

**wetland**—Wetlands are “... those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (33 CFR 328.3).

**whole-body dose**—In regard to radiation, dose resulting from the uniform exposure of all organs and tissues in a human body. (*See* effective dose equivalent.)

**wind rose**—A circular diagram showing, for a specific location, the percentage of the time the wind is from each compass direction. A wind rose for use in assessing consequences of airborne releases also shows the frequency of different wind speeds for each compass direction.

**yield**—The force in tons of TNT of a nuclear or thermonuclear explosion.

APPENDIX H  
List of Preparers

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**H LIST OF PREPARERS**

<b>Name</b>	<b>Education/Expertise</b>	<b>Contribution</b>
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DOE = U.S. Department of Energy; DOE-EM = DOE Office of Environmental Management; NCO = NEPA Compliance Officer; NNSA = National Nuclear Security Administration; NNSA-ESH = NNSA Office of Environment, Safety, and Health; NNSA-LA = NNSA Los Alamos Field Office; NNSA-SR = NNSA Savannah River Operations Office

To support preparation of this PEIS, the LANL and SRS M&O contractors (Triad and SRNS, respectively), established dedicated teams of environmental professionals. These teams prepared supporting references, identified details related to the Proposed Action, and supported technical reviews of the PEIS relative to their sites.

The PEIS was prepared under a contract with Tetra Tech, Inc. and its subcontractor, as listed in the following table.

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