Chapter 8: **Quality Assurance**

The Savannah River Site (SRS) quality assurance (QA) and quality control (QC) program objectives verify that SRS products and services meet or exceed customers' requirements and expectations. SRS has multiple QA requirements for collecting samples, analyzing and reporting data, and managing records. It is important to confirm the accuracy of sample results so SRS can confidently assess the impacts Site activities may have on human health and the environment.

2024 Highlights

Analytical Laboratory Quality Assurance

SRS continued to use South Carolina Department of Environmental Services (SCDES)-certified laboratories to analyze the environmental monitoring samples it reports to SCDES and the U.S. Environmental Protection Agency (EPA).

The U.S. Department of Energy Consolidated Audit Program (DOECAP) requires the analytical laboratories providing service to DOE have accreditation through the program. In 2024, the three SRS subcontract laboratories that analyzed the environmental samples reported in this document continued to maintain their accreditation.

In 2024, SRS participated in two DOECAP audits of treatment, storage, and disposal facilities (TSDFs) and reviewed DOECAP audit reports of other TSDFs. The audits indicated that there were no significant findings that would cause SRS waste generators to discontinue using the commercial TSDFs.

Quality Control Activities

Onsite and subcontracted laboratories reported acceptable proficiency and maintained SCDES certification for analyses. QC samples showed nothing that would affect the results of the surveillance and monitoring programs.

8.1 INTRODUCTION

The Savannah River Site (SRS) implements and conducts its quality assurance (QA) program to comply with the following regulations: 1) U.S. Department of Energy (DOE) Order 414.1D, *Quality Assurance*, 2) American Society of Mechanical Engineers Nuclear Quality Assurance (NQA) standards NQA-1-2008 with the NQA-1a-2009 Addenda, *QA Requirements for Nuclear Facility Applications*, and 3) the Code of Federal Regulations (CFR) in 10 CFR 830, *Nuclear Safety Management*. In addition, specific programs may have other QA requirements from outside organizations. For example, under the Tank Closure Program and Area Completion Projects, the U.S. Environmental Protection Agency (EPA) and South Carolina Department of Environmental Services (SCDES) require DOE to develop and follow a project-specific sampling and

analysis plan and a QA program plan. DOE has QA programs to verify the integrity of analyses from both onsite and subcontracted offsite laboratories and to ensure it is complying with the quality control (QC) program requirements.

SRS uses and disseminates high-quality data to promote environmental stewardship and support other Site missions. The environmental monitoring QA and QC program improves the methods and techniques used to both collect and analyze the environmental samples and to prevent errors in generating the data. The QA and QC program includes continuous assessments, precision checks, and accuracy checks, as Figure 8-1 shows. Through an ongoing process, the results of activities in one area provide input into assessments or checks conducted in the other two areas. The result is high-quality data. By combining continuous assessment of field, laboratory, and data management performance with checks for accuracy and precision, SRS ensures that all monitoring and surveillance data accurately represent conditions at SRS. Appendix F, *Glossary*, contains definitions for each term Figure 8-1 presents.

Chapter 8—Key Terms

Quality assurance *is an integrated system of management activities involving planning, implementing, documenting, assessing, reporting, and improving quality to ensure quality in the processes through which products are developed. The goal of QA is to improve processes so that defects do not arise when the product is produced. It is proactive.*

Quality control *is a set of activities that ensure quality in products by identifying defects in the actual products. The goal of QC is to identify and correct defects in the finished product before it is made available to the customer. QC is a reactive process.*

In summary, quality assurance makes sure an entity is doing the right things, the right way; quality control makes sure these results are what the entity expected.

Some elements of the QA and QC program are inherent within environmental monitoring standard procedures and practices. SRS evaluates these elements as part of the continuous assessment process. The Department of Energy Consolidated Audit Program (DOECAP) focuses on assessing specific QA and QC program elements.

8.2 BACKGROUND

DOE Order 414.1D, *Quality Assurance*, requires an integrated management system to ensure that the results of environmental monitoring efforts meet the requirements of federal and state regulations and DOE Order 458.1, *Radiation Protection of the Public and the Environment*. SRS uses field and laboratory procedures to guide activities such as collecting samples, analyzing samples, evaluating data, and reporting results. SRS uses an integrated testing system to ensure the integrity of analyses SRS and offsite laboratories perform. This testing includes internal laboratory QA and QC tests and testing associated with state and national testing programs, such as the Mixed Analyte Performance Evaluation Program (MAPEP). In addition, SRS uses QA and QC procedures to verify and control environmental monitoring. Together, these quality measures ensure that the resulting data representatively reflects SRS operational impacts on the health and safety of the public, workers, and the environment.

