1 INTRODUCTION

This report was prepared to meet the U.S. Department of Energy (DOE) Order 231.1B "Environment, Safety, and Health Reporting." It also is the principal document that demonstrates compliance with the requirements of DOE Order 458.1, "Radiation Protection of the Public and the Environment," and is a key component to DOE's effort to keep the public informed of environmental conditions at the Savannah River Site (SRS).

This document presents summary environmental information and data for the SRS to:

- Highlight significant Site programs and efforts,
- Summarize environmental occurrences and responses reported during the calendar year,
- Describe compliance status with respect to environmental standards and requirements,
- Document the Site's environmental management performance, and
- Show the results of radiological monitoring and the results from monitoring property for release from SRS.

This chapter (i.e. Introduction) will discuss a brief history of the SRS, and the current missions the Site holds. This section will also highlight various organizations on site and their prime responsibilities, as well as physical characteristics and attributes in and around the SRS. This chapter introduces the Site's primary mission via programmatic activities and provides the annual update for each program (i.e. Nuclear Materials Stabilization, Waste Management, Environmental Monitoring, etc.).

1.1 HISTORY

SRS is a DOE site located in the western region of South Carolina along the Savannah River. SRS was built in the early 1950s to produce materials used to create nuclear weapons. Five nuclear reactors were built to produce these materials. Reactor operations continued until 1988. A number of support facilities were also built. Several of these facilities continue to operate. The main activities on Site today are waste processing and treatment, environmental cleanup and remediation, tritium processing, and protection of nuclear material.

1.2 MISSIONS

The mission of SRS is to operate safely and efficiently and to protect public health and the environment, while supporting the nation's nuclear deterrent programs. SRS missions fall under the DOE Environmental Management (EM) program or the National Nuclear Security Administration (NNSA).

SRS has three main mission areas:

Environmental Stewardship – SRS is focused on reducing the environmental legacy of nuclear materials and radioactive waste at SRS through initiatives such as groundwater restoration, deactivation and decommissioning of excess contaminated facilities, and radioactive waste disposition.

National Security – SRS is focused on enhancing national security by creating safe, innovative solutions to manage nuclear materials. Activities include surplus nuclear materials disposition, tritium supply management, and nuclear stockpile maintenance and evaluation.

Clean Energy – Through public and private research and development partnerships, SRS is focused on accelerating technological development to provide sustainable energy.

You will find more information on SRS's website.

1.3 ORGANIZATION

Two DOE Program Offices (Office of Environmental Management (EM) and National Nuclear Security Administration (NNSA)) provide direction to the Savannah River Operations Office. To execute SRS's missions, two federal agencies, two state universities, and several contractors participate in various supporting roles. Figure 1-1 shows the relationship of these contractors with DOE. You will find a description of each entity on the following pages.

