

SAVANNAH RIVER SITE

Environmental Report Summary

2014



Savannah River Nuclear Solutions, LLC
Savannah River Site
Aiken, South Carolina



Environmental Summary Report for 2014

The Savannah River Site (SRS) began publishing the yearly SRS Environmental Report over 60 years ago and the report was first made available to the public in 1959.

It is our duty as citizens of these communities to communicate the impact of SRS operations on our communities. This summary report is meant to:

- Show our mission accomplishments,
- Show SRS compliance with environmental laws and regulations,
- Highlight SRS's environmental monitoring and surveillance programs, and
- Highlight our community involvement efforts.

SRS is a government facility located in the western region of South Carolina along the Savannah River. The Site is approximately 300 square miles covering parts of Aiken, Allendale, and Barnwell counties. SRS was built in the early 1950's 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 including two chemical separation plants, a heavy water extraction plant, nuclear fuel and target fabrication facilities, a tritium extraction facility and waste management facilities were also built, and several of these facilities continue to operate. The main activities on Site today are waste processing and treatment, environmental cleanup and protection of nuclear material.

Radiation is Part of Life

Radiation is the transfer of energy in the form of rays, waves, or particles through space. Humans, plants, and animals can receive radiation doses from both natural and man-made sources. Radiation can come from as far away as outer space and from as near as the ground that you are standing on. Because it is naturally all around us, we cannot eliminate radiation from our environment. We can, however, reduce our exposure to it.



How Are We Exposed to Radiation?

We are exposed to radiation in many different ways. Simply breathing particles that are in the air will cause some exposure. Every time we eat food or drink water, we receive radiation. We can be directly exposed to radiation from the sun or the ground. Contaminants in the air can deposit on grass, which can then be eaten by cows in pastures. These cows produce milk and provide beef. When we consume milk and beef we are exposed to radiation. Natural radiation can also be found in foods such as bananas, carrots, white potatoes, and brazil nuts. Radiation is everywhere and has been here since the earth was formed. Radiation has many uses that are helpful and are an important part of our lives.



According to the National Council on Radiation Protection, nearly half of the exposure of the average person living in the United States to radiation comes from medical sources such as x-rays, CT scans, and drugs with radioactive material known as radiopharmaceuticals.



Industries also use radiation in a variety of ways. Nuclear power plants use radioactive materials to produce electricity, industrial radiography uses x-rays to check for weak points in metal parts and welds before products are sold, the food industry uses irradiators (machines used to kill bacteria and other pathogens in food and other items). Devices that test the density of highway and construction materials, research reactors, and security screening at airports and shipping ports also use radioactive materials.

You may also have products in your homes such as antique clocks and watches that glow, ceramics such as Fiesta ware or smoke detectors that contain small amounts of radioactive material. In addition, the materials your home is made of, such as bricks, contain small amounts of natural radioactive materials.

What is Radiation Dose?

Radiation dose to a person is the amount of energy absorbed by the human body as a result of a radioactive source. The yearly dose to the average person living in the United States is 625 mrem; this includes a yearly background dose of 311 mrem from naturally occurring radionuclides found in our bodies and in the earth, and from radiation from the sun. It also includes 300 mrem from medical procedures like x-rays, 13 mrem from products you use everyday and less than 1 mrem from exposures from industry and work.

In 2014, the maximum dose to a representative member of the public from SRS operations was 0.16 mrem per year. Department of Energy (DOE) limits the exposure from DOE operations to an individual member of the public to 100 mrem per year. The dose standard of 100 mrem per year includes doses a person receives from routine DOE operations through the liquid pathways and from the airborne exposure pathways. Some exposure pathways discussed in this summary are not included in the standard dose compliance calculation. This is because they apply to activities that are not typical for a member of the public such as eating fish caught only from the mouths of SRS streams or a small segment of the population such as onsite volunteer hunters. These doses are calculated and reported separately.

How Are We Exposed to Chemicals?

Chemicals may be present in air, water, and soil. Similar to radionuclides, these pollutants in air and rainwater can land on grass in pastures or in streams and lakes where they are absorbed by plants or eaten by animals. People become exposed to chemicals by breathing, eating, drinking, or touching them.