8.3 QUALITY ASSURANCE PROGRAM SUMMARY

The SRS Environmental Monitoring QA and QC Program focuses on minimizing errors through ongoing assessment and control of the program components. The QA and QC activities are interdependent.

For example, QC identifies an ongoing problem with the quality of the product and alerts QA personnel that there is a problem in the process. QA determines the root cause and extent of the problem and changes the process to eliminate the problem, prevent reoccurrences, and improve product quality.

QA focuses on the processes implemented to produce the data presented in this report. SRS evaluates the Environmental Monitoring Program (EMP) to identify and implement improvements. The QA efforts that lead to recurring or one-time program improvements include the following:

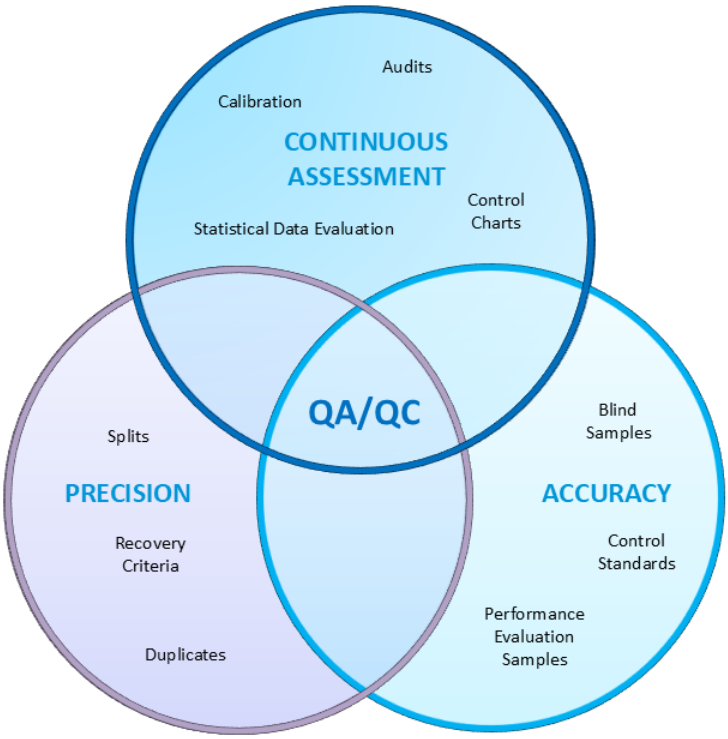

Figure 8-1 Interrelationship between QA and QC Activities

- Implementing EMP enhancements
- Improving data quality in the laboratory and field
- Performing DOECAP audits of commercial treatment, storage, and disposal facility (TSDFs) that SRS waste generators use
- Ensuring onsite and subcontracted laboratories reported acceptable proficiency and maintained SCDES certification for all analyses
- Ensuring commercial analytical laboratories maintain DOECAP accreditation

QC activities are the tests and checks that ensure SRS is complying with defined standards. Ongoing QC associated with environmental monitoring includes the following:

- Participating in MAPEP by laboratories that perform analytical measurements on SRS samples
- Participating in proficiency testing by laboratories performing National Pollutant Discharge Elimination System (NPDES) and drinking water analyses
- Collecting and analyzing QC samples (duplicate, blind, and blank samples) associated with field sampling
- Analyzing QC samples (blanks, laboratory control samples, duplicates, spikes, and others) associated with laboratory analyses

These specific checks identify instances when defects can occur in SRS processes and ensure that when addressed through planning and improving, quality data is produced.

