

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 Site Environmental Report also is 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 from 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, 2020, the Savannah River Site celebrated its 70th anniversary. On this date in 1950, President Harry S. Truman requested that the E. I. Du Pont de Nemours Company design, build, and operate what was then known as 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 within the DOE complex.

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 the public health and the environment while supporting the nation's nuclear deterrent programs and transforming the Site for future use. The Site is a 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 current main activities involve 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. These two DOE Program Offices direct DOE missions. DOE-EM's Savannah River Operations Office (DOE-SR) is the Site landlord and oversees the cleanup of environmental legacy waste. NNSA's Savannah River Field Office (SRFO) is responsible for the defense programs, and the NNSA Office of Defense Nuclear Nonproliferation is responsible for the nuclear nonproliferation elements of the national security missions. SRS executes the mission with the support of contractors and their subcontractors, universities, and federal agencies.

Savannah River Nuclear Solutions (SRNS), Savannah River Remediation (SRR), and Centerra-SRS directly contribute to both the DOE-EM and NNSA missions. In addition to its role as the management and operating contractor at the Site, SRNS supports SRS missions through the Savannah River National Laboratory (SRNL). The laboratory provides a full complement of analytical services for radiochemical and environmental monitoring programs. As the liquid waste operations contractor, SRR is responsible for treating and disposing of radioactive liquid waste and operationally closing waste tanks. Centerra-SRS is the Site's protective force.

To support the cleanup of SRS's legacy waste, Parsons Government Services, Inc. is designing, constructing, and commissioning the Salt Waste Processing Facility, a key component in processing and dispositioning radioactive liquid waste.

DOE-EM manages the Savannah River Site and its environmental resources. 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 support DOE-EM in managing and conserving the Site's environmental resources. Through an interagency agreement with DOE-SR, USFS-SR manages SRS's natural resources. For more than 65 years, UGA has operated the Savannah River Ecology Laboratory (SREL), 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 also supports SRS's environmental resource management by supplying biomass-generated steam to SRS. This effort has allowed SRS to discontinue using coal to generate steam.

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 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 2010 data, the population within a 50-mile radius of H Area is 803,370 people. This translates to about 107 people per square mile outside the SRS boundary, with the largest concentration in the Augusta metropolitan area.

1.3.1 Water Resources

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 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 above the Site. All onsite streams drain into the Savannah River (Denham 1995).