Environmental laws require SRS to obtain permits from federal and state agencies. These permits are intended to control the release of chemicals to the air or water. The permits set limits on the amount of a pollutant that can be released. The limits are set at levels protective of both human health and the environment.

625 mrem

Annual radiation dose to the average person living in the United States

311 mrem

Annual background dose from naturally occurring radionuclides

100 mrem

Annual exposure limit from DOE operations to an individual member of the public

0.16 mrem

Maximum dose to a representative member of the public from SRS operations in 2014

Millirem is a dose of absorbed energy adjusted to be equivalent for different kinds of radiation.

Monitoring Program

SRS conducts extensive environmental monitoring to determine impacts, if any, from SRS operations to the surrounding communities and the environment. In addition to the monitoring activities conducted on the Site, SRS also monitors a 2,000-square-mile area beyond the Site boundary.

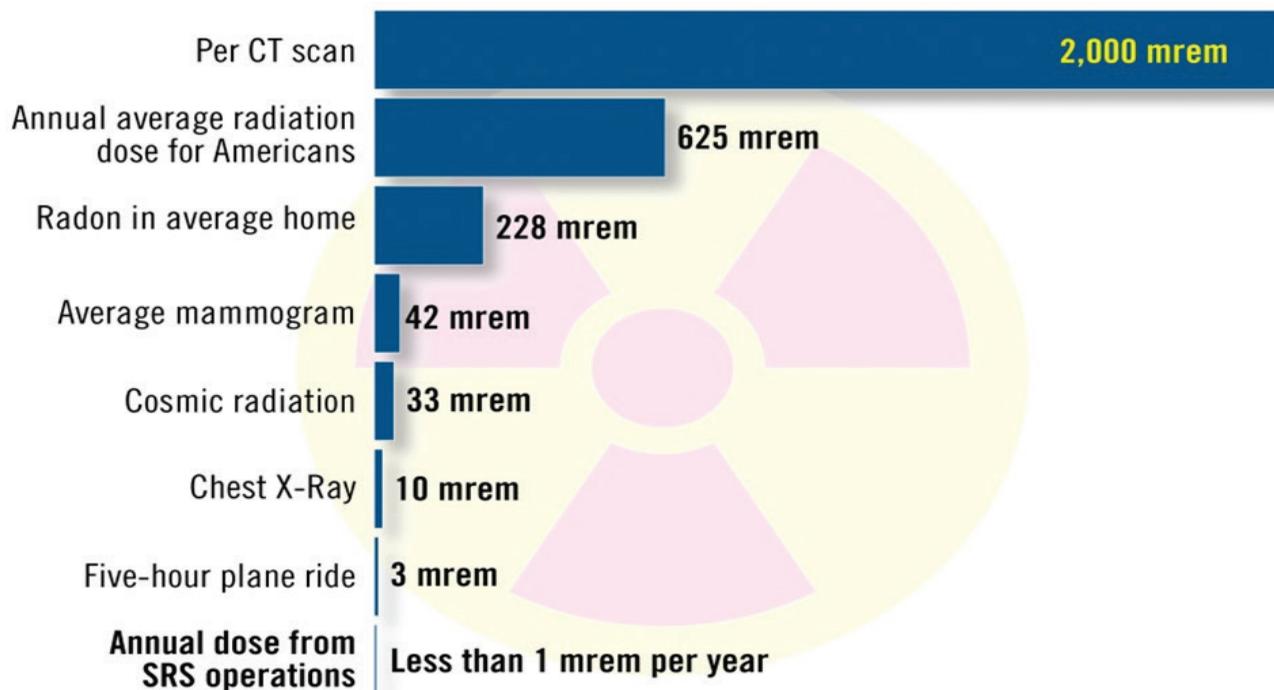
Work at SRS continued to have little effect on the public and the environment. The Site's radioactive and chemical discharges to air and water were well below federal, state and DOE regulations and standards that are set to protect the public, environment, and Site workers. SRS calculates the dose from Site operations to a representative person (hypothetical person) who supposedly lived at the SRS boundary; drank milk and ate meat and vegetables from that location; drank water and ate fish from the Savannah River; and spent time on or near the river every day.

