# Chapter 1: **Introduction**

*The "Savannah River Site (SRS) Environmental Report" is the primary document that the U.S. Department of Energy (DOE) uses to inform the public of environmental performance and conditions at SRS. This report meets the requirements of DOE Order 231.1B, "Environment, Safety, and Health Reporting." The "SRS Environmental Report" is also the principal document that demonstrates how the Site complies with the requirements of DOE Order 458.1, "Radiation Protection of the Public and the Environment."*

*The "SRS Environmental Report" summarizes the Site's environmental information and data to achieve the following:*

- *Highlight significant Site programs*
- *Report environmental occurrences and responses*
- *Describe SRS's compliance with environmental standards and requirements*
- *Describe SRS's Environmental Management System and sustainability performance*
- *Provide the results of monitoring material containing residual radioactivity before its release from SRS*

### *Chapter Background*

This chapter presents the following:

- A brief history of SRS, along with a summary of its current missions
- Highlights of SRS organizations and their primary responsibilities
- Descriptions of the physical characteristics and attributes of the environment in and around SRS
- Updates of SRS's primary mission and annual programs

## 1.1 HISTORY

On November 28, 1950, President Harry S. Truman tasked the E. I. Du Pont de Nemours Company with designing, building, and operating what was then the Savannah River Plant. The construction project relocated citizens, homes, and businesses from the six South Carolina towns that had existed on the land. By 1953, SRS began producing the basic materials used to create nuclear weapons for the nation's defense. The work performed during the Site's early days was key to the United States winning the Cold War. For the seven decades since the Site's beginning, SRS has been a leader in environmental protection within the DOE complex and a steward of conserving water and energy throughout the 310-square mile site.

An *Overview of the Savannah River Site*, available on the SRS website, details much of the Site's history and accomplishments.

## 1.2 MISSION AND CURRENT OPERATION

The SRS mission is to safely and efficiently protect public health and the environment while supporting the nation's nuclear deterrent programs and transforming the Site for future use. The Site is a recognized long-term national asset in the areas of environmental stewardship, innovative technology, national security, and energy independence. It acts with an inspired workforce and mature, efficient management processes, while sustaining public confidence in its employees and capabilities. The SRS core values include performing safe and effective operations, along with maintaining good relations with Site stakeholders. The Site's main activities are treating and processing waste, environmental cleanup and remediation, tritium processing, and protecting nuclear material.

The DOE Office of Environmental Management (DOE-EM) and the National Nuclear Security Administration (NNSA) oversee the Site mission. DOE-EM's primary mission at the Savannah River Operations Office is to ensure that SRS operations and the cleanup of legacy waste protect public health and the environment. DOE-EM executes this mission with the support of contractors and subcontractors, universities, and federal agencies. Additionally, DOE-EM has various agreements with the U.S. Department of Agriculture (USDA), Forest Service-Savannah River (USFS-SR), the University of Georgia (UGA), the University of South Carolina (USC), and Ameresco Federal Services (via contract) to manage and conserve the Site's environmental resources. The USFS-SR oversees SRS's natural resources through an interagency agreement with DOE-Savannah River. UGA has operated the Savannah River Ecology Laboratory (SREL) since 1951, independently evaluating the environmental risk associated with Site activities. Since 1978, USC has overseen the Savannah River Archaeological Research Program (SRARP), a research unit that provides the technical expertise to manage SRS cultural resources. Ameresco Federal Solutions maintains a cogeneration power plant that uses renewable materials to supply steam, eliminating the need for coal.

NNSA's Savannah River Field Office is responsible for defense programs, and NNSA's Office of Defense Nuclear Nonproliferation is responsible for the nuclear nonproliferation elements of the national security missions.

Savannah River Nuclear Solutions (SRNS), Savannah River Mission Completion (SRMC), Centerra-SRS, and Battelle Savannah River Alliance (BSRA) contract with DOE to directly contribute to both the DOE-EM and NNSA missions. SRNS, as the management and operations contractor, oversees and ensures safe and efficient operations at SRS, managing landlord services and supporting both EM cleanup (excluding liquid waste operations) and NNSA activities. SRMC became the liquid waste operations contractor in February 2022 and is responsible for treating and disposing of radioactive liquid waste and tank closures. SRMC worked closely with Parsons Government Services, Inc., a limited-service contractor to DOE-EM, to design, construct, and commission the Salt Waste Processing Facility (SWPF) to accomplish SRMC's goals. Centerra-SRS provides a uniformed force to protect DOE and NNSA security interests at the Site. BSRA is the management and operations contractor for the Savannah River National Laboratory (SRNL), whose mission is applied research and development in environmental remediation and risk reduction, nuclear materials processing and disposition, nuclear detection and national security, and clean energy applications.