8.4 ENVIRONMENTAL MONITORING PROGRAM QA ACTIVITIES

SRS repeatedly assesses the EMP to identify and implement continuous improvements and minimize the potential for errors. During 2024, SRS implemented the following quality improvements:

- Radiological Liquid Effluent Program— SRS transitioned radium-226 and niobium-94 from monthly radiological liquid effluent program outfalls to annual sampling and reporting under the radiological liquid surveillance program. Additionally, SRS installed new ultrasonic equipment at outfall HP-52 to provide more accurate flow rate measurement and obtain more representative samples. SRS also installed a flow meter at the HP-50 manhole upstream of outfall FM-1C to verify the Tritium Facility is not discharging liquid to the environment through this manhole.
- Radiological Liquid Surveillance Program—SRS discontinued weekly analysis of radium-266 in Site streams, the Savannah River, and Site basins after the third quarter of calendar year (CY) 2024; trend tests indicated the concentrations are stable and there is not a seasonal component that impacts the concentrations. Monthly analyses for radium-226 at the stream locations and basins were also discontinued.
- Air Effluent Program—SRS removed two effluent airborne locations from active quarterly monitoring in H Tank Farm after the second quarter of CY 2024.
- Air Surveillance Program—SRS began utilizing its new air station in F Area to collect Savannah River Plutonium Processing Facility (SRPPF) baseline data and monitor SRPPF activities when the facility becomes active. Additionally, SRS removed the Hwy 21/167 air station from private property and installed a new air station on SRS property at the old Williston barricade.
- Fish Sampling Program—SRS purchased a new electrofishing boat equipped with current industry standard electrical equipment, providing the ability to fine tune the equipment to collect the fish species being targeted and reduce the overall environmental impact.
- Surface (River and Stream) Water Quality Surveillance Program—SRS added a new stream sampling location, BFA-1 in F Area to collect SRPPF baseline data and monitor SRPPF activities when the facility becomes active.
- Radiological and Nonradiological Sediment Surveillance Programs—SRS added a new sampling location, BFA-1 in F Area to collect SRPPF baseline data and monitor SRPPF activities when the facility becomes active.

New Smith-Root Electrofishing Boat Enhances Sampling Efforts to Ensure Public Safety.

SRS uses SCDES-certified laboratories for those parameters that are reportable to SCDES. SCDES certifies the SRS onsite laboratories and offsite subcontract laboratories for a large variety of environmental analyses. In 2024, SCDES performed recertification evaluations of the Savannah River Nuclear Solutions (SRNS) Environmental Monitoring and SRNS Domestic Water laboratories. These evaluations include a review of QA and QC practices and procedures. SCDES renewed the certification for these onsite laboratories for another three years.

8.4.1 Department of Energy Consolidated Audit Program (DOECAP)

Department of Energy Consolidated Audit Program (DOECAP) is a comprehensive program that audits contract and subcontracted laboratories, providing analytical services to DOE Operations and Field Offices. DOECAP performs consolidated audits to reduce the number of audits DOE field sites conduct independently and to standardize audit methodologies, processes, and procedures. DOECAP audits commercial environmental analytical laboratories and commercial TSDFs that DOE facilities use.

8.4.1.1 DOECAP Laboratory Audits

The DOECAP Laboratory Audit Program is a formal accreditation program that DOE requires of commercial laboratories that perform analyses for the DOE Complex. A DOECAP-approved third-party accreditation body must assess a laboratory for it to receive and maintain DOECAP accreditation. The DOECAP-approved accreditation bodies evaluate laboratories based on technical capability and competence, along with their proficiency in complying with DOE QA requirements. The assessment includes how well the laboratories document incoming samples, calibrate instruments, adhere to analytical procedures, verify data, issue data reports, manage records, perform nonconformance and corrective actions, perform preventative maintenance, and dispose of samples. Within these topics, auditors evaluate how the laboratories use control charts, control standards, chemical recoveries, performance evaluation samples, and laboratory procedures.

In 2024, the three subcontracted laboratories that analyze the environmental samples documented in the *SRS Environmental Report* maintained their accreditation and continued to provide service to DOE and SRS.

8.4.1.2 DOECAP TSDF Audits

DOECAP performs annual audits of the commercial treatment, storage, and disposal facility (TSDFs) SRS uses to treat and dispose of mixed and hazardous waste. These reviews ensure that TSDFs are meeting contract requirements and are complying with applicable local, state, and federal regulations. DOECAP uses functional area checklists to conduct the following audits: QA, analytical data quality, environmental compliance, radiological controls, waste operations, safety and industrial hygiene, and transportation.

In 2024, SRS provided five auditors who participated virtually in two of these audits of commercial TSDFs. Additionally, SRS reviewed all final DOECAP audit reports of each TSDF that SRS has contracts with. The reviews indicated that there were no significant findings that would cause SRS waste generators to discontinue using the commercial TSDFs.