Results: Far Below Dose and Health Limits

The total dose to this individual from SRS liquid and air releases was estimated at 0.16 millirem (mrem) for 2014 as compared to 0.19 mrem for 2013. It is well below the dose limit of 100 mrem per year set by DOE for radiation exposure to the public from all sources combined.

You will find more information in Chapter 6, "Radiological Dose Assessments," of the *Savannah River Site Environmental Report for 2014*.

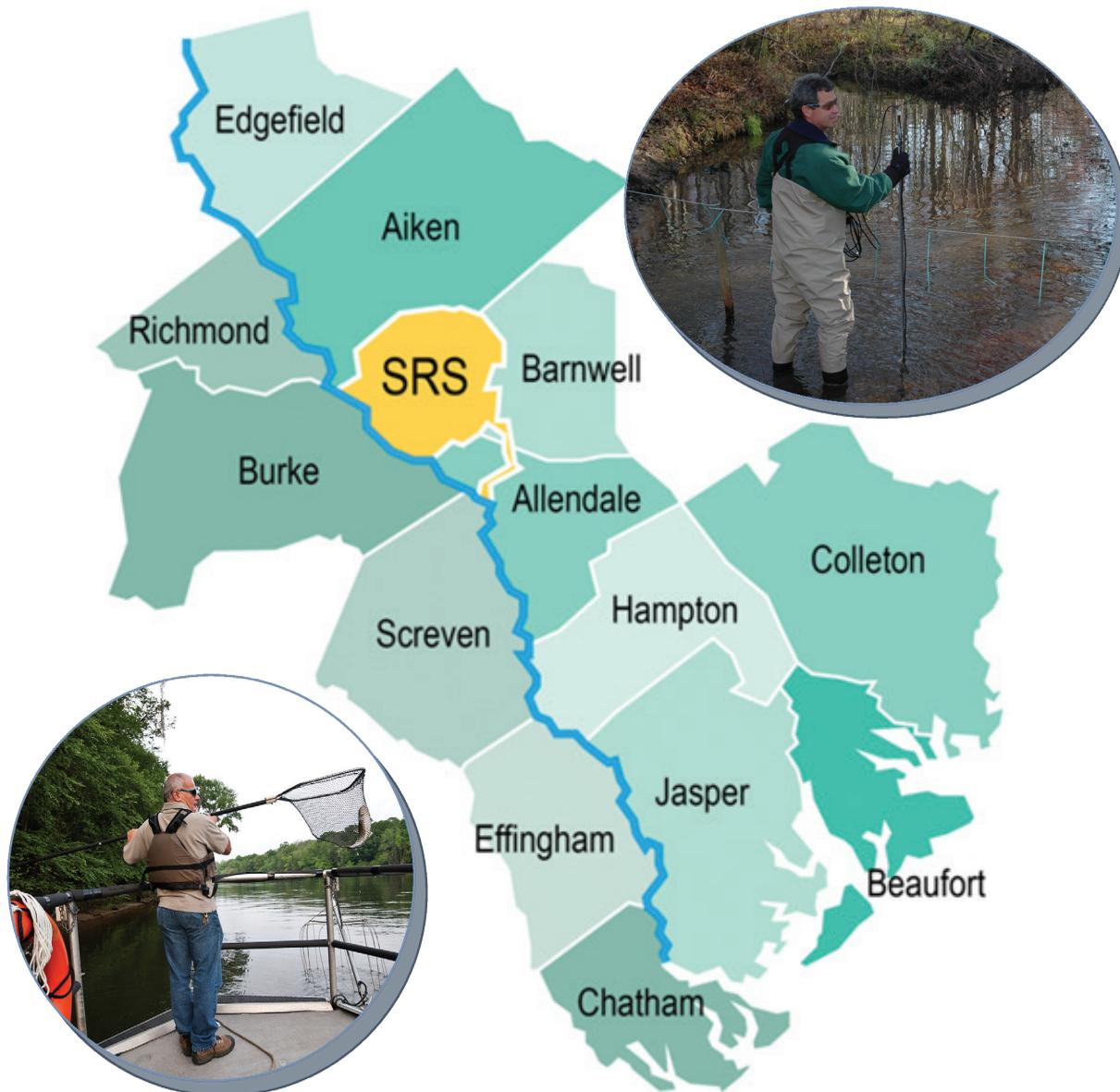
Comparison of Dose from SRS Operations with Dose Associated with Common Activities