## 1.3 SITE LOCATION, DEMOGRAPHICS, AND ENVIRONMENT

SRS borders the Savannah River and encompasses about 310 square miles of Aiken, Allendale, and Barnwell counties in South Carolina. SRS is about 12 miles south of Aiken, South Carolina, and 15 miles southeast of Augusta, Georgia (Figure 1-1). The Savannah River flows along the Site's southwestern border. The capital letters on the Figure 1-1 map reference the operational areas within the SRS borders.

Based on the U.S. Census Bureau's 2020 data, the population within a 50-mile radius of H Area (where most of the Site's radiological releases occur) is 838,833 people. This translates to about 111 people per square mile outside the SRS boundary, with the largest concentration in the Augusta metropolitan area.

### 1.3.1 Water Resources

**An Aerial View of the Savannah River**

SRS activities potentially impact water resources, including the Savannah River, Site streams, and the underlying groundwater. The Savannah River bounds SRS on the southwest for 35 river miles. The upriver boundary of SRS is about 160 river miles from the Atlantic Ocean. The nearest downriver municipal facility that uses the river as a drinking water source (Beaufort-Jasper Water and Sewer Authority's Purrysburg Water Treatment Plant) is about 90 river miles from the Site. Commercial fishermen, sport fishermen, and boaters also use the river. The Savannah River is not currently used for any large-scale irrigation projects downriver of the Site. The groundwater at SRS migrates through the subsurface, primarily discharging into the Savannah River and its tributaries. SRS uses groundwater for both industrial processes and drinking water.

### 1.3.2 Geology

SRS is located on the southeastern Atlantic Coastal Plain in the Aiken Plateau. The center of SRS is about 25 miles southeast of the geologic fall line that separates the Coastal Plain from the Piedmont. The Aiken Plateau slopes gently to the southeast and is generally well-drained, although many poorly drained depressions exist. Elliptical-shaped Carolina bays, for example, are common on the Aiken Plateau. All major streams on SRS originate onsite, except for Upper Three Runs, which begins north of the Site. All onsite streams drain into the Savannah River (Denham 1995).

