
Quality Assurance



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[During 2009, responsibility for the environmental Quality Assurance (QA) program continued to be divided among three groups—Environmental Monitoring Laboratory (EML), Environmental Monitoring (EM), and Data Management and Waste Engineering (DMWE).]

*S*R^S's environmental QA program is conducted to verify the integrity of analyses determined by onsite and subcontracted offsite environmental laboratories, and to ensure that quality control program requirements are met. The program's objectives are to ensure that samples are representative of the surrounding environment, and that analytical results are accurate.

SRS and Environmental QA Programs Integration

The SRS comprehensive environmental QA program follows the QA requirements defined in the SRS Quality Assurance Manual (1Q) [SRS, 2008]. Each environmental organization has developed and implemented QA procedures that address these requirements. In addition, a Cognizant Quality Function (CQF) from the site's independent QA organization is assigned responsibility for environmental program oversight for each organization. The CQF periodically performs QA reviews and assessments on environmental programs to ensure compliance with site requirements. In addition, each organization assigns QA responsibilities to individuals to oversee daily QA activities for the organization. Results, improvement opportunities, and corrective actions that come from assessments and reviews are documented in the Site Tracking, Analysis and Reporting (STAR) system. Site environmental professionals periodically conduct QA self-assessments on specific environmental program activities. The results of these assessments are documented in STAR. Site management participates in the Management Field Observation process; the results from these reviews also are documented in STAR.

QA for EM Program Samples

Internal Quality Assurance Program

EM has a documented QA program that meets SRS and U.S. Department of Energy (DOE) requirements (3Q1-2 Volume III, "Quality Assurance Plan") [SRS EM Program, 2002b]. Based on data reviews, no QA issues or corrective actions were identified during 2009.

Laboratory Certification

EM is certified by the South Carolina Department of Health and Environmental Control (SCDHEC) Office of Laboratory Certification for field pH, temperature, total residual chlorine measurements, and low-level mercury sampling. Certification is renewed every three years; the current certification expires in June 2012.

Blind pH Samples

EM personnel routinely conduct blind sample analyses for field measurements of pH to assess the quality and reliability of field data measurements.

During 2009, two blind pH field measurements were taken monthly, for a total of 24 samples. All field pH measurements were within the U.S. Environmental Protection Agency's (EPA's) suggested acceptable control limit of ± 0.4 pH units of the true (known) value. Blind pH sample results can be found in the data tables section of the CD accompanying this report ("[Blind Sample Results for pH Field Measurements](#)").

QA for EML Sample Analyses

Internal QA Program

EML has a documented QA program that meets SRS and DOE requirements [SRNS, 2009]. Analytical instrumentation includes liquid scintillation and gas flow proportional counters, alpha and gamma spectrometry, inductively coupled plasma atomic emission spectrometry (ICP-AES), inductively coupled plasma mass spectrometry (ICP-MS), flow injection mercury system (FIMS) and gas chromatography mass spectrometry (GC-MS). Analyses include tritium, carbon-14, nickel-63, gamma-emitting isotopes (cesium-137, cobalt-60, potassium-40, plus any other detected isotopes), iodine-129, strontium 89/90, strontium-90, americium-241, curium-244, neptunium-237, plutonium-238, plutonium-239, thorium-229, thorium-230, thorium-232, uranium-234, uranium-235, uranium-238, inorganic metals, mercury, and volatile organic compounds. Total suspended solids are determined gravimetrically. Instruments are calibrated with known reference standards. Instrument performance is monitored through the use of check standards and control charts. Analytical batch performance is measured through the use of quality control (QC) samples (blanks, spikes, carriers, tracers, laboratory control samples, and laboratory duplicates). QC results that fall outside of specified limits may result in analytical batch or sample reruns. For those batches or samples that fall outside of limits but for which the results are determined to be satisfactory, the reason is documented in the data package, which includes the QA cover sheet, instrument data printouts, and associated QC data.

Based on inspections of instrument records and analytical data packages, no corrective actions were identified during 2009.

Laboratory Certification

EML is certified by the SCDHEC Office of Labora-

tory Certification for analytical measurements using the following methods:

- total suspended solids (Standard Methods, 2540D), 27 metals by ICP-AES (EPA, 200.7), mercury by FIMS (EPA, 245.2), and 18 metals by ICP-MS (EPA, 200.8)
- 42 volatile organic compounds by GC-MS (EPA, 8260B), 28 metals by ICP-AES (EPA, 6010C), mercury by FIMS (EPA, 7470A and 7471B), and 18 metals by ICP-MS (EPA, 6020A)

Certification is renewed every three years; the current certification expires in June 2012.

