

Chapter 4: Nonradiological Environmental Monitoring Program

The Savannah River Site (SRS) nonradiological environmental monitoring program serves two purposes: it confirms the Site is complying with state and federal regulations and permits, and it monitors any effects SRS has on the environment, both onsite and offsite. SRS monitors permitted point-source discharges from onsite facilities for nonradiological parameters to ensure it is complying with regulations and permit requirements. SRS collects and analyzes environmental media such as air, water, sediment, and fish for nonradiological parameters to evaluate the effect of Site operations on the environment.

2022 Highlights

Effluent Releases

- Nonradiological effluent releases for all categories except industrial wastewater met permit limits and applicable standards.
- SRS reported only four exceptions out of 2,334 analyses at SRS National Pollutant Discharge Elimination System (NPDES) industrial wastewater outfalls, a greater than 99% compliance rate.
- All SRS industrial stormwater outfalls under the South Carolina general industrial stormwater permit were compliant.

Onsite Drinking Water

All SRS drinking water systems complied with South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Environmental Protection Agency (EPA) water quality standards.

Surveillance Program

- SRS industrial wastewater and industrial stormwater discharges are not significantly affecting the water quality of onsite streams and the Savannah River.
- Sediment results from SRS streams, stormwater basins, and the Savannah River were consistent with the background control locations and were comparable with historical levels.
- Fish flesh sample results were consistent with historical levels.

4.1 INTRODUCTION

Environmental monitoring programs at SRS examine both radiological and nonradiological constituents that Site activities could release into the environment. Chapter 5, *Radiological Environmental Monitoring Program*, discusses the radiological components of this monitoring program, while this chapter focuses on the nonradiological constituents.

The nonradiological monitoring program collects and analyzes air, water, sludge, sediment, and fish samples from numerous locations throughout SRS and the surrounding area. The program consists of two focus areas: 1) effluent monitoring, and 2) environmental surveillance. The objective of the effluent monitoring program is to demonstrate the Site is complying with permits, and the focus of the environmental surveillance program is to assess the environmental impacts of Site operations on the surrounding area. SRS determines sampling frequency and analyses based on permit-mandated monitoring requirements and federal regulations.

SRS conducts nonradiological environmental monitoring on the following categories:

- Atmospheric (airborne emissions and precipitation with a special focus on mercury deposition)
- Water (wastewater, stormwater, sludge, onsite drinking water, and river and stream water quality)
- River, stream, and stormwater basin sediment
- Fish

Figure 4-1 shows the types and typical locations (for example, upstream and downstream of SRS influence) of the nonradiological sampling SRS performs.

This chapter summarizes the nonradiological environmental monitoring programs and data results. Section 8.4, *Environmental Monitoring Program QA Activities*, and Section 8.5, *Environmental Monitoring Program QC Activities*, summarize the quality assurance (QA) and quality control (QC) practices that support the sampling and analysis reported in this chapter. Appendix Table B-1 of this document summarizes the nonradiological surveillance sampling media and frequencies.

Chapter 4—Key Terms

Effluent is a release to the environment of treated or untreated water or air from a pipe or a stack. Liquid effluent flows into a body of water, such as a stream or lake. Airborne effluent (also called emission) discharges into the air.

Effluent monitoring is the collection of samples or data from the point a facility discharges liquids or releases gases.

Environmental surveillance is the collection of samples beyond the effluent discharge points and from the surrounding environment.

Outfall is a place where treated or untreated water flows out of a pipe or ditch.