2014 Environmental Monitoring and Sampling Results

SRS performs environmental monitoring to meet state and federal regulations and DOE orders. The monitoring results are used to determine how operations at the Site affect the community and environment and are summarized below. DOE Order 458.1, "Radiation Protection of the Public and the Environment" specifies radiation dose standards for individual members of the public.

Detailed environmental monitoring and sampling program descriptions and results are available in Chapters 4, "Effluent Monitoring", and 5, "Environmental Surveillance", of the *Savannah River Site Environmental Report for 2014*.



Radiological Surface Water and Sediment Monitoring

SRS monitors surface water for radionuclides associated with SRS operations. Monitoring locations include storm water and stream sediment in Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, Lower Three Runs, and McQueen Branch, and the Savannah River.

The concentrations are far below DOE standards. The levels in the streams show a decreasing trend, which is due to a combination of decreases in Site releases and the natural decay of radionuclides. Sediment sample results indicate no buildup of radioactive materials from effluent release points.

Surface Water Chemical Monitoring

During 2014, SRS met the permit requirements in all facilities over 99% of the time. Only one out of approximately 3,200 sample analyses performed during 2014 exceeded National Pollution Discharge Elimination System (NPDES) permit limits, a 99.9% compliance rate. SRS did not receive any Notices of Violation from the state of South Carolina. You will find additional information in Chapter 3, "Compliance Summary," of the *Savannah River Site Environmental Report for 2014*.

Onsite and Municipal Drinking Water Facilities

SRS operates onsite water treatment facilities that supply most of the drinking water at SRS.

All samples collected from these systems in 2014 met the state of South Carolina and Environmental Protection Agency (EPA) chemical water quality standards.

SRS also gathers samples at two off site water treatment facilities that use water from the Savannah River. One of these facilities is located in Beaufort, South Carolina and one is in North Augusta, South Carolina.

No monitored drinking water results were over the maximum contaminate levels set by the state of South Carolina or Environmental Protection Agency (EPA).

You will find more information in Chapter 5, "Environmental Surveillance," of the *Savannah River Site Environmental Report for 2014*.

3,200

Approximate number of sample analyses performed as part of the SRS NPDES monitoring.

1

Sample exceeded NPDES limits

99.9%

Compliance with NPDES Permit limits

0

Notices of Violation from the state of South Carolina

Onsite and Offsite Groundwater Monitoring

SRS monitors groundwater onsite for contamination including chemicals such as trichloroethylene (TCE) and tetrachloroethylene (PCE) and radioactive contaminants including tritium, strontium-90, and technetium-99. Most of the contaminated groundwater is found in the central area of SRS and does not affect areas beyond the boundaries of SRS. Currently, groundwater contaminant levels beneath a small area (less than 3%) of SRS are greater than the standards set by the EPA and the state of South Carolina. SRS continues cleanup activities to restore groundwater to beneficial use and prevent any further exposure to contaminants.

SRS also monitors offsite in Georgia. In the early 1990s, SRS assessed the likelihood of tritium transport beneath the Savannah River from South Carolina to Georgia. A groundwater model developed by the U.S. Geological Survey indicated there is no mechanism by which groundwater, and thus no tritium, could flow under the Savannah River and contaminate Georgia wells. In response to public concern, SRS continues to monitor for tritium in groundwater monitoring wells. Tritium concentrations in these wells are far below the EPA safe drinking water limit. There is no evidence that tritium is transported by the groundwater pathway from SRS.



The South Carolina Department of Health and Environmental Control (SCDHEC) conducts groundwater monitoring adjacent to SRS in South Carolina, as part of a grant from DOE-SR. You will find more information at the [SCDHEC ESOP webpage](#).

You will find more information on SRS activities in Chapter 7, "Groundwater Management Program," of the *Savannah River Site Environmental Report for 2014*.