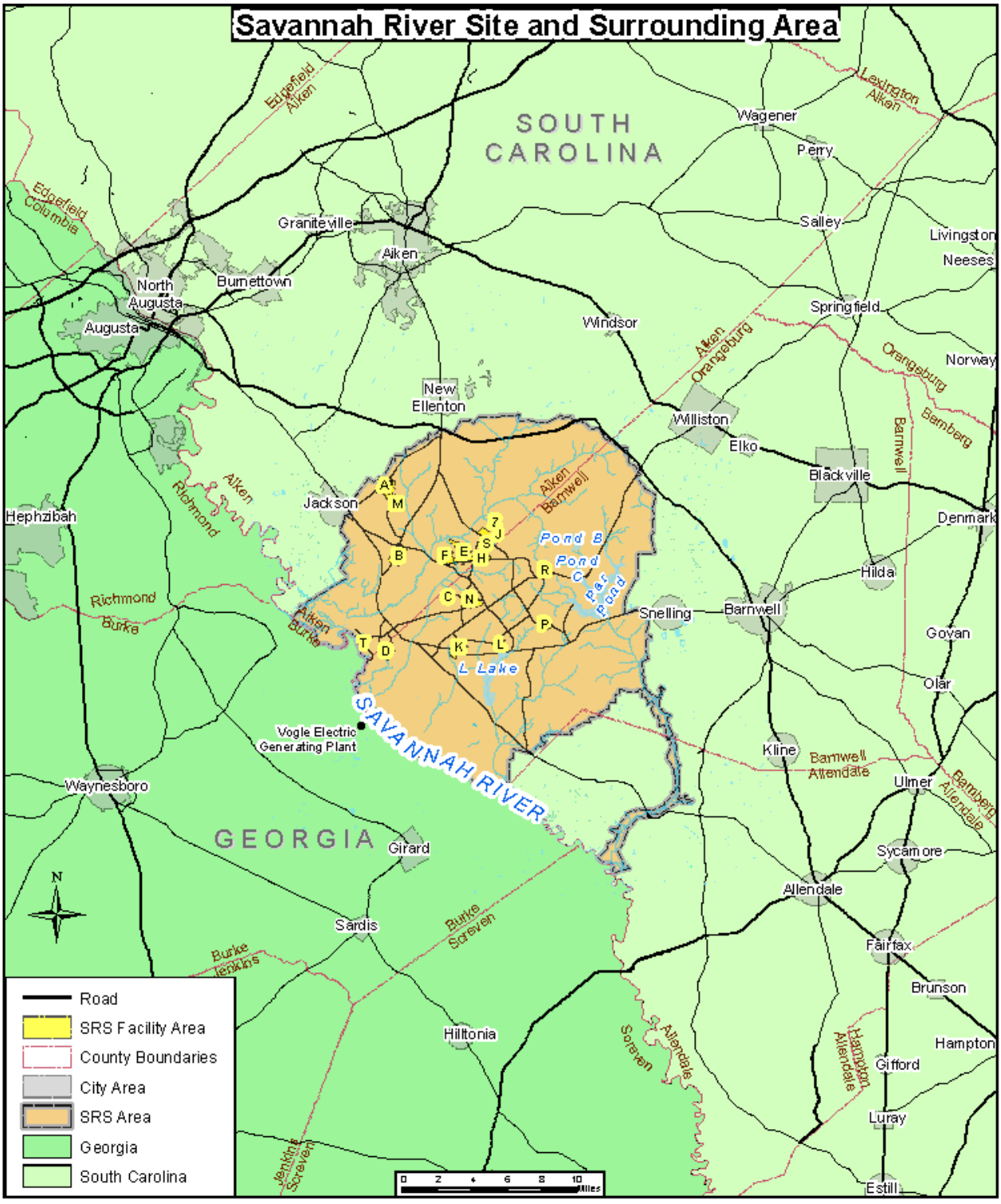
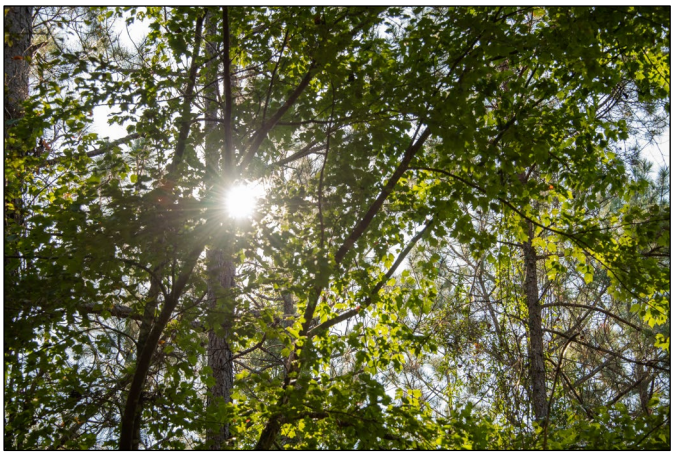



**Figure 1-1 The Savannah River Site and Surrounding Areas**

### 1.3.3 Land and Forest Resources

About 10% of SRS's land is industrial; the remaining 90% consists of natural and managed forests that the USFS-SR plants, maintains, and harvests. SRS consists of four major forests: 1) mixed-pine hardwoods, 2) sandhills pine savanna, 3) bottomland hardwoods, and 4) swamp floodplain forests. These forests, as well as Carolina bays, are accessible to the public when visiting the Crackerneck Wildlife Management Area and Ecological Reserve near Jackson, South Carolina. Carolina bays provide important wetland habitat and refuge for many plants and animals. As many as 300 Carolina bays exist on SRS.



**Ninety Percent of the Site Consists of Natural and Managed Forests.**

### 1.3.4 Animal and Plant Life

SRS is home to many varieties of plants and animals, including

- More than 100 species of reptiles and amphibians
- Approximately 50 species of mammals
- Nearly 100 species of fish
- Nearly 600 species of aquatic insects
- Approximately 1,500 species of plants, of which at least 40 are of state or regional concern
- More than 250 species of birds, some of which are migratory and do not make SRS their permanent home

**A USDA Forestry Lumberjack Installs an Artificial Nest Box.**

The Site also provides habitat for federally listed as threatened or endangered animal and plant species, including the wood stork, the red-cockaded woodpecker, the gopher tortoise, the pondberry, and the smooth coneflower.

## 1.4 DOE-EM PRIMARY SITE ACTIVITIES

DOE's Environmental Management Program oversees many Site activities. The following sections highlight key programs. Additional information is available on the SRS website.

### 1.4.1 Nuclear Materials Management

Nuclear Materials Management operations provide an interim storage location for a portion of the nation's surplus plutonium as well as the capability to disposition the plutonium into a nonproliferable form. Facility infrastructure and security upgrades are being addressed to ensure safe storage of plutonium and to support the Surplus Plutonium Disposition project, which will increase SRS's capacity for disposition of surplus plutonium.