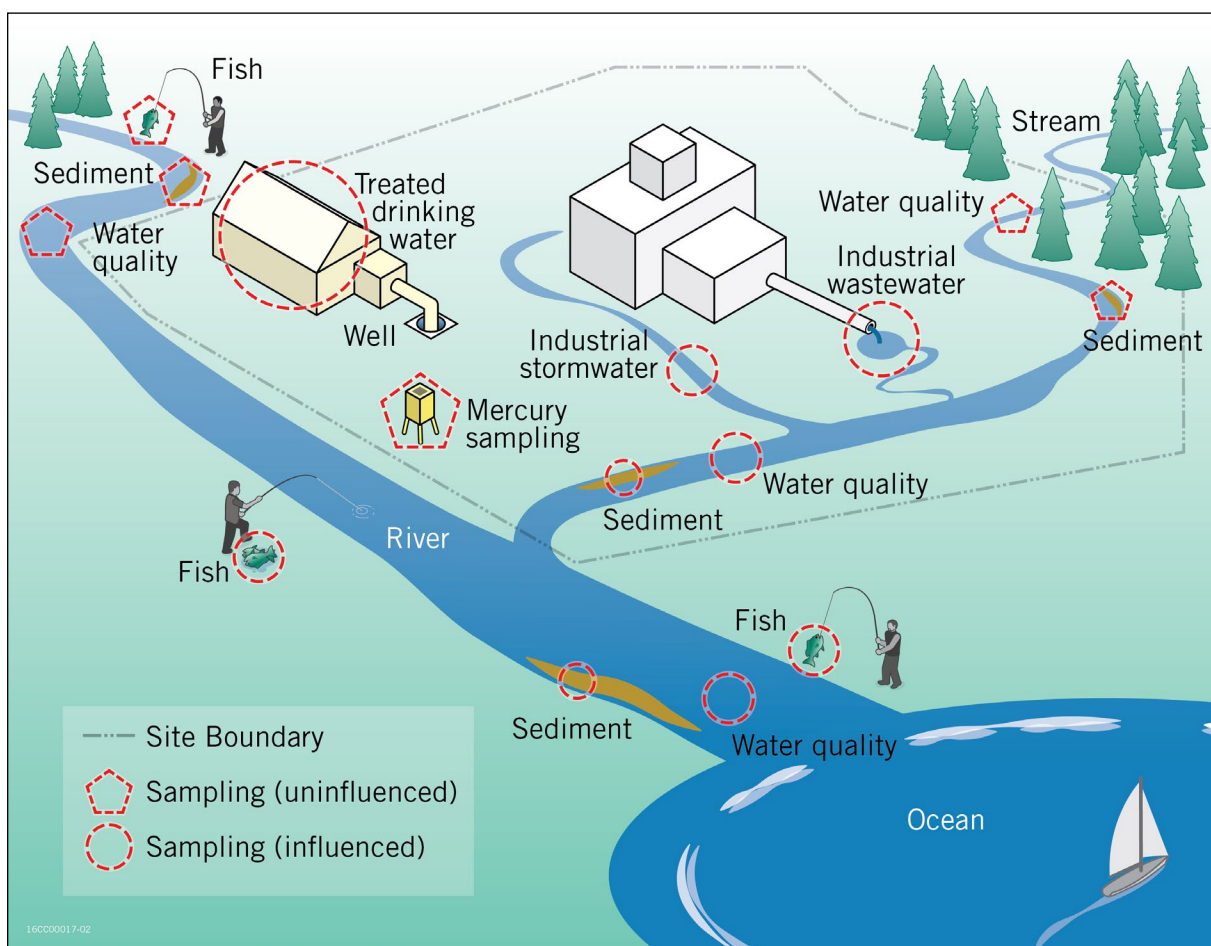


Figure 4-1 Types and Typical Locations of Nonradiological Sampling

4.2 CALCULATED AIR EMISSIONS

Airborne contaminants can present a risk to public health and the environment. Thus, identifying and quantifying these contaminants is essential to a nonradiological monitoring program. SCDHEC regulates nonradioactive air pollutant emissions from SRS sources. The regulations list pollutants, compliance limits, and the analytical methods or test procedures approved to demonstrate compliance.

SRS uses nonradioactive volatile chemicals (gasoline and toluene), fuels, and combustion products that can adversely affect the environment if released into the air in sufficient quantities. However, the Site uses most of these materials in very small quantities, and the environmental impact from their potential release is negligible. Because of the nature and quantity of potential air emissions, regulators do not require SRS to sample or monitor the ambient air for chemical pollutants. Following SCDHEC requirements, SRS uses process data to calculate emissions.

Many of the applicable regulatory standards are source-dependent (that is, applicable to certain types of industries, processes, or equipment). The SCDHEC-issued Title V operating permit provides the source-specific limits for operating facilities, source sampling, testing, monitoring, and reporting frequency. SRS demonstrates it is complying with these regulations by performing air dispersion modeling

and submitting to SCDHEC an emissions inventory of air pollutant emissions. SRS uses SCDHEC- and EPA-approved calculations that include source-operating parameters—such as operating hours, process throughput, and EPA-approved emission factors—to determine facility source emissions. SRS then compares the total actual annual emissions for each source to the emission limits contained in applicable permits. Chapter 3, *Compliance Summary*, Section 3.3.6.4, *Air Emissions Inventory*, discusses emissions reporting.

4.3 WATER MONITORING

SRS nonradiological water monitoring includes collecting water, sludge, and sediment samples and performing field measurements on various water sources onsite and from the Savannah River. The sample results enable SRS personnel to evaluate whether there is long-term buildup of pollutants downstream of discharge points and determine whether SRS is complying with permit requirements. SRS also collects and analyzes fish from the Savannah River to evaluate metal uptake in the flesh. Chapter 7, *Groundwater Management Program*, discusses SRS groundwater monitoring.

4.3.1 Wastewater, Stormwater, and Sludge Monitoring

Nonradiological surface water monitoring primarily consists of sampling water discharges (industrial wastewater and industrial stormwater) associated with SRS NPDES-permitted outfalls. SRS monitors nonradiological liquid discharges to surface waters through the NPDES program, as mandated by the Clean Water Act. The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into Waters of the United States.

SCDHEC administers the NPDES permit program and is responsible for permitting, compliance tracking, monitoring, and enforcing the program. The permits SCDHEC issues to SRS provide specific requirements for sampling locations, collection methods, analytes required at an individual outfall, monitoring frequency, permit limits for each analyte, and analytical and reporting methods.

SRS collects NPDES samples in the field according to 40 Code of Federal Regulations (CFR) 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants*. This document lists specific methods for sample collection and preservation, and acceptable analytical methods for the type of pollutant.

Wastewater

Through May 2022, SRS monitored 28 industrial wastewater outfalls for physical and chemical properties, including flow, dissolved oxygen, acidity (pH), ammonia, biochemical oxygen demand, fecal coliform, metals, oil and grease, volatile organic compounds, and total suspended solids (TSS). At the end of May, Permit SC0047431 concluded, and sampling at D-Area outfalls was halted permanently, leaving 20 outfalls. Figure 4-2 shows these locations. The permit specifies how often SRS is to monitor the outfalls. Typically, SRS



A Refrigerated Sampler Allows for Remote Temperature Verification.