Monitoring Well Installation

42

Samples collected from Georgia wells

1

Number of samples with detectable tritium concentrations

Highest concentration of tritium in the single sample with detectable levels was <1% of EPA Drinking Water Standard

Air Monitoring

SRS monitors many different pathways in order to study our effect on workers, the public, animals, and plants. We monitor the air at several locations, on and off site, to make sure our activities are not affecting the air of nearby communities.

Radiological Air Monitoring

SRS monitors radionuclides in air releases to demonstrate compliance with EPA's National Emissions Standards for Hazardous Air Pollutants (NESHAP) and DOE dose standards.

In 2014, the Total Effective Dose (TED) from all sources at SRS calculated for NESHAP compliance was 0.031 mrem per year, well below the EPA 10 mrem per year standard. The TED from all sources at SRS calculated for DOE order compliance was 0.044 mrem per year.



Chemical Air Monitoring

The release of air pollutants is regulated under the Clean Air Act. SRS monitors chemical air pollutants that include carbon monoxide, sulfur oxides, nitrogen oxides, volatile organic compounds, asbestos, and tiny pieces (particulate) of matter. You will find more information in Chapter 3, "Compliance Summary," of the *Savannah River Site Environmental Report for 2014*.

Releases of these pollutants were far below permit limits this year.

You will find more information in Chapter 4, "Effluent Monitoring," of the *Savannah River Site Environmental Report for 2014*.

Monitoring Food Products

Meat, Fruits, and Vegetables

In 2014, SRS sampled collards, fruit, soybeans, peanuts, and beef from farms near SRS.

The highest single dose from eating these types of food was estimated to be 0.081 mrem, a very small fraction of the standard.

Milk

SRS collected milk from eight dairies within 25 miles of SRS.

A person who drank 310 liters (82 gallons) of milk collected from nearby farms could have taken in a dose of 0.020 mrem, a very small fraction of the standard.



Fish and Shellfish

SRS collected fish from several spots along the Savannah River, found upstream and downstream from SRS, and shellfish from the South Carolina coast in 2014.

The highest dose of radiation that could be received from eating the fish we sampled was calculated to be 0.28 mrem.

SRS monitors fish from the Savannah River and nearby fresh-water bodies for metals.

The mercury levels found are within or below the levels that SCDHEC issued for warnings about consumption of fish in the Savannah River. SCDHEC issues advisories to help ensure that the fish you catch are safe to eat.

You will find more information on consumption of fish caught in South Carolina waters at the [SCDHEC Fish Consumption Advisory webpage](#). Most states have issued fish consumption advisories. To look at other states' advisories, go to [EPA's Fish Consumption Advisories webpage](#).



Game Animals

SRS conducts seasonal controlled hunts for safety purposes to reduce vehicle impact collisions. Hunters harvest deer, feral hogs, turkeys, and coyotes.

All harvested animals are monitored for radionuclide concentrations and doses assigned to hunters before the animals are released from SRS control.

During 2014, the highest dose of radiation an onsite hunter could have received was estimated to be 18.3 mrem, below the 22 mrem per year DOE administrative release limit.

You will find more information in Chapter 5, "Environmental Surveillance," and Chapter 6, "Radiological Dose Assessments," of the *Savannah River Site Environmental Report for 2014*.



Honoring Our Commitment

We are committed to cleaning up legacy contamination, minimizing the effects of our operations, and working with community leaders and our neighbors to keep SRS and the surrounding communities a safe place to live and work. SRS honors these commitments through results. For SRS, 2014 was another year of sound results while keeping the public's potential radiation dose from SRS operations well below any federal public dose limit.

Environmental Stewardship

SRS met all regulatory laws and standards and under the Area Completion Projects continued operation of soil and groundwater cleanup systems. Under Waste Disposition SRS continued processing and disposing of radioactive waste through the Interim Salt Waste Disposition facilities where over one million gallons of salt waste was safely processed. We continued construction of the Saltwaste Processing Facility to increase how much salt waste we can treat. We also continued construction of disposal units at the saltstone facilities to accommodate the salt treatment capacity.