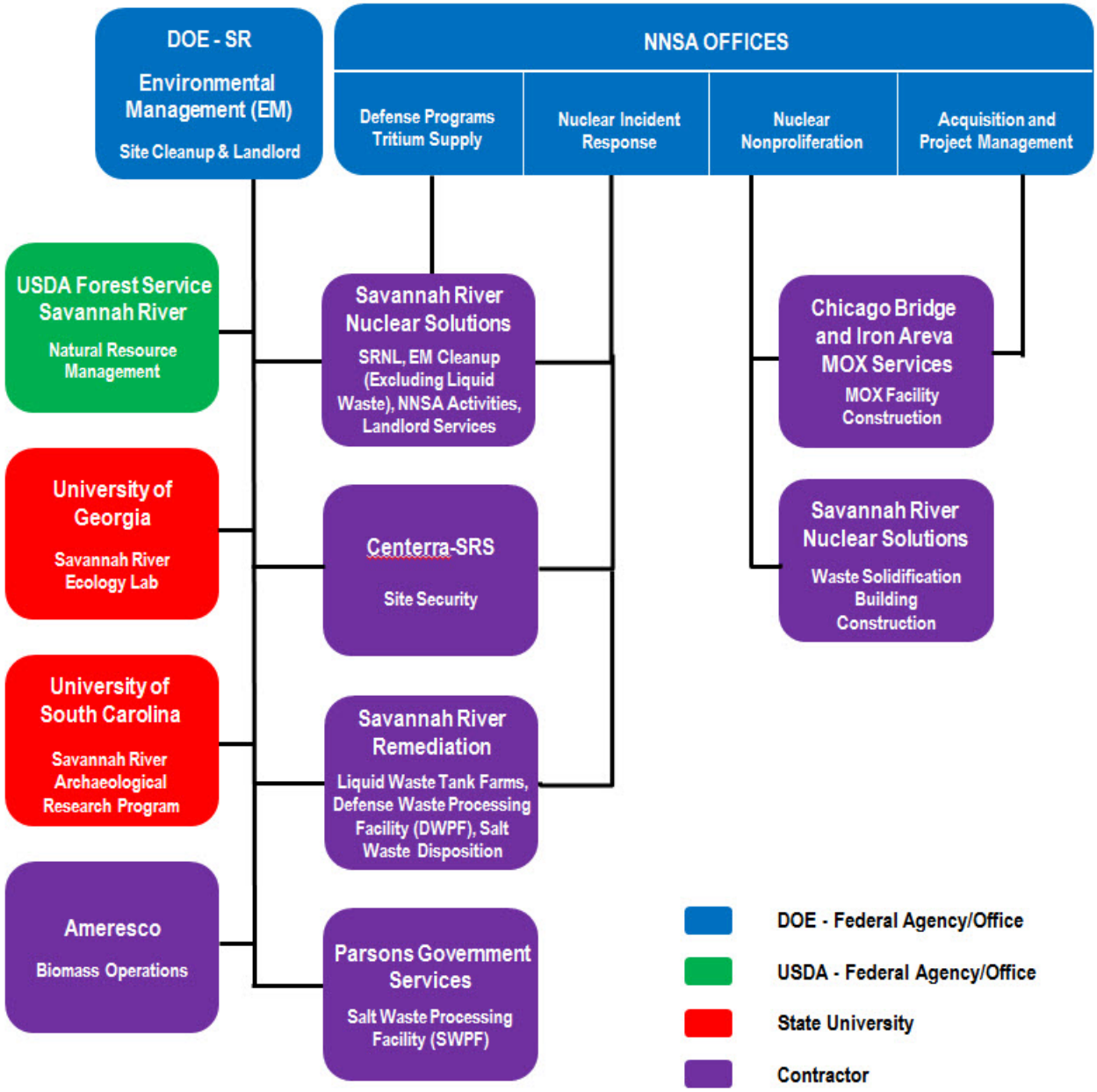

Figure 1-1 SRS Organization

The mission of Office of EM is to complete the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development and government-sponsored research. The DOE Savannah River Operations Office (DOE-SR) is responsible for oversight of EM operations and landlord services supporting all mission areas at SRS. You will find more information on the DOE-SR website.

NNSA is responsible for the defense programs and nuclear nonproliferation elements of the national security mission. NNSA is also responsible for emergency operations related to SRS tritium facility functions and DOE/NNSA radiological emergency response assistance program. You will find more information on the NNSA website.

Savannah River Nuclear Solutions, LLC (SRNS), a joint venture of Fluor Corporation, Newport News Nuclear, and Honeywell International, Inc., is the SRS management and operations contractor. SRNS is responsible for nuclear materials facilities, solid waste management facilities, tritium programs, Site infrastructure, and waste site remediation and closure projects. You will find more information on the SRNS website.

SRNL, operated by SRNS, is the only EM applied research and development laboratory. SRNL creates practical, high-value, cost-effective technological solutions in all three SRS mission areas as well as throughout the DOE weapons complex. SRNL also provides technical leadership and key support for future SRS missions. You will find more information on the SRNL website.

Savannah River Remediation LLC (SRR) is responsible for treating and disposing of radioactive liquid waste and operationally closing waste tanks. SRR is composed of a team of companies led by AECOM with partners Bechtel National, CH2M, and BWX Technologies. Critical subcontractors for the contract are AREVA, Energy Solutions, and URS Professional Solutions. You will find more information on the SRR website.

Parsons Government Services, Inc. is responsible for the design, construction, startup, and operation of the Salt Waste Processing Facility (SWPF). The SWPF will separate radioactive salt solutions currently stored in below ground tanks at SRS. SWPF will then transfer separated solutions to the Defense Waste Processing Facility (DWPF) or the Saltstone Facility for more processing. You will find more information on the Parsons website.