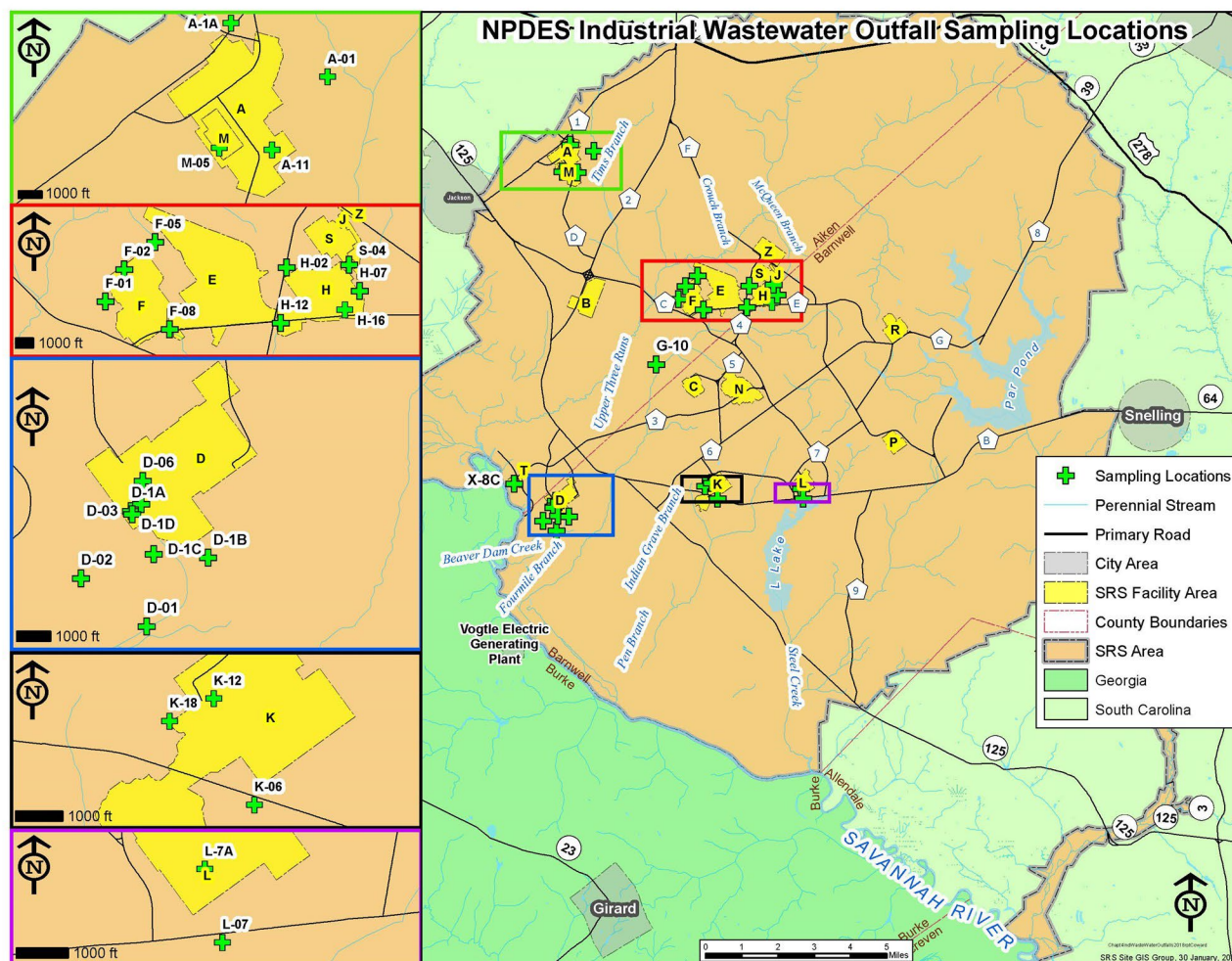


Figure 4-2 NPDES Industrial Wastewater Outfall Sampling Locations

collected samples at the locations once a month, although some locations required monitoring as frequently as once a day and others as infrequently as once a quarter. As specified by the permit, SRS collected either grab samples (individual sample collected all at one time) or composite samples collected over a specific period, typically 24 hours. SRS has also continued to utilize new technology to more efficiently collect samples and improve QA/QC methods. A refrigerated sampler coupled with a modem allowed personnel to verify the sample temperature and communicate with the equipment by remote control. SRS reported results to SCDHEC in required monthly discharge monitoring reports. In addition, SRS collected QC samples as an internal check to ensure representative data. Section 8.5, *Environmental Monitoring Program QC Activities*, summarizes the QC sample results.

SCDHEC assesses the SRS NPDES Industrial Wastewater program during Comprehensive Evaluation Inspections or Comprehensive Sample Inspections. The evaluation includes discharge sampling; records and procedures review; personnel interviews; and outfall, treatment facility, and land application site inspections. SCDHEC did not conduct any inspections in 2022.

Stormwater

SCDHEC issued a new five-year Industrial Stormwater permit effective July 2022 that covers 33 outfalls. The previous general permit, which was effective through June 2022, covered 36 industrial stormwater outfalls, which Figure 4-3 illustrates. Three outfalls—B-10, Y-01, and Y-03—were deactivated in 2022, effective with the new permit. Industrial stormwater monitoring consists of four components: effluent limitations guidelines monitoring, impaired waters monitoring, benchmark monitoring, and visual assessment.

SRS typically collects stormwater samples during qualifying rain events, characterized by two conditions: 1) at least 72 hours have elapsed since the previous flow event, and 2) the sample collection should occur during the first 30 minutes of the flow event. For benchmark samples, SRS continued to use wireless technology to send immediate text notifications of rain events and to start automated samplers. For visual assessments, SRS uses sample bottles installed in some outfalls that fill when the flow reaches the bottle inlet. These practices allowed SRS to comply with the SCDHEC permit requirement of sampling within 30 minutes of stormwater flow. SRS collects grab samples in a few locations where automated installations are not possible due to the construction of the outfall.