External QA Program

In 2009, EML participated in the DOE Mixed Analyte Performance Evaluation Program (MAPEP), an interlaboratory comparison program that tracks performance accuracy and tests the quality of environmental data reported to DOE. The Radiological and Environmental Sciences Laboratory (RESL), under the direction of DOE-Headquarters Environmental Safety and Health (ES&H), administers the MAPEP.

MAPEP samples include water, soil, air filter, and vegetation matrices with environmentally important stable inorganic, organic, and radioactive constituents.

In 2009, EML completed the analysis of 54 radioisotopes and 15 metals for MAPEP-20 (designation of a specific study set) and the analysis of 55 radioisotopes and 15 metals for MAPEP-21. Results show that the laboratory passed the 80-percent-acceptable-results level for the study set (table 8-1). The percentage was calculated by dividing the acceptable and the acceptable-with-warning results by the total number of results.

MAPEP intercomparison study results for EML can be found in the data tables section of the CD accompanying this report ("[MAPEP Performance Study 20](#)" and "[MAPEP Performance Study 21](#)"). The MAPEP information has been copied from the actual MAPEP final report; "NR" in the report stands for "not reported," which indicates that the laboratory did not submit data for that particular analysis. The Flag column is used to denote if a result is Acceptable (A), Not Acceptable (N),

Table 8-1
EML Performance on Mixed-Analyte Performance Evaluation Program (MAPEP)

Study Set	Matrix	EML
MAPEP-09-GrF20	Air Filter	100%
MAPEP-09-GrW20	Water	100%
MAPEP-09-MaS20	Solid	100%
MAPEP-09-MaW20	Water	100%
MAPEP-09-RdF20	Air Filter	100%
MAPEP-09-MaV20	Vegetation	100%
MAPEP-09-GrF21	Air Filter	100%
MAPEP-09-GrW21	Water	100%
MAPEP-09-MaS21	Solid	100%
MAPEP-09-MaW21	Water	100%
MAPEP-09-RdF21	Air Filter	100%
MAPEP-09-MaV21	Vegetation	100%

Warning (W), etc., and the Uncertainty (Unc) Flag column is used to note uncertainty values that may be High (H) or (L), etc..

QA for EM Sample Analyses

Onsite and subcontract environmental laboratories providing analytical services must have documented QA programs and meet the quality requirements defined in the SRS Quality Assurance Manual (IQ).

An annual DOE Consolidated Audit Program (DOECAP) evaluation of each subcontract laboratory is performed to ensure that all the laboratories maintain technical competence and follow the required QA programs. The evaluation includes an examination of laboratory performance with regard to sample receipt, instrument calibration, analytical procedures, data verification, data reports, records management, nonconformance and corrective actions, and preventive maintenance. In 2009, evaluations were conducted at three laboratories, resulting in a total of 27 Priority II findings. A Priority II finding documents a deficiency that in and of itself does not represent a concern of sufficient magnitude to render the audited facility unacceptable to provide services to DOE. A report on the

2009 findings and recommendations was provided to each laboratory. For findings, each affected laboratory submitted corrective action responses, and the responses subsequently were reviewed. The findings typically are closed during the next laboratory audit (scheduled for 2010).

Evaluations were conducted at four laboratories in 2008, resulting in a total of 22 Priority II findings. Each laboratory submitted a corrective action response that addressed each finding. All 22 of the 2008 findings were reviewed and closed during 2009.

Nonradiological Liquid Effluents

National Pollutant Discharge Elimination System (NPDES) samples are analyzed by four onsite laboratory groups—EML, EM, D-Area Powerhouse, and the Waste Treatment Plant—and one offsite subcontract laboratory, Shealy Environmental Services, Inc. (SES). All these laboratories are certified by SCDHEC for NPDES analyses.

Interlaboratory Program

During 2009, all laboratories performing NPDES analyses for SRS participated in the SCDHEC-

required proficiency testing studies, per State Regulation 61–81 (“State Environmental Laboratory Certification Program”). The former EPA-required annual NPDES Discharge Monitoring Report–Quality Assurance (DMR–QA) studies program was eliminated. EPA notified SCDHEC May 14 that it had granted SCDHEC’s request for an exemption from the NPDES DMR–QA studies. It was determined that SCDHEC’s proficiency testing program requirements provide adequate QA to replace EPA’s DMR–QA study program. All laboratories utilized Environmental Resource Associates (ERA) as the accredited proficiency testing provider. ERA, as required by EPA, is accredited by the American Association of Laboratory Accreditation.

EPA and SCDHEC use the study results to certify laboratories for specific analyses. As part of the recertification process, these agencies require that laboratories investigate the unacceptable results and implement corrective actions as appropriate.

The onsite laboratories reported 30 proficiency testing results in 2009. One pH analysis was not acceptable on the initial study, but results were acceptable for the follow-up study. Therefore, state certification was maintained for all analyses during 2009.