Chicago Bridge & Iron Areva MOX Services, LLC is responsible for the design, construction, startup, and operation of the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF). The MFFF will convert plutonium that could be used to make weapons to a form that can be used in a commercial nuclear power plant. You will find more information on the Chicago Bridge & Iron Areva MOX Services website.

Centerra-SRS is responsible for the protective force that focuses on ensuring Site operations are not disrupted by criminal or terrorist acts, while protecting sites employees, sensitive information and nuclear materials in a safe manner. You will find more information on the Centerra website.

Ameresco Federal Solutions, Inc. constructed and now operates biomass steam generating plants in K and L Areas and the steam and electricity cogeneration plant located near F Area. Ameresco currently supplies steam to SRS. Ameresco does not provide compliance data for the *SRS Environmental Report for 2015.* You will find more information on the Ameresco website.

The Savannah River Ecology Laboratory (SREL) is a research unit of the University of Georgia that has been conducting ecological research at SRS for more than 60 years. SREL's mission is to provide an independent, university-based perspective on the environmental risks associated with past, present, and future DOE missions. SREL's mission includes training future generations of scientists on how to evaluate such risks and to provide local communities with data on how SRS addresses environmental issues of importance to environmental protection and human health. You will find more information on the SREL website.

U.S. Department of Agriculture
Forest Service
Southern Region

Under an Interagency Agreement with DOE-SR, the U.S. Department of Agriculture (USDA) Forest Service-Savannah River (USFS-SR) contributes to environmental stewardship at SRS by managing the Site's natural resources, including timber; maintaining and improving habitat for threatened, endangered, and sensitive species; maintaining secondary roads and Site boundaries; performing prescribed burns and protecting the Site from wildland fires; and evaluating the effects of its management practices on the environment. You will find more information on the USFS-SR website.

Savannah River Archaeological Research Program

The Savannah River Archaeological Research Program (SRARP) is a research unit of the University of South Carolina that provides the technical expertise to support management of SRS cultural resources. SRARP responsibilities include identifying, evaluating, and protecting SRS archaeological sites and artifacts, conducting compliance based research, offering public outreach programs, and preparing documents and reports for state and federal regulators. You will find more information on the SRARP website.

1.4 SITE LOCATION, DEMOGRAPHICS, AND ENVIRONMENT

SRS borders the Savannah River, and covers about 310 square miles in the South Carolina counties of Aiken, Allendale, and Barnwell. SRS is about 12 miles south of Aiken, South Carolina, and 15 miles southeast of Augusta, Georgia (Figure 1-2). The Savannah River flows along the Site's southwestern border. On Figure 1-2, the capital letters within the SRS borders identify operational areas referenced throughout this report.

Based on the U.S. Census Bureau's 2010 data, the population within a 50-mile radius of the center of SRS is about 781,060 people. This translates to an average population density of about 104 people per square mile outside the SRS boundary, with the largest concentration in the Augusta metropolitan area.

1.4.1 Water Resources

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 flow system at SRS consists of four major aquifers. Groundwater migrates through the subsurface, eventually either discharging into the Savannah River and its tributaries or migrating vertically downward into the deeper regional flow systems. SRS uses groundwater for both industrial processes and drinking water.