An Aerial View of a Carolina Bay at SRS

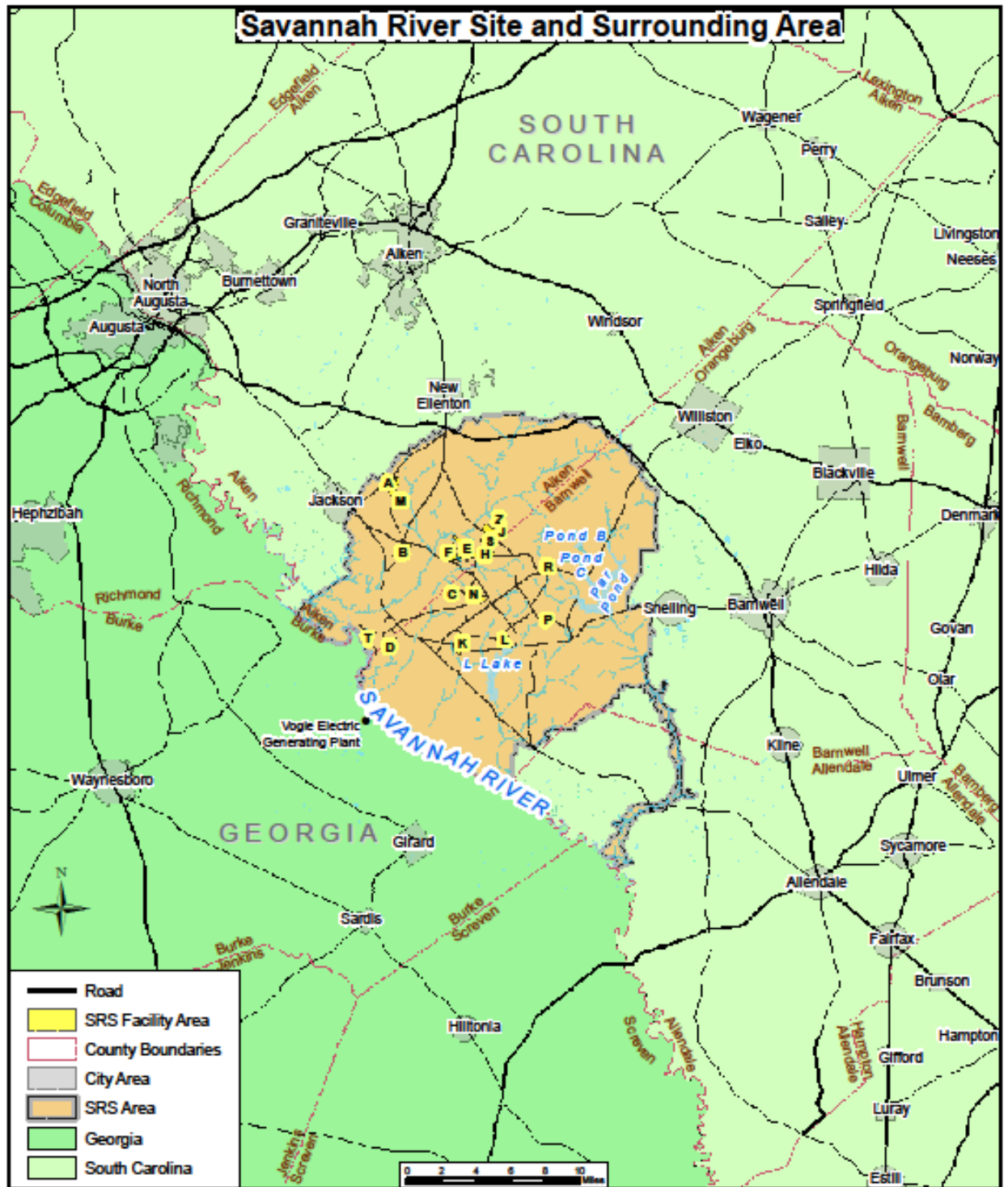


Figure 1-1 The Savannah River Site and Surrounding Area

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.

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 Wild Turkey is One of the Many Bird Species at SRS

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 excess plutonium. SRS has two facilities designated for the handling and extended safe storage of plutonium and other special nuclear materials. Facility infrastructure and security upgrades are being addressed to ensure safe plutonium storage until the Surplus Plutonium Project is fully implemented.

1.4.2 Nuclear Materials Disposition

H Canyon is the only operating radiologically shielded chemical separations facility in the United States. Since 2003, H Canyon has recovered highly enriched uranium from various sites across the DOE complex and from foreign test reactors. DOE now uses H Canyon to blend down highly enriched uranium into low-

enriched uranium fuel. Blending down, or down blending, as it is sometimes referred to, mixes the uranium with natural uranium to not only make it undesirable to use in nuclear weapons, but also to make it useable for commercial nuclear reactors. However, H Canyon has not shipped blended-down uranium since 2011, and DOE is evaluating the direct transfer of dissolved spent nuclear fuel into liquid waste batches for disposition.

1.4.3 Spent Nuclear Fuel Storage

SRS supports the DOE 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.

1.4.4 Waste Management

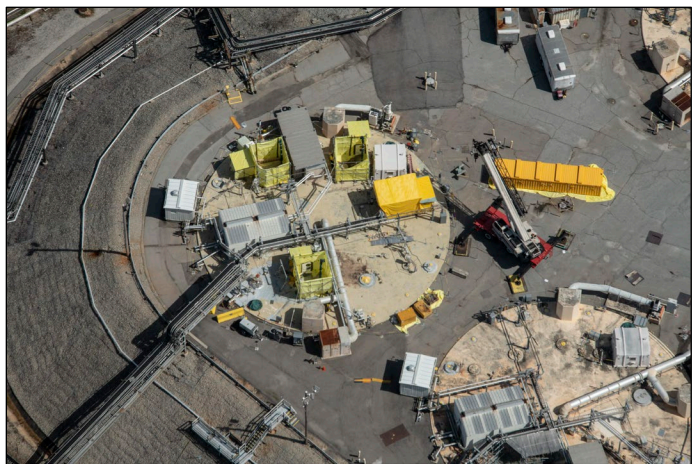
SRS manages radiological and nonradiological waste created by legacy operations, as well as newly generated waste created by ongoing Site operations.

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 36 million gallons of radioactive liquid waste underground in the F- and H-Area Tank Farms. 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. SRS began operating the Tank Closure Cesium Removal (TCCR) system in 2019. The TCCR system removes the cesium in the salt waste, allowing SRS to expedite treating the salt waste and accelerate tank closures. Since it began operating, TCCR has processed approximately 300,000 gallons of salt solution.