Effluent Limitations Guidelines Monitoring—Certain outfall sectors have specific limitations imposed. SRS has one outfall that falls in this category because the runoff is from a coal storage pile area at a decommissioned steam electric-generating facility. The stormwater runoff collects into a basin that was designed for at least a 10-year/24-hour rainfall event. Although the outfall has not discharged since 1991, in the event that it does discharge, SRS will sample for pH. SRS submits an annual report to SCDHEC that indicates the outfall has not discharged in the previous 12 months.

Impaired Waters Monitoring—A waterbody is impaired if it has been identified as not meeting applicable state water quality standards. When a receiving stream is impaired, SRS samples stormwater discharges to that stream to ensure they are not contributing to an existing problem. Under the impaired water monitoring program, SRS does not sample and analyze for *Escherichia coli* (*E. coli*) because SRS processes do not contribute that contaminant to either of the two *E. coli*-impaired streams onsite.

Benchmark Monitoring—SRS must monitor for any benchmark parameter specified for the outfall's assigned industrial sector(s). Not all outfalls have required benchmark monitoring. Under the previous permit, which expired in July, benchmark sampling requirements had been met at all but one outfall, N-12A, which did not meet the copper limit. The Site implemented corrective measures, and the results are trending in a positive direction. Under the current permit, benchmark sampling for an analyte must continue until the average of four consecutive quarters meets the benchmark limit. The requirement is then met until year four of the permit, when it must be repeated. Because only two quarters of the new permit elapsed in 2022, benchmark sampling continues at all outfalls with benchmark limits.

Visual Assessment—Visual assessment outfalls are divided into groups with substantially identical effluents. Each year, one outfall is selected from each group to be the designated representative outfall for the required quarterly sampling. The representative outfall in each group rotates annually. Trained Site employees collect samples and inspect them for clarity, odor, oil and grease, and other simple parameters. The inspector completes visual assessment forms to document the assessment results.

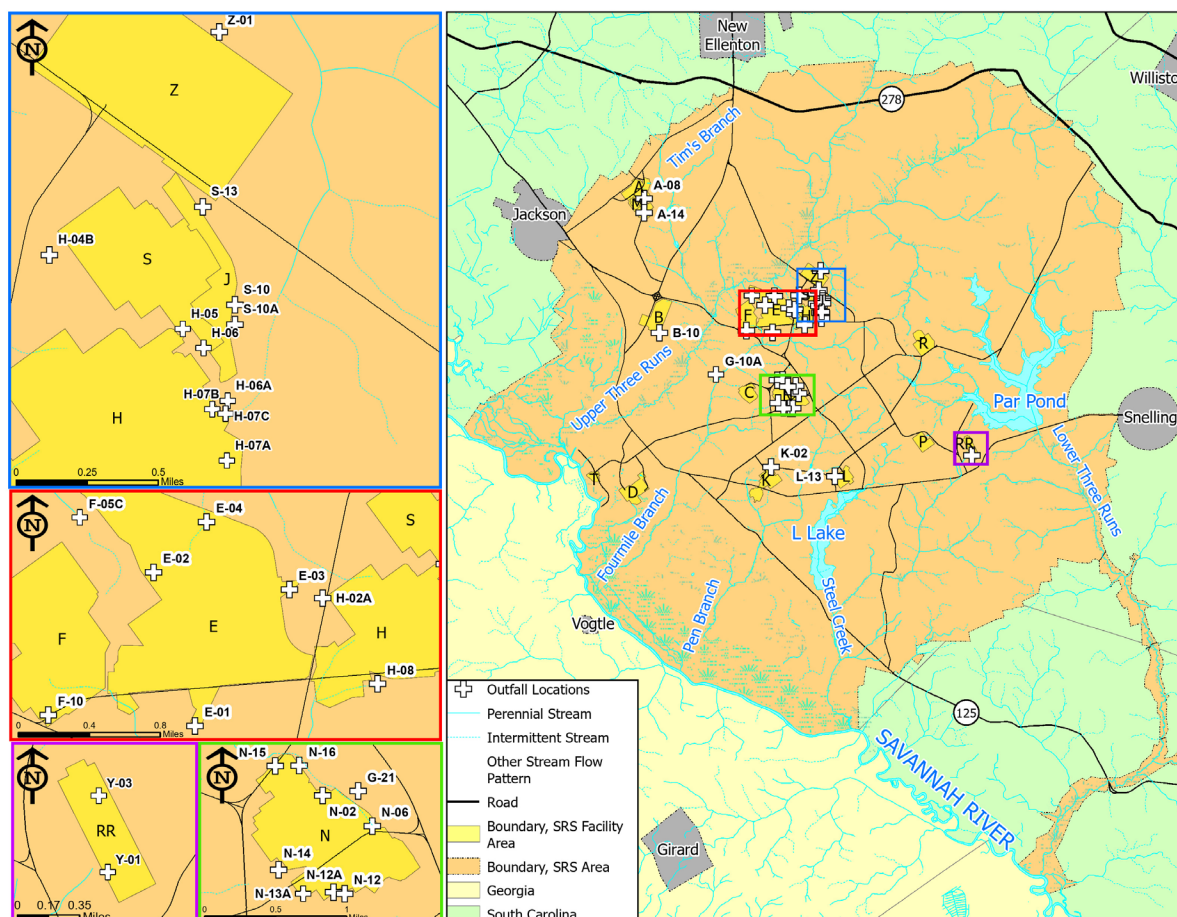


Figure 4-3 NPDES Industrial Stormwater Outfall Sampling Locations

Sludge

SRS disposes of sludge from the Central Sanitary Wastewater Treatment Facility according to the requirements in the SCDHEC-issued NPDES land application permit. In doing so, the Site must sample the sludge to confirm it has met the permit's standards before applying the sludge to the designated pine forest land.