In 2014, SRS continued with preparations to close two radioactive tanks that once held legacy waste that had already been treated and processed. This processed waste either went into glass waste canisters at the Defense Waste Processing Facility or has been disposed of in the saltstone facilities. Closing these tanks stabilizes the empty tanks with grout further eliminating the risk associated with the Site's legacy waste.

At SRS, transuranic waste is solid waste mostly in the form of clothing, tools, rags, and other items contaminated with small amounts of man-made elements that are heavier (higher in atomic number) than uranium, such as plutonium. In 2014, SRS finalized preparations for the last shipment of legacy transuranic waste at the Site for disposal at the Waste Isolation Pilot Plant in Carlsbad, New Mexico at a time to be determined in the future.

As part of the SRS mission, we ensure that the United States' excess plutonium and other special nuclear materials continue to be under safe and secure handling and storage. In 2014 SRS continued disposition of nuclear materials through used nuclear fuel processing.

National Security

SRS plays an important role in the national mission to prevent the spread of nuclear weapons and related material, thereby helping the United States to meet its international commitments in this mission area. SRS uses H-Canyon, the only facility of its kind left in the United States, to downblend enriched nuclear materials into undesirable forms that cannot be used for nuclear weapons, but rather used to make fuel for commercial power reactors, such as the Tennessee Valley Authority, which provide power for homes.

For over a half-century, SRS has consistently delivered high-quality tritium products and services to meet the needs of the United States military. Tritium is a radioactive form of the hydrogen element in a gaseous state. SRS continued to process and deliver tritium in 2014.

Your Neighbor in the Central Savannah River Area

Our missions at SRS and protecting the environment go hand-in-hand. Our missions create jobs for our citizens, provide for research and development in environmental stewardship through renewable energy and cleanup technologies; and further assist with national security.

Environmental stewardship is not only a requirement but it is also important to us as we share this community with you. We live and work in this community as your friends, neighbors, and community partners.

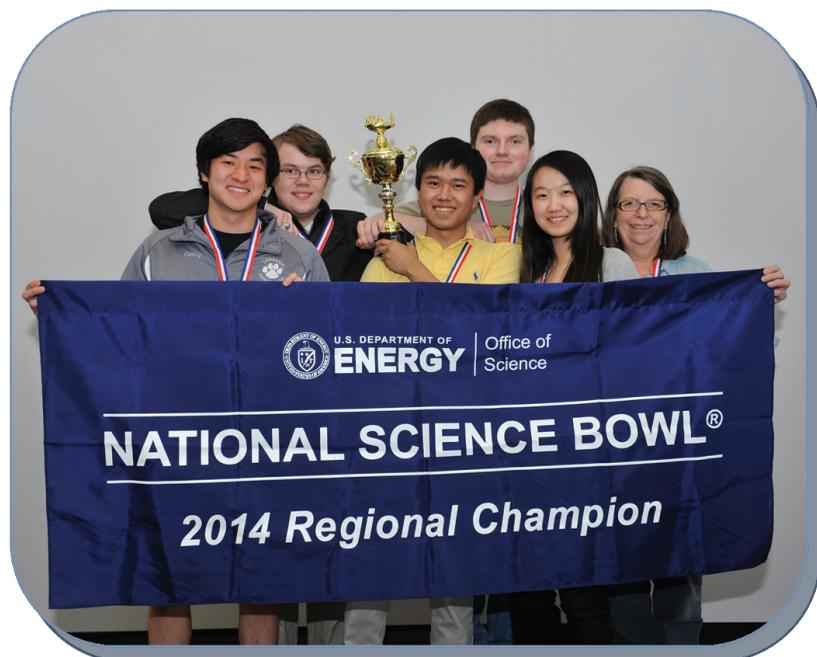
Supporting Education in Our Communities

SRS considers science, technology, engineering, and math (STEM) education very important to its community. We know how important it is to teach our children these subjects. For the United States to remain competitive with other countries on building new technology, we need new, trained workforces to succeed the retiring workers. SRS provides financial support for STEM education for students from elementary school through college. We are dedicated to supporting programs, events, and campaigns that facilitate students learning and foster teacher growth. Some of these programs include:

- The DOE Savannah River Regional Science Bowl is organized for students to compete in the areas of biology, chemistry, physics, math, earth sciences, computers, energy, and astronomy. SRS invites local high schools to participate in the regional competition that is held in the first three months of every year. Regional winners compete in the National Science Bowl held every year in Washington D.C.