### 1.4.2 Nuclear Materials Disposition

H Canyon is the only operating radiologically shielded chemical separations facility in the United States. From 2003 to 2019, H Canyon has recovered highly enriched uranium from various sites across the DOE complex and from foreign test reactors to blend down into low-enriched uranium fuel. Known as the Accelerated Basin De-inventory mission, H-Canyon is now being utilized to dissolve spent nuclear fuel and discard this material directly into liquid waste sludge batches for disposition. This approach to operations began in 2020 and will continue until 2034, when the liquid waste program is no longer available to receive discarded material from the H-Canyon facility.

### 1.4.3 Spent Nuclear Fuel Storage

SRS supports DOE's National Security mission by safely receiving and storing spent fuel elements from foreign and domestic research reactors, pending disposition. Currently, SRS stores spent nuclear fuel at the L-Area Complex until final disposition.

### 1.4.4 Waste Management

SRS manages radiological and nonradiological waste created by legacy operations as well as newly generated waste from ongoing Site operations.

#### 1.4.4.1 Radioactive Liquid Waste Management

SRS generates radioactive liquid waste as the byproduct of processing nuclear materials for national defense, research, and medical programs. The Site safely stores approximately 34 million gallons of radioactive liquid waste underground in the F-Tank Farm and H-Tank Farm in F Area and H Area, respectively. Closing these tanks is a high priority for DOE-EM. To do this, SRS must first remove the waste from the tanks, which is mostly salt waste, and then process and treat the waste before disposing of it.

**Excavation and Groundwork were Initiated for SDU-11 and SDU-12, the Final Mega-Vaults Planned for Construction.**

SRS mixes the salt solution at the Saltstone Production Facility to make saltstone and disposes of this low-activity liquid waste in cylindrical tanks, known as Saltstone Disposal Units (SDUs). In 2022, SRS continued permanently disposing of waste, processing more than 3.3 million gallons into grout and disposing of it in the cylindrical concrete SDUs. SRS continued construction of SDU-8 and SDU-9 and initiated construction of SDU-10, the next three mega-vaults. All three mega-vaults have a capacity of 34.5 million gallons. In addition, SRS started excavation and groundwork for SDU-11 and SDU-12, the final planned mega-vaults.

SRS uses the Defense Waste Processing Facility (DWPF) to process high-activity waste from the F-Tank Farm and H-Tank Farm. Since DWPF began operating in March 1996, it has produced more than 16.8 million pounds of glass—immobilizing 64.2 million curies of radioactivity—and pouring more than 4,346 canisters. In 2022, DWPF produced 58 canisters of glass, weighing 218,200 pounds and immobilizing 992,000 curies of radioactivity.

SWPF is a major piece of the liquid waste system and will process most of the Site's salt waste inventory by separating the highly radioactive waste from the less radioactive salt solution. Parsons Corporation, which designed and built the first-of-a-kind facility, completed its first year of operations on January 17, 2022. SRMC took over management of the Liquid Waste Program in late February 2022 and management of SWPF in late March 2022. SWPF processed more than 2.4 million gallons of salt solution in 2022.

### 1.4.4.2 Solid Waste Management

SRS manages the following types of solid waste:

- Low-level waste: ordinary items—such as coveralls, gloves, and hand tools—contaminated with small amounts of radioactive material
- Transuranic (TRU) waste: protective clothing, equipment, and job waste containing alpha-emitting isotopes with an atomic number greater than that of uranium (92)
- Hazardous waste (nonradiological): toxic, corrosive, reactive, or ignitable material that could affect human health or the environment


**Inspection of a K-Area Shipment before it Leaves SRS for the Waste Isolation Pilot Plant**

- Mixed waste: construction debris, laboratory samples, and soils containing both hazardous and radioactive components
- Sanitary waste: office waste, other wastes similar to household waste, and industrial or construction waste that is neither radioactive nor hazardous

To meet environmental and regulatory requirements, SRS treats, stores, and disposes of all low-level radioactive and hazardous waste that it generates. The Site disposes of all hazardous waste it generates in

offsite Resource Conservation and Recovery Act-permitted facilities. The Site also emphasizes recycling and minimizing waste to reduce the waste volume that SRS must manage.

SRS packages TRU waste and transports it in U.S. Department of Transportation-approved containers for underground disposal at the Waste Isolation Pilot Plant (WIPP), DOE's geologic repository near Carlsbad, New Mexico. SRS began shipping TRU waste to WIPP in May 2001 and has made more than 1,700 shipments. SRS made 16 TRU shipments in 2022, including the first shipment from K Area of downblended surplus plutonium.