4.3.1.1 Wastewater, Stormwater, and Sludge Results Summary

Wastewater

SRS reports NPDES industrial wastewater analytical results to SCDHEC through monthly Discharge Monitoring Reports. The Site reported only four permit exceptions to the permit requirements for the 2,334 analyses performed during 2022, a 99.8% compliance rate. All exceptions were due to flow meter issues at Central Sanitary Outfall G-10. A permit limit exceedance is when a sample's analyte exceeds the permit amount limits minimum or maximum value. A permit exception is a failure to comply with permit conditions other than listed effluent volumes. SRS received no Notices of Violation in 2022.

Stormwater

SRS monitored all industrial stormwater outfalls according to permit requirements in the following manner:

- SRS did not collect samples at the one outfall (H-07B) that required effluent sampling because there was no discharge in 2022. SRS reported results to SCDHEC in a required annual discharge monitoring report.
- Under the previous permit, which expired in July, SRS met benchmark sampling requirements at all but one outfall (N-12A). Sampling all benchmark outfalls under the new permit began in July and continues.
 - There was no discharge in 2022, so SRS could not collect samples at Outfalls G-10A or Z-01.
 - Under the previous permit, SRS met benchmark sampling requirements for all analytes except copper at Outfall N-12A; however, corrective measures (installing oyster shells and bone char) implemented in 2017 and 2018 are expected to be effective for several years. Oyster shells and bone char adsorb metals to reduce concentrations in the stormwater.
 - Under the current permit, zinc results for the third and fourth quarters at Outfall N-06 have made it mathematically impossible to meet the benchmark limit. These elevated zinc results led to corrective actions, and oyster shells were installed at check dams upstream of the outfall in December 2022. High copper results at Outfall N-12A continued but were lower than the highest historical result.
 - Based on evaluations of the current operations in the watersheds, SRS deactivated Outfalls B-10, Y-01, and Y-03 because the discharges do not meet the criteria SCDHEC specified.
- For visual assessment sampling, SRS groups substantially identical outfalls—30 of the 36 outfalls in 9 groupings—and designates 1 outfall to represent a group each year. SRS samples the remaining six outfalls individually and not in groups. In 2022, Site personnel visually assessed the water of these outfalls for color, odor, clarity, solids, foam, and oil sheen. Visual assessments identified no industrial impacts.



A Teledyne ISCO Sampler Jug is Removed Before Being Taken to the Lab for Analysis.

Sludge

The Site generally applies treated sludge from the Central Sanitary Wastewater Treatment Facility once every two years. SRS did not perform sludge land application in 2022.

4.3.2 Onsite Drinking Water Monitoring

SRS uses groundwater sources to supply drinking water to onsite facilities. The A-Area treatment plant supplies most of SRS's drinking water. The Site also has four smaller drinking water facilities that SCDHEC regulates, each serving fewer than 25 people.

SCDHEC requires SRS to collect 10 bacteriological samples each month from the A-Area Domestic Water Distribution System to ensure that domestic water meets SCDHEC and EPA bacteriological drinking water

quality standards. SRS surpasses this requirement by collecting 15 samples each month from various locations throughout the system.

4.3.2.1 Drinking Water Results Summary

All drinking water bacteriological samples that SRS collected in 2022 met the state and federal drinking water quality standards.

4.3.3 River and Stream Water Quality Surveillance

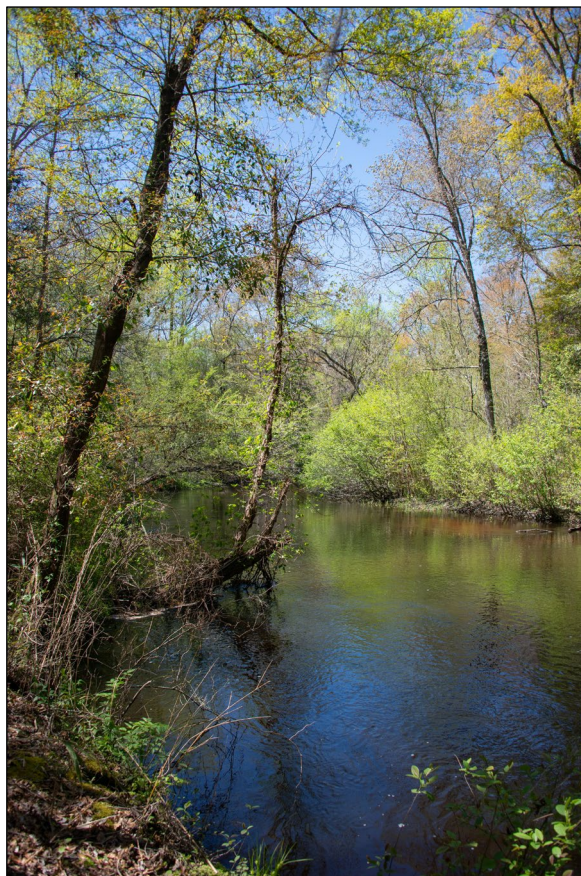
South Carolina Regulation 61-69, *Classified Waters*, classifies SRS streams and the Savannah River as “freshwaters.” Freshwaters, as defined in Regulation 61-68, *Water Classifications and Standards*, (SCDHEC 2014) support the following:

- Primary and secondary contact recreation and as a drinking water source after conventional treatment in accordance with SCDHEC requirements
- Fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora
- Industrial and agricultural uses

SRS surveys river and stream water quality to identify: 1) any degradation that could be attributable to the water discharges site NPDES permits regulate, and 2) materials coming from inadvertent releases at sources other than routine release points.