The SRS within the Counties of the Central Savannah River Area



- The Innovative Teaching Mini-Grants program provides elementary and middle school teachers with the opportunity to compete for a grant from SRS for their creative and new teaching ideas related to math and science. Grants of \$500, \$750, and \$1,000 are awarded so that teachers can buy the things needed to help their students improve in these subjects. Elementary and middle school teachers in the seven-county area (Aiken, Allendale, Bamberg, Barnwell, and Edgefield Counties in South Carolina and Columbia and Richmond Counties in Georgia) are invited to apply.

- The Future City Competition is held across the United States and is supported by DiscoverE, formerly known as National Engineers Week Foundation. This competition is held to help more middle school students understand technology and engineering.



- The Savannah River Regional Science and Engineering Fair gives grade school children from the CSRA the opportunity to learn about research in science and technology by planning, building, and showing off their own “hands-on” science projects. First place winning projects by 4th through 12th graders from school science fairs are invited to enter.

- The Traveling Science Demonstration Program is a partnership between the University of South Carolina-Aiken’s Ruth Patrick Science Education Center and SRS. World-class scientists and engineers from SRS volunteer to teach elementary, middle and high school students about chemistry, biology and physics. The volunteers demonstrate experiments for teachers and students using science kits that schools can borrow. The program also allows teachers to use equipment not available in schools. Visits are planned by contacting the Ruth Patrick Science Center.



Neighbors Helping Neighbors

SRS supports the surrounding communities through a number of social programs. We help the community in various ways through donating to the United Way campaign, Toys for Tots, and donating blood to the Shepard Community Blood Center. SRS holds educational programs for schools, participates in and sponsors food and clothing drives for neighbors in need; and supports our troops through a variety of programs.

On the job, at home, and in the community – SRS is proud to be your neighbor.



SRS supports our community.

Clockwise from top: Project Vision, Toys for Tots, United Way, and Touch an Animal Day

How You Can Be Involved

Community Outreach

SRS continues to support community outreach initiatives that are focused on building partnerships and trust on a number of issues related to the Site. Community outreach initiatives include business and community development; gifts to community-based and national organizations through corporate contributions and hours of volunteer work. SRS also provides tours related to our mission for the public ([SRS Public Tour Program](#)), sponsors public involvement activities like the SRS Environmental Bulletin, and hosts special public meetings and hearings or events.

Environmental Justice

Since 1995 DOE-SR has funded the environmental justice (EJ) program, and has coordinated with the EPA beginning in 2003, through a grant with Savannah State University (SSU) in Savannah, Georgia.

The EJ program includes the following:

- Addressing environmental justice concerns, job-training programs, the availability of resources through grants, capacity building, environmental monitoring, and emergency response. EJ meetings took place in Augusta, Waynesboro, Shell Bluff, Millen and Sylvania, Georgia; and North Augusta, Edgefield, Aiken, Blackville, Barnwell, Allendale, Columbia, Beaufort, Denmark and Hampton, South Carolina.
- Organizing the Teaching Radiation, Energy and Technology (TREAT) Workshop to provide opportunities for local school teachers and members of the public to learn about environmental radiation.
- Continuing to get newer and better cutting-edge environmental analytical laboratory equipment for the SSU Environmental Science students, and mentoring students in the Environmental Scholars Program.
- Providing student internships for environmental contaminant analysis research projects, hands on training, and the chance to work with local communities on the parts that make up environmental justice.



For more information about the SRS EJ program, contact the DOE-SR EJ Coordinator at (803) 952-8607.

Citizens Advisory Board

The SRS Citizens Advisory Board (CAB) is one of the eight chapters of the DOE Environmental Management Advisory Boards that is specific to a site. These boards give advice and recommendations to DOE on environmental remediation, waste management, and related issues. The SRS CAB is nationally recognized as one of the most productive site-specific advisory boards in the DOE complex. The SRS CAB provided nine recommendations to DOE in 2014.