DOE conducts annual reviews to ensure that Site operations are within DOE's performance standards. The annual reviews for the E-Area Low-Level Waste Facility Performance Assessment (PA) and the Saltstone Disposal Facility PA showed that SRS continued to operate these facilities in a safe and protective manner.

### 1.4.5 Area Completion Projects

SRS's Area Completion Projects organization is responsible for investigating and remediating waste units, surface water, and groundwater at SRS. The U.S. Environmental Protection Agency and the South Carolina Department of Health and Environmental Control have oversight of the remedial programs that reduce the footprint of legacy wastes and contamination, treat and immobilize contamination in soil and groundwater, and slow contaminate transport. Cleanup can include capping inactive waste sites; installing and operating efficient groundwater treatment units; deactivating and decommissioning excessed Environmental Management facilities; and using natural remedies, such as bioremediation (employing naturally occurring microbes) and phtoyremediation (using plants to clean up a contaminated environment).

### 1.4.6 Environmental Monitoring

SRS has an extensive environmental monitoring program, with records and documents from 1951, before the start of Site operations. Beginning in 1959, SRS made offsite environmental surveillance data available to the public. SRS reported onsite and offsite environmental monitoring separately until 1985, when it merged data from both programs into one publicly available document, the *U.S. Department of Energy Savannah River Plant Environmental Report for 1985*.

SRS continues to conduct an extensive environmental monitoring program to determine impacts, if any, from SRS to the surrounding communities and the environment, both on and off the Site. In addition to the onsite environmental monitoring the Site conducts, SRS also monitors a 2,000-square-mile area beyond the Site boundary. This area includes neighboring cities, towns, and counties in South Carolina and Georgia. SRS collects samples of air, rainwater, surface water, drinking water, groundwater, food products, wildlife, soil, sediment, and vegetation. The Site evaluates these samples for radionuclides, metals, and other chemicals that could be in the environment because of SRS activities.

## 1.5 NNSA PRIMARY SITE ACTIVITIES

NNSA operates tritium facilities at SRS to supply and process tritium, a radioactive form of hydrogen gas that is a vital component of nuclear weapons. SRS also plays a critical role in NNSA's nonproliferation missions, helping the United States meet its commitments to security and disposing of plutonium and uranium.

### 1.5.1 Tritium Processing

SRS has the nation's only facility for extracting, recycling, purifying, and reloading tritium. SRS replenishes tritium by recycling it from existing warheads and by extracting it from target rods irradiated in nuclear reactors that the Tennessee Valley Authority operates. SRS purifies recycled and extracted gases to produce tritium used by the Department of Defense for nuclear weapons. Additionally, helium-3 gas, a byproduct of the tritium production process, is used for neutron-detection equipment. SRS is the sole producer of helium-3 gas in the United States.

In 2022, Savannah River Tritium Enterprise continued facility infrastructure improvements to ensure robust plant operation, contributing to overall efficiency and the ability to meet future mission needs.

SRS tritium facilities are part of NNSA's Defense Program at SRS. The Defense Programs page of SRS's website includes more information.

### 1.5.2 Nuclear Nonproliferation

In continued support of nonproliferation goals, SRS continued carrying out the Surplus Plutonium Disposition mission to permanently dispose of weapons-grade plutonium declared excess to national security, with priority on disposition and removing plutonium previously consolidated onsite.

### 1.5.3 Pit Production

The plutonium pit production mission is an essential part of the NNSA's long term strategy for nuclear stockpile sustainment. In June 2021, NNSA approved the recommended approach to produce at least 50 plutonium pits per year at the Savannah River Plutonium Processing Facility (SRPPF). During 2022, SRS began design work for the conversion of an unfinished NNSA facility, which will become the SRPPF.

## 1.6 SPECIAL ENVIRONMENTAL STUDIES

SRS provides a unique setting for environmental study. Several organizations at the Site—the SREL, USFS-SR, SRARP, and SRNL—conduct research to support a better understanding of human impact on both plants and animals.

Since 1951, SRS has served as an invaluable outdoor laboratory for SREL researchers and others. The facility's large size (310 square miles), habitat diversity, and mix of natural and industrial areas provide many opportunities to study both natural ecological processes and human impacts. In 1972, DOE recognized SRS as the nation's first National Environmental Research Park.

The SREL and USFS-SR provide annual reports on the environmental studies and research they conduct on SRS. These reports, available on the *SRS Environmental Report* 2022 webpage, present and discuss environmental studies and research that occurred during the reporting year. Special environmental studies and research directly impacting the SRS environmental monitoring program and dose calculations are presented and discussed in their respective chapters.