8.5 ENVIRONMENTAL MONITORING PROGRAM QC ACTIVITIES

An important part of SRS Environmental Monitoring Program QC activities is to ensure Site personnel collect and analyze samples to the highest standard without errors. All laboratories analyzing samples for the SRS EMP must participate in QC programs that either SCDES or DOE directs.

8.5.1 QC Sampling

SRS collects and transports several types of QC samples—including duplicates, blinds, trip blanks, and field blanks—throughout the year to determine the source of any measurement error.

- Duplicate—second sample collected at the same location and time as a regular sample. The purpose of a field duplicate sample is to assess the precision of the sampling process and the homogeneity of the sample at the point of collection. It helps determine if the sampling method consistently captures representative portions of the material being analyzed.
- Blind—second sample collected at the same location and time as a regular sample but submitted to the lab without identifying it as a duplicate. The primary purpose of a field blind sample is to assess the quality of laboratory analysis by testing their performance without them knowing it's a test.
- Trip Blank—a sample of analyte-free water, stored in the same container type as other samples, that travels from the lab to the field and back, without being exposed to the sampling environment. Its purpose is to determine if any contaminants were introduced into the sample during handling, transportation, or storage, and to ensure that the results of the actual samples are not compromised by external factors.
- Field Blank—a sample of analyte-free water that is handled in the field, just like a regular sample, but without actually collecting water from the source. The primary purpose of a field blank is to assess whether the field conditions or the sampling equipment itself introduced any contaminants into the samples.

Some analytes must be measured in the field due to their short hold time, the maximum amount of time a sample can be held after it is collected before it needs to be analyzed to ensure the results are valid and accurate. Samples for hydrogen ion activity (pH) must be measured in the field due to its 15-minute hold time. To assess the quality and reliability of field data measurements for pH, SRS routinely analyzes duplicate and blind samples. Duplicates for pH are not performed when the pH meter measures the sample directly from the source; they are collected only when a bucket and rope is needed to collect the sample. Blind pH sample analysis is performed on the river and stream water quality runs, one river and one

Sampler Collecting a pH Sample with a Bucket and Rope.

stream location each month. A blind sample is provided to the sampling personnel to take on the sampling run and to analyze under the same the field conditions as the regular samples. The sampling personnel do not know the pH of the blind solution. Results are reported, and the value measured in the field is compared to the actual value. Analytical differences between the measured value and actual value are expected to be within the acceptable limit of less than 0.4 standard units.

During intralaboratory checks performed for the National Pollutant Discharge Elimination System (NPDES) industrial wastewater program, SRS collects blind and duplicate field samples for at least 10% of each outfall's required frequency. For example, if an outfall has a monthly sampling requirement, then SRS collects two blinds and two duplicate samples during the year. SRS onsite and subcontracted laboratories also analyze duplicate samples for the water quality (nonradiological) program. Each month, SRS collects duplicate samples at one river and one stream location to verify analytical results. SRS also collects duplicate samples for both the radiological and nonradiological sediment samples on an annual basis.

The relative percent difference (RPD) between each sample result and the result of the corresponding blind or duplicate sample (when both values are at least five times above their detection limit) should be less than or equal to 20%. Table 8-1 summarizes 1) the blind and duplicate sample analyses associated with the NPDES industrial wastewater program, 2) the duplicate sample analyses associated with the river and stream water quality program, 3) both the nonradiological and radiological duplicate sample analyses for river, stream, and basin sediment programs, and 4) the number of impacted analytes per program and sample type.

Table 8-1 Summary of Laboratory Blind and Duplicate Sample Analyses

Program and Sample Type	Number of Comparisons	Number of (%) Comparisons within Acceptable Limits (RPD between Results ≤ 20%)		Number of (%) Comparisons Outside Acceptable Limits (RPD between Results > 20%)		Number of Impacted Analytes
NPDES pH Blind	24	24	(100%)	0	(0%)	0
NPDES Blind	89	88	(99%)	1	(1%)	1
NPDES Duplicate	101	100	(99%)	1	(1%)	1
River/Stream Water Quality Duplicate	432	415	(96%)	17	(4%)	7
Nonradiological River/Stream/Basin Sediment Duplicate	48	46	(96%)	2	(4%)	2
Radiological River/Stream/Basin Sediment Duplicate	30	24	(80%)	6	(20%)	3

Note:
RPD = relative percent difference
NPDES = National Pollutant Discharge Elimination System

Results in this table address both SRS and offsite subcontracted laboratory analyses. One hundred percent of the NPDES pH blind samples, 99% percent of the NPDES blind samples, 99% of the NPDES duplicate

samples, 96% of the water quality duplicate samples, 96% of the nonradiological sediment duplicate samples, and 80% of the radiological sediment duplicate samples met the acceptable difference limit. Reasons for results differing between the programs include sampling uncertainties and analytical uncertainties associated with the measurements, such as the precision of the analytical instruments and detection limits of the analytical instruments.