Part of the SRS CAB mission is to improve communication with communities that could be impacted by the Site and to make sure the stakeholders have the chance to become involved in decisions made at the Site. A speaker's bureau is available to provide information about the SRS CAB and its activities at civic organizations and club meetings.

For more information about the CAB and its recommendations, call the CAB administrator at (800) 249-8155, email the board at

srscitizensadvisoryboard@srs.gov, or visit the CAB website at <http://cab.srs.gov>. A schedule of the SRS CAB meetings, including online meetings, is available on the website. Membership applications, also available on the website, are accepted year-round and selected yearly from stakeholders in Georgia and South Carolina.



Public Involvement in SRS Cleanup Decisions

SRS has held a range of community involvement activities to get community input and make sure that the public stays informed about Site activities throughout the cleanup process. Outreach activities have included public notices and information meetings on cleanup progress and activities. The Savannah River Site Federal Facility Agreement Community Involvement Plan serves as the overall guidance document for public participation and outreach activities at SRS and is available at http://www.srs.gov/general/programs/soil/ffa/CIP_2011.pdf. This plan explains the process SRS uses for public participation as well as ways the public can be involved in the SRS cleanup decision-making process.

In cooperation with the state of South Carolina and the EPA, and in consultation with the Nuclear Regulatory Commission (NRC), SRS seeks public involvement by taking part in workshops, public meetings and public comment periods on radioactive liquid waste tank closure documents so that the concerns of all the affected people can be answered. Additional information can be found at the NRC Public Meetings and Involvement webpage at <http://www.nrc.gov.edgesuite.net/public-involve.html> or the SCDHEC Public Notices webpage at <http://www.scdhec.gov/publicnotices/>.

Savannah River Site

How To Learn More

Visit the SRS website: <http://www.srs.gov/general/srs-home.html>

The Savannah River Site Environmental Report for 2014 is available on the web at the following address:

<http://www.srs.gov/general/pubs/ERsum/er14/index.html>.

Contact Us

For information about the Department of Energy-Savannah River Operations Office contact:

Office of External Affairs

Savannah River Operations Office

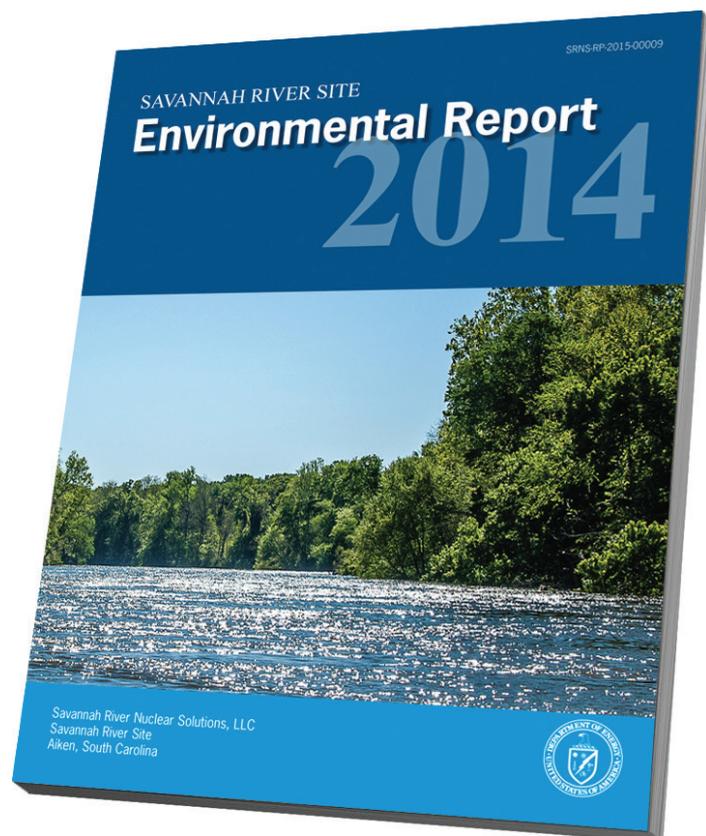
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