SRS sampled 10 onsite streams and 5 Savannah River locations for various physical and chemical properties, including temperature, hardness, dissolved oxygen, pH, metals, nitrate, nitrite, phosphorus, total organic carbon, and TSS. In calendar year 2022, herbicides, pesticides, and polychlorinated biphenyls (PCBs) were removed from the water quality program because historical data typically indicated nondetectable levels; this

change also aligned with the SCDHEC Environmental Surveillance and Oversight Program changes. Figure 4-4 shows the sampling locations. The river and stream sampling locations are upstream from, adjacent to, and downstream from the Site. SRS compares results to background levels of chemicals from natural sources and from contaminants produced by municipal sewage plants, medical facilities, and other upstream industrial facilities to assess the environmental impacts of Site operations on the surrounding area. SRS samples the water quality locations monthly by the conventional grab-collection



SRS Surveys River and Stream Water Quality.

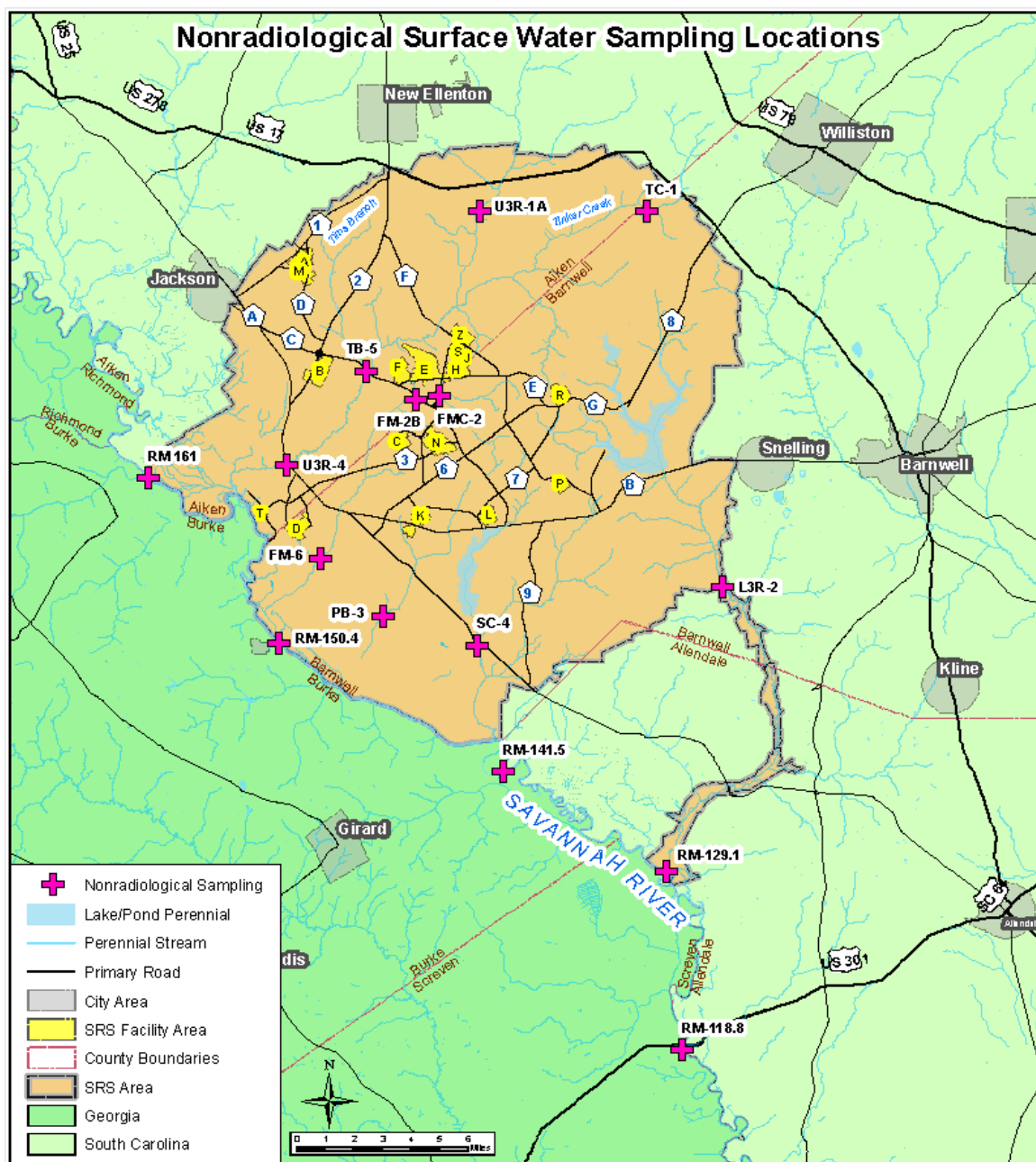


Figure 4-4 Nonradiological Surface Water Sampling Locations

technique. SCDHEC also collects samples at several onsite stream locations as a quality-control check of the SRS program. SRS collects quality control samples throughout the year, as documented in Section 8.5, *Environmental Monitoring Program QC Activities*.