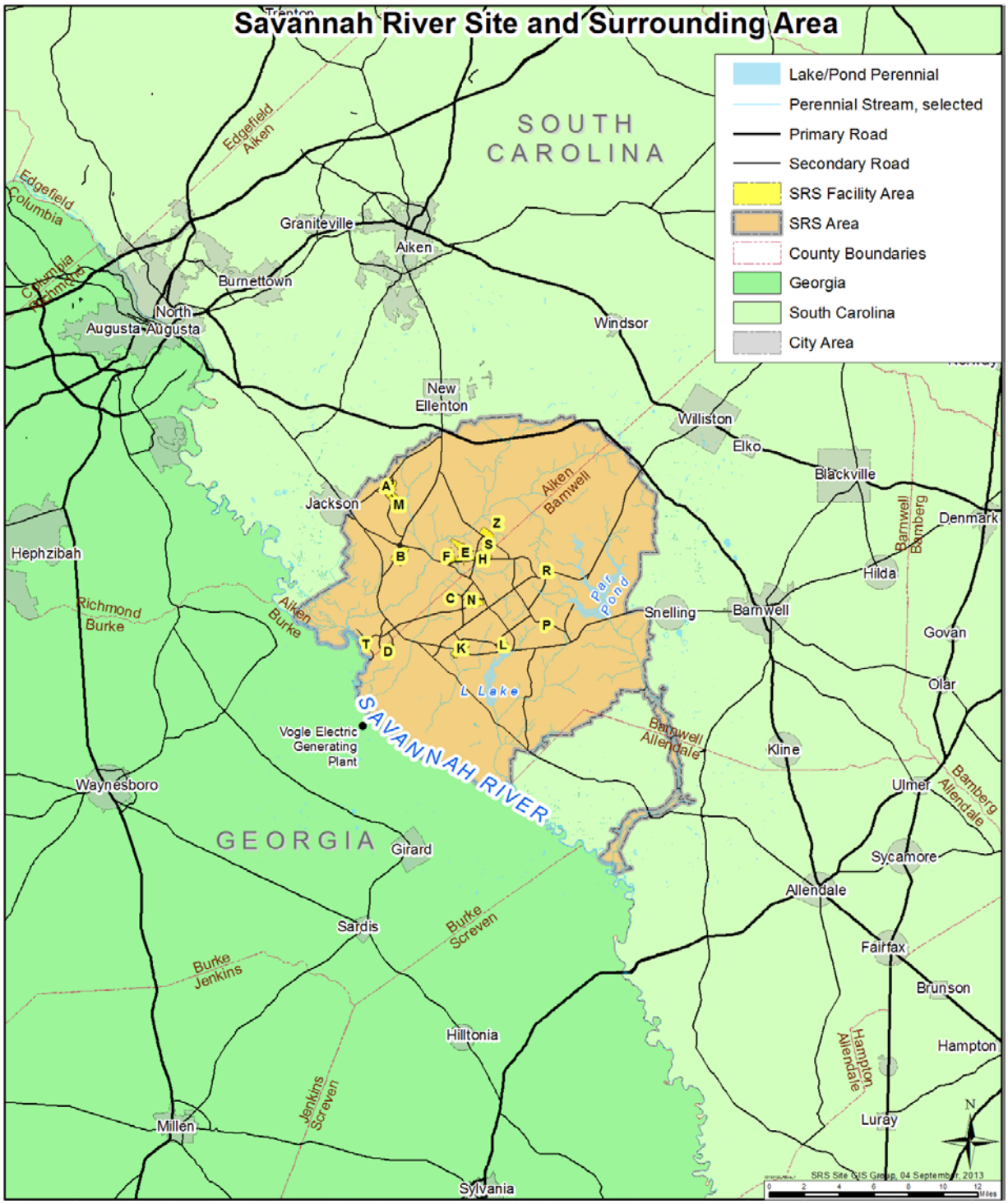

Figure 1-2 The Savannah River Site and Surrounding Area

1.4.2 Geology

SRS is on the southeastern Atlantic Coastal Plain, part of the larger Atlantic Plain that extends south from New Jersey to Florida. The center of SRS is about 25 miles southeast of the geological fall line that separates the Coastal Plain from the Piedmont.

With nearly three centuries of available historic and contemporary seismic data, the Charleston/ Summerville area remains the most seismically active region of South Carolina and the most significant seismogenic region affecting SRS. Levels of seismic activity within this region are very low, with magnitudes generally less than or equal to 3.0 on the Richter Scale.

1.4.3 Land and Forest Resources

SRS uses only about 10% of the total land area of the Site for industrial activities and the remaining 90% consists of natural and managed forests planted, maintained, and harvested by the USFS-SR. Four major forest types are found on SRS: mixed pine-hardwoods, sandhills pine savanna, bottomland hardwoods, and swamp floodplain forests. More than 345 Carolina Bays exist on SRS. Carolina Bays are relatively shallow depressions that provide important wetland habitat and refuge for many plants and animals.

1.4.4 Animal and Plant Life

SRS is home to about 1,500 species of plants, more than 100 species of reptiles and amphibians, some 50 species of mammals, nearly 100 species of fish, and provides habitat for more than 250 species of birds. Nearly 600 species of aquatic insects can be found in SRS streams and wetlands. The Site also provides habitat for a number of protected species including the wood stork, the red-cockaded woodpecker, the pondberry, the gopher tortoise, and the smooth purple coneflower (all federally-listed as threatened or endangered species) and at least 40 plant species of state or regional concern.