Although results indicate there were some differences between the QC samples and their corresponding regular samples, they did not impact conclusions made with the data. The results indicate that in 2024 there were no consistent problems with either sample collection or laboratory analysis techniques.

Table 8-2 summarizes the results of field and trip blank analyses associated with the NPDES industrial wastewater program. All 2024 field blank and trip blank results were nondetect, indicating neither sampling nor shipping techniques contributed to contaminants in the actual samples as discussed in Chapter 4, *Nonradiological Environmental Monitoring Program*.

Table 8-2 Summary of Trip and Field Blank Sample Analyses

Program and Sample Type	Number of Samples Analyzed	Number of Samples with Results Below Detection Limits
NPDES Trip Blank	36	36
NPDES Field Blank	12	12

Note:
NPDES = National Pollutant Discharge Elimination System

8.5.2 Laboratory Proficiency Testing

8.5.2.1 Nonradiological Methods Proficiency Testing

SCDES Regulation 61-81, *State Environmental Laboratory Certification Program*, requires laboratory proficiency testing to ensure the validity and quality of the data being generated. Proficiency testing validates a particular measurement process. It is used to evaluate a laboratory's performance against pre-established criteria by testing the same samples at other laboratories and comparing the results. SRS laboratories performing NPDES and drinking water analyses maintained state certification for all analyses after achieving acceptable results in SCDES-required proficiency testing.

During 2024, onsite and subcontracted laboratories participated in water pollution (NPDES) and water supply (drinking water) performance evaluation studies. Onsite laboratories reported proficiency for water pollution and water supply of 100%. Subcontracted laboratories reported water pollution proficiency greater than 97%. Both onsite and subcontracted laboratories maintained SCDES certification for all analyses at SRS.

Laboratories develop corrective actions for failed analyses. The corrective actions are submitted to SCDES, along with subsequent passing proficiency testing results for those analyses. The objective of the corrective actions is to prove the lab's proficiency and to prevent a reoccurrence of failed analyses. Corrective actions may include modifying sample preparation or analysis procedures.

8.5.2.2 Radiological Methods Proficiency Testing

All laboratories performing environmental analytical measurements in support of DOE's Environmental Management (DOE-EM) activities must participate in Mixed Analyte Performance Evaluation Program (MAPEP). This intercomparison program is an integral component of the DOE-EM Laboratory Management Division's QA program, ensuring laboratories provide DOE-EM with defensible, accurate data. The DOE Radiological and Environmental Sciences Library twice a year prepares, characterizes, and distributes MAPEP proficiency samples, which contain environmentally important and compliance-required constituents in representative matrices. The samples include air filter, soil, vegetation, and water matrices with stable inorganic, organic, and radioactive elements representative of those found at DOE sites. The MAPEP rounds conducted during 2024 were MAPEP 49, 50, and 51.

The SRS Environmental Laboratory participated in the two MAPEP studies, receiving acceptable results for 100% of results on MAPEP Series 50 and 97% acceptable results for water, air, vegetation, and soil analytes in MAPEP Series 51.

One SRS subcontracted laboratory participated in MAPEP Series 50 and had acceptable results in 96% of the water and soil matrices. Another SRS subcontracted laboratory participated in MAPEP Series 49 and 50 and had acceptable results in 97% of the water and soil matrices. SRS sent all applicable environmental samples to the subcontracted laboratories, which continued to successfully participate in the MAPEP program.

8.6 RECORDS MANAGEMENT

Documentation is an important part of the SRS Environmental Program. The *SRS Environmental Report* is the public record of SRS's annual environmental performance. SRS compiles the report every year following guidelines in DOE Order 231.1B, *Environment, Safety, and Health Reporting*.

The *SRS Environmental Report* communicates SRS's results to government agencies and the public. In addition to this report, SRS generates various records and reports to document SRS nonradiological and radiological environmental programs, groundwater management, and Site compliance with applicable regulations. SRS maintains these documents and the records generated in accordance with SRS records management procedures.

This Page Intentionally Left Blank