4.3.3.1 River and Stream Water Quality Results Summary

SRS analyzed 3,717 individual analytes (177 samples) collected from the 15 stream- and river-water quality locations during 2022, with 2,712 of 3,009 (90.1%) meeting South Carolina Freshwater Quality Standards, as available. (Not all analytes sampled have a standard.) All samples met standards for beryllium, chromium, mercury, nickel, nitrite, and zinc. Averages for each river and stream location met standards for cadmium, copper, lead, nitrate, temperature, thallium, and dissolved oxygen. Additionally,

all locations met pH maximum standards. Appendix Table C-1 summarizes the analytical results. These results continue to indicate that SRS discharges are not significantly affecting the water quality of onsite streams or the Savannah River.

4.3.4 Sediment Sampling

SRS's nonradiological sediment surveillance program measures the concentrations of various inorganic contaminants that Site releases deposit in stormwater basins, stream systems, and the Savannah River, where they accumulate or disperse.

The nonradiological sediment program collects sediment samples annually at various site stream, stormwater basin, and Savannah River locations (Figure 4-5). The locations vary from year-to-year, depending on the rotation schedule agreed upon with SCDHEC. SRS collects duplicate samples to assess quality control, as documented in Section 8.5, *Environmental Monitoring Program QC Activities*.

4.3.4.1 Stream and River Sediment Results Summary

SRS collected and analyzed 384 individual sediment analytes from 24 locations (10 from streams, 3 from stormwater basins, and 2 from the shared stream and basin background locations; and 8 from the Savannah River and 1 from the Savannah River Background location). SRS measured aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, uranium, and zinc. Many of these are trace metals that occur naturally in soils and sediments. Of the 2022 results, 96.1 % (369 of 384 analyses) met the EPA Region 4 Sediment Refinement Screening Values (RSVs). Barium accounted for 12 of the 15

samples that exceeded its RSV (60 mg/kg), while manganese accounted for the remaining three exceeding its RSV (1,100 mg/kg). SRS considers the barium exceedances as background, as evidenced by Agency for Toxic Substances and Disease Registry 2007 Toxicological Profile for Barium (mean values ranging between 265 and 835 mg/kg), and because there are similar results in both control locations and in historical trending. Appendix Table C-2 summarizes the analytical results. All results compare to those of the previous five years and demonstrate SRS activities are not significantly affecting the metals concentrations of onsite basins and streams, or the Savannah River.



SRS's Sediment Sampling Program Examines Metals Concentrations in Rivers, Streams, and Basins.

4.3.5 Fish Monitoring

SRS samples aquatic species to identify and evaluate any effect of Site operations on contaminant levels in fish. The Site collects freshwater fish (bass, catfish, flathead catfish, and panfish) at six locations on the