1.5 DOE EM PRIMARY SITE ACTIVITIES

1.5.1 Nuclear Materials Stabilization

In the past, separations facilities located in F and H Areas processed special nuclear materials and spent fuel from Site reactors to produce materials for nuclear weapons and isotopes for both medical and National Aeronautics and Space Administration applications. The end of the Cold War in 1991 brought a shift in the mission of these facilities to stabilization of nuclear materials from onsite and offsite sources for safe storage or disposition.

H Canyon

H Canyon is a multi-purpose facility supporting both DOE-EM and NNSA missions. Its unique design and capability allows it to disposition surplus uranium and plutonium materials. One of the most important missions of H Canyon since 2003 has been to recover and disposition highly enriched uranium from various spent and un-irradiated nuclear fuels as well as from uranium bearing materials from across the DOE complex. In H Canyon, the highly

enriched uranium is purified through a separations process and then diluted into a low-enriched uranium product using natural uranium. The low-enriched product is shipped offsite and used in the manufacture of commercial reactor fuel.

H Canyon also dissolves plutonium materials into a solution that is converted into a purified oxide product. DOE has forecasted the plutonium oxide product as feed for the MFFF. In 2015, H Canyon marked 60 years of service to the nation. You will find more information on the H-Area Nuclear Materials Disposition page on SRS's website.

1.5.2 Nuclear Materials Consolidation and Storage

SRS handles and provides interim storage of our nation's surplus plutonium and other special nuclear materials and fulfills the United States' commitment to international nonproliferation efforts in a safe and environmentally sound manner.

K-Area Complex

The K-Area Complex is DOE's only special nuclear materials storage facility designated for interim safe storage of plutonium. The principal operations building formerly housed K Reactor, which produced nuclear materials to support the United States during the Cold War for nearly four decades. DOE has revitalized this very safe and robust structure to store nuclear materials. The stored materials have various proposed disposition paths including Waste Isolation Pilot Plant (WIPP), the Defense Waste Processing Facility (DWPF), H Area facilities, and the MFFF.

You will find more information on the Nuclear Materials Management page on SRS's website.

Spent Fuel Storage in the L-Area Complex

1.5.3 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, spent nuclear fuel is stored at the L-Area Complex. You will find more information in the L-Area Complex fact sheet on SRS's website.

1.5.4 Waste Management

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

1.5.4.1 Radioactive Liquid Waste Management

The processing of nuclear materials for national defense, research, and medical programs generates radioactive liquid waste. Approximately 36 million gallons of radioactive liquid waste are safely stored underground in waste tanks located in the F- and H-Area Tank Farms. SRS waste tanks have provided more than 50 years of safe storage for radioactive liquid waste. The primary activities of this program are waste removal, treatment, and disposal followed by closure of the tanks. Removing waste from the tanks will allow for permanent closure of the Site's radioactive liquid waste storage tanks, a high priority for DOE. In 2015, SRS completed closure of the seventh radioactive liquid waste storage tank at the Site (Tank 16H), and the fifth tank closed since 2012. Through 2015, seven tanks have been closed.

SRS uses cylindrical Saltstone Disposal Units (SDUs) for disposal operations. In 2015 SRS continued construction of a new design for the cylindrical SDUs and processed and disposed of over 750,000 gallons of waste through the Saltstone facilities.

High activity waste from the Tank Farms is processed at DWPF. Since operations began in March 1996, over 15 million pounds of glass have been produced, 57.4 million curies have been immobilized, and 4,000 canisters poured. In FY 2015, the DWPF produced 93 canisters with approximately 350,000 pounds of glass, immobilizing approximately 1.8 million curies of radioactivity.

You will find more information in the Radioactive Liquid Waste: Operational Tank Closure and Liquid Waste Facilities fact sheets on SRS's website.