SRS mixes the decontaminated 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). The Saltstone facilities processed and disposed of approximately 638,759 gallons of waste during 2020. SDU-6, the first mega-volume SDU at SRS, continues to receive the saltstone for disposal. Construction continued during 2020 on SDU-7, the second of seven SRS mega-volume SDUs. Site preparation for the next two mega-vaults, SDU-8 and SDU-9, also continued in 2020.

SRS uses the Defense Waste Processing Facility (DWPF) to process high-activity waste from the Tank Farms. Since DWPF began operating in March 1996, it has produced more than 16 million pounds of glass—immobilizing 62.1 million curies of radioactivity—and pouring more than 4,200 canisters. DWPF produced 16 canisters of glass, weighing 61,842 pounds and immobilizing approximately 273,677 curies of radioactivity in 2020.



A Mega-Volume Saltstone Disposal Unit

During 2020, SRS received authorization to transition from the project phase to operations of the Salt Waste Processing Facility (SWPF). The SWPF is a major piece of the liquid waste system and will process the majority of the Site's salt waste inventory by separating the highly radioactive waste from the less radioactive salt solution. This milestone was a considerable achievement for the Site's cleanup program and marks significant progress toward emptying and closing the remaining high-level waste tanks.

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
- 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 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 in New Mexico. SRS began shipping TRU waste to WIPP in May 2001 and has made more than 1,670 shipments. SRS made 10 TRU shipments in 2020.

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 (ACP) is responsible for waste units, surface water, and groundwater remediation at SRS. In its efforts to remediate contaminants and reduce the footprint of legacy waste at SRS, ACP treats and immobilizes contamination in soil and groundwater. Cleanup also focuses on slowing contamination transport through soil and groundwater and slowing the movement of contamination that has already migrated from the source. Cleanup includes capping inactive waste sites; installing and operating efficient groundwater treatment units; removing and disposing contaminated material; and using natural remedies, such as bioremediation (using naturally occurring microbes).

During 2020, SRS conducted a removal action at the D-Area Coal Storage Area (484-17D), which was used continuously when 484-D Powerhouse operated. SRS added soil neutralization amendments to reduce acidity in the upper portion of the vadose zone. The action, which was not time-critical, will reduce the amount of leachate to the groundwater and improve groundwater conditions.

1.4.6 Environmental Monitoring

SRS has an extensive environmental monitoring program, with records and documents from 1951, prior to 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 offsite. 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 suitable for use.

In 2020, Savannah River Tritium Enterprise (SRTE) continued facility infrastructure improvements to ensure robust plant operation, contributing to overall efficiency and the ability to meet future mission needs. SRTE increased operational capabilities and flexibility by completing the Diffuser Stacking project. This project provides a means to directly process waste gas out of the Tritium Extraction Facility and eliminates dependency on H Area New Manufacturing as that facility transitions into higher production needs.

SRS tritium facilities are part of the NNSA's Defense Program at SRS. The [Defense Programs](#) page of SRS's website includes more information.

1.5.2 Nuclear Nonproliferation

Since 1999, the NNSA Nuclear Nonproliferation Program had been working to design and build the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF), which would have converted surplus weapons-grade

plutonium into fuel for commercial facilities to generate electricity. DOE decided to terminate the project in October 2018. On March 29, 2019, SRNS accepted custodianship and operational responsibility for the MFFF facility and began preparations for its future use.

In November 2020, the NNSA published the *Record of Decision for the Final Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site (DOE/EIS 0541)*. This document announces the decision to implement the proposed action to repurpose the MFFF to produce reserve plutonium pits at SRS to meet national security requirements.

The NNSA Materials Management and Minimization Program is currently preparing surplus weapons-grade plutonium for disposal at WIPP, using the dilute and dispose approach. The South Carolina Department of Health and Environmental Control issued an Air Quality State Construction Permit to the Surplus Plutonium Disposition (SPD) Project on October 23, 2020. This permit will allow construction of the SPD Project, which, when completed, will expedite plutonium removal from the State of South Carolina by dispositioning surplus weapons-grade plutonium. SPD will expand the current SRS down-blending capability, preparing additional surplus plutonium for disposal at WIPP.

1.6 SPECIAL ENVIRONMENTAL STUDIES

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

[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 2020 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.