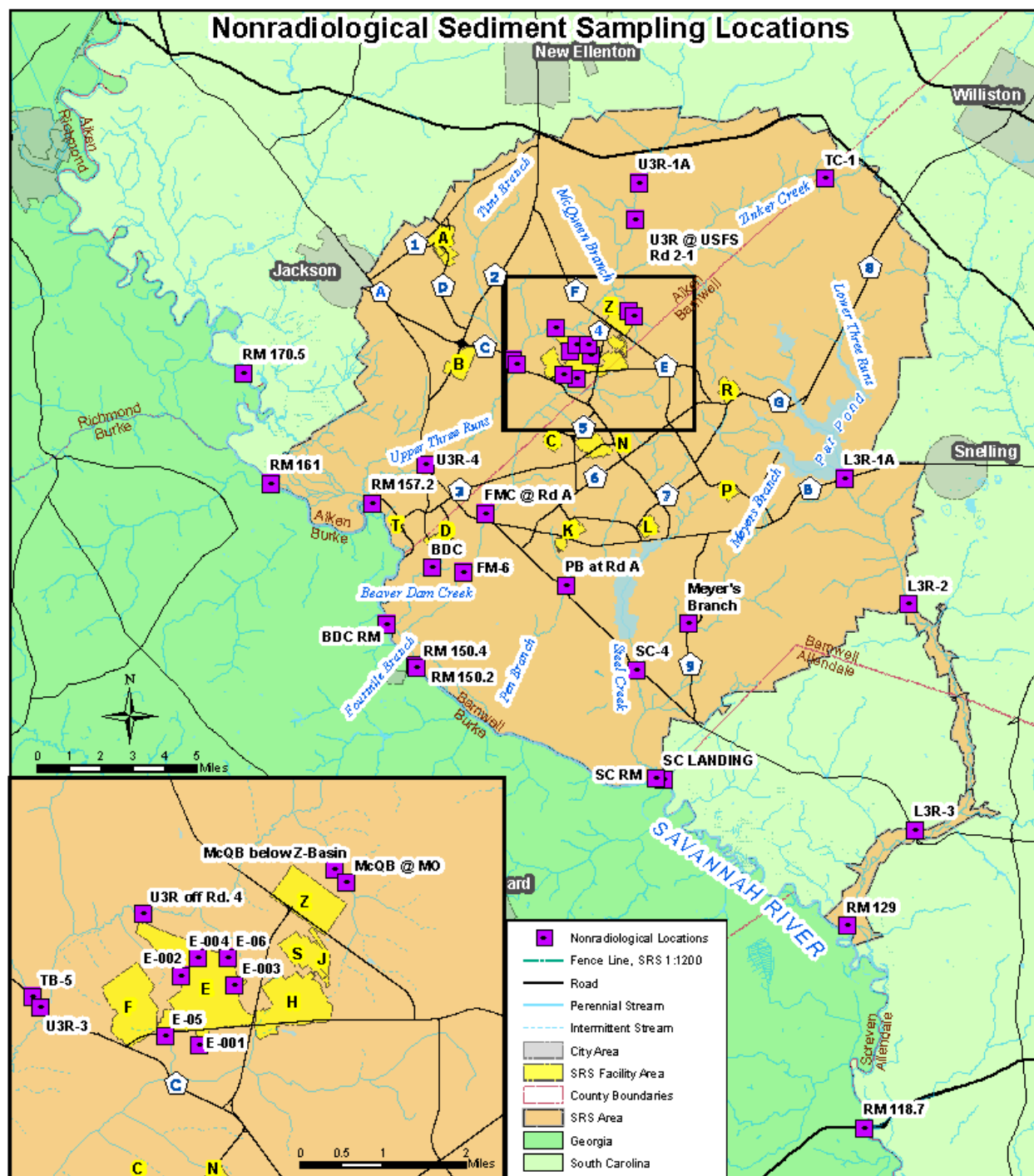


Figure 4-5 Nonradiological Sediment Sampling Locations

Savannah River from above SRS at Augusta, Georgia, to the coast at Savannah, Georgia. SRS collects freshwater fish at the mouth of the streams that flow through the Site and gathers saltwater fish (mullet) at the Savannah River mouth near Savannah. SRS analyzes samples of the edible flesh for metals uptake. SRS performs nonradiological analyses for antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, and zinc.

4.3.5.1 Fish Results Summary

In 2022, SRS performed 1,720 individual analyses on 172 fish flesh samples. In 2020, SRS added flathead catfish to the freshwater fish surveillance program as the flathead have become established in most waters where they have been introduced, including the Savannah River. Appendix Tables C-3 and C-4 summarize the analytical results. SRS detected and quantified 17%, or 287 results, of the 1,720 individual analyses. The only analytes that had results that were detected and quantified were copper, mercury, and zinc. Sixty-four percent of the results were nondetects (less than the method detection limit), with the remaining 19% being estimated values. This indicates SRS detected the analyte, and the concentration was close to the method detection limit. The 2022 data is comparable to the results for the previous five years. Figure 4-6 shows the average mercury results by fish type for 2017 through 2022.

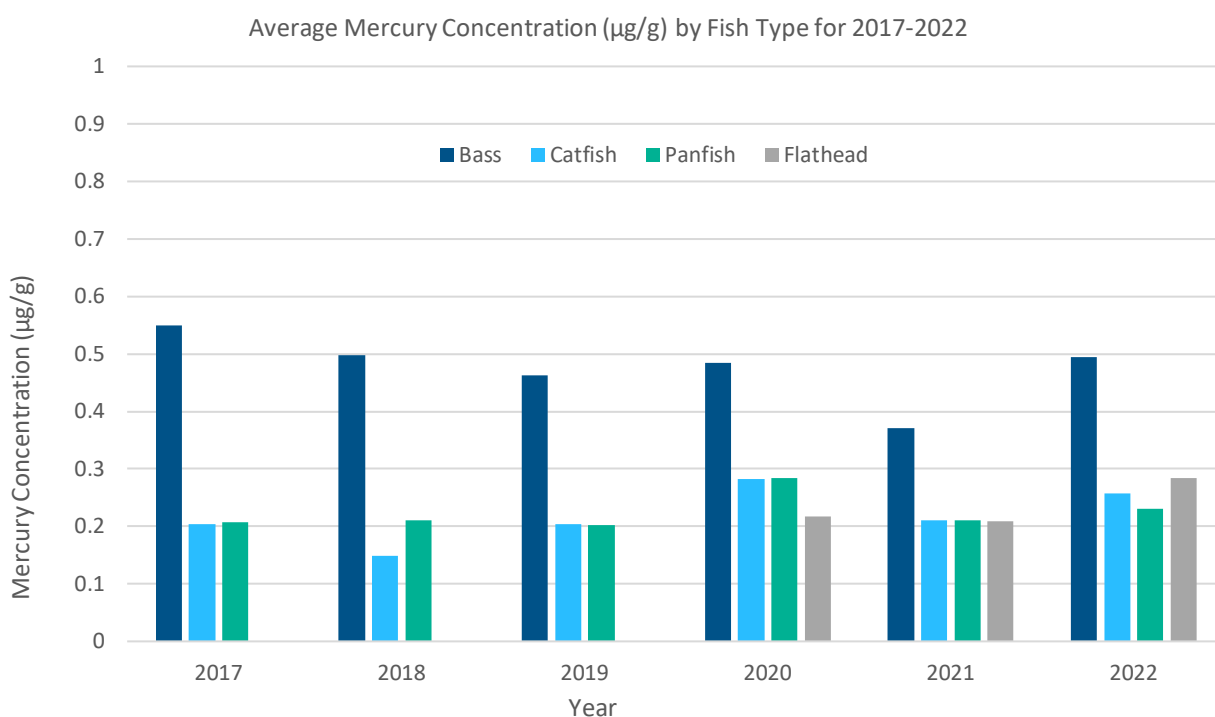


Figure 4-6 Average Mercury Concentration of Fish Species in the Savannah River, Adjacent to the Savannah River Site

This page intentionally left blank