E-Area Waste Storage and Disposal Facilities

1.5.4.2 Solid Waste Management

Solid wastes managed at SRS include the following types:

- Low-level radioactive solid waste includes ordinary items that have become contaminated with small amounts of radioactive material;
- Transuranic (TRU) waste, which contains alpha-emitting isotopes with an atomic number greater than that of uranium;
- Hazardous waste (nonradiological), which is any toxic, corrosive, reactive, or ignitable material that could affect human health or the environment;
- Mixed waste, which contains both hazardous and radioactive components; and
- Sanitary waste, like ordinary municipal waste, is neither radioactive nor hazardous.

All low-level radioactive and hazardous wastes generated at SRS are treated, stored, and disposed of to meet environmental and regulatory requirements. The Site also emphasizes waste minimization and recycling as a way to reduce the volume of waste that SRS must manage.

TRU waste is packaged and transported by DOT approved caskets to WIPP for disposal. SRS did not make any TRU shipments in 2015. This was a result of the WIPP being shut down. WIPP is the disposal location for SRS TRU waste.

Annual reviews are conducted to ensure that Site Operations are within the performance standards established by DOE. The 2015 annual reviews for the E-Area Low-Level Waste Facility Performance Assessment (PA) and the Saltstone Disposal Facility PA, showed that operations in FY 2015 were within the performance standards established by DOE Orders, and that the public and the environment were protected.

You will find more information on the Solid Waste Management page on SRS's website.

1.5.5 Waste Site Remediation and Closure

Past operations at SRS have resulted in the release of hazardous and radioactive substances to soil which subsequently have ended up in the groundwater. The Area Completion Projects is responsible for and focuses on reducing the footprint of legacy waste at SRS's contaminated waste sites and obsolete facilities. Area Completion Projects cleans up contamination in the environment by treating or immobilizing the source of the contamination; mitigating transport through soil and groundwater or slowing the movement of contamination that has already migrated from the source. Cleanup actions include capping inactive waste sites, installing and operating efficient groundwater treatment units, and using natural remedies, such as bioremediation (using naturally occurring microbes) and natural remediation (using natural processes) to reduce contaminants from reaching groundwater or the contaminants concentrations in groundwater.

SRS Employees Observe D-Area Coal Ash Basin Closure Activities

During 2015, SRS continued a five-year project to restore 90 acres located near the former coal-fired power plant in D Area. The restoration activities will include removal of ash, deposited over decades, and construction of an engineered cover system, resulting in two highly engineered grassy hills. You will find more information on the Area Completion Projects page on SRS's website.

1.5.6 Environmental Monitoring

SRS has an extensive environmental monitoring program that has been in place since 1951, prior to the start of Site operations. In the 1950s, onsite environmental monitoring program data were reported in Site documents. Beginning in 1959, SRS made offsite environmental surveillance data available to the public. SRS reported onsite and offsite environmental monitoring activities separately until 1985, when data from both programs were merged into one publicly available document.

SRS continues to conduct an extensive environmental monitoring program to determine impacts, if any, from SRS operations to the surrounding communities and the environment, both on and offsite. In addition to the environmental monitoring activities conducted on the Site, 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 thousands of samples of air, rainwater, surface water, drinking water, groundwater, food products, wildlife, soil, sediment, and vegetation. These samples are checked for radionuclides, metals, and other chemicals that could be in the environment because of activities at SRS.

During 2015, the Site's radioactive and chemical discharges to air and water were well below regulatory standards for environmental and public health protection; its air and water quality results met applicable requirements; and the potential radiation dose to the public was well below the DOE public dose limit. You will find more information in the Environmental Monitoring fact sheet on SRS's website.

1.6 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 plutonium and uranium disposition and security.

Tritium Facility

1.6.1 Tritium Processing

SRS has the nation's only facility for extracting, recycling, purifying, and reloading tritium. SRS replenishes tritium by recycling tritium from existing warheads and by extracting tritium from target rods irradiated in nuclear reactors operated by the Tennessee Valley Authority. Recycled and extracted gases are purified to produce tritium suitable for use. SRS tritium facilities are part of the NNSA's Defense Programs operations at SRS. You will find more information on the Defense Programs page on SRS's website.

MFFF Facility under Construction

1.6.2 Nuclear Nonproliferation

Currently under construction, the MFFF will convert surplus weapons-grade plutonium to a form used to generate electricity in commercial nuclear power reactors. Once irradiated, the plutonium in the MOX fuel cannot be used for nuclear weapons. You will find more information on the Chicago Bridge & Iron Areva MOX Services website.