The offsite laboratory reported 121 proficiency testing results in 2009. Two lead analyses and one copper analysis were not acceptable on the initial study, but results were acceptable for the follow-up study. Therefore, state certification was maintained for all analyses during 2009.

Interlaboratory program results can be found in the data tables section of the CD accompanying this report (“[Discharge Monitoring Proficiency Testing Studies](#)”).

Intralaboratory Program

The environmental monitoring intralaboratory program reviews laboratory performance by analyzing field duplicate and blind samples throughout the year.

The onsite and offsite laboratories processed 64 field duplicate analyses during 2009. The relative-percent difference was equal to zero for 55 of these analyses. Only four of the 64 field duplicate analyses exceeded the relative-percent (20-percent) difference. The five remaining analysis results were between zero and 20 percent.

The onsite and offsite laboratories processed 73 blind analyses during 2009. The relative-percent difference was equal to zero for 54 of these analyses. Only four of the 73 blind analyses exceeded the relative percent (20-percent) difference. The 15 remaining results were between zero and 20 percent.”

Results for the field duplicate and blind sampling programs indicated no consistent problems with the laboratories. Field duplicate and blind sample program results can be found in the data tables section of the CD accompanying this report (“[NPDES Duplicate Sample Results](#)” and “[NPDES Blind Sample Results](#)”).

Stream and River Water Quality

SRS’s water quality program requires checks of 10 percent of the samples to verify analytical results. Duplicate grab samples from SRS streams and the Savannah River were analyzed by SES and EML in 2009. SES and EML reported approximately 3,000 analyses for this program. Greater than 95 percent of the approximately 1,100 field duplicate results were within acceptable limits (< 20-percent difference). Results for the field duplicate sampling program indicated no consistent problems with the laboratories. Detailed stream and Savannah River field duplicate sample results can be found in the data tables section of the CD accompanying this report (“[SRS Stream and Savannah River Water Quality Duplicate Sample Results](#)”).

QA for DMWE Sample Analyses

Groundwater analyses at SRS are performed by offsite (subcontract) and onsite laboratories. During 2009, General Engineering Laboratories (GEL) and TestAmerica, Inc., were the primary full-service subcontract laboratories used by Area Completion Projects (ACP). EML performed groundwater analyses for ACP during 2009. Eberline Services Oak Ridge Lab (radiological only) and Lionville Laboratory (nonradiological only) were subcontracted laboratories; however, no samples were sent to these laboratories for analysis in 2009 because their services were not required to support the site’s sample analysis needs.

GEL and TestAmerica participated in various water pollution (WP) and water supply (WS) studies in 2009. The WP study results (table 8–2) show that the laboratories met or exceeded the 80-percent-acceptable-results level. The table reflects only the studies

Table 8–2
Subcontract-Laboratory Percent Acceptable Performance for Environmental Resource Associates (ERA) Water Pollution Studies

Study	General Engineering	TestAmerica
WS–149	100%	
WS–153		95.2% ^{i,k,v}
WS–155	100%	
WP–159		88.7% ^{l,m,n,p,r,s,w,y}
WP–168	98.5% ^t	98.4% ^{a,b,c,d,e,f,g,i,q}
WP–173		98.4% ^{g,h,o,u,y}
WP–174		98.7% ^x
WP–177	100%	

Results Not Acceptable		
^a Volatile Solids	^j tert-Butylbenzene	^s 1,3,5-Trimethylbenzene
^b Nitrite as N	^k trans-1,3-Dichloropropene	^t 2,4 Dinitrotoluene
^c COD	^l cis-1,2-Dichloroethylene	^u Dichlorprop
^d trans-1,2-Dichloroethylene	^m sec-Butylbenzene	^v Bromoform
^e 2,4-DB	ⁿ 2-Chlorotoluene	^w 4-Isopropyltoluene
^f Hexachlorocyclopentadiene	^o Boron	^x Naphthalene
^g Ethylbenzene	^p 1,1,1,2-Tetrachloroethane	^y 2,4-D
^h Ortho-phosphate as P	^q Toluene	
ⁱ Xylenes, total	^r 1,2,3-Trichloropropane (TCP)	

associated with contracted analyses performed for SRS.

Results from the subcontract-laboratory performance on MAPEP are summarized in table 8–3. The results show that all laboratories exceeded the 80-percent-acceptable-results level for all studies for the air filter, water, soil, and vegetation matrices.

To help participants identify, investigate, and resolve potential quality concerns, the MAPEP issues a letter of concern to a participating laboratory upon identification of a potential analytical data quality problem in the MAPEP results. Letters of concern have been issued since 1996, shortly after the beginning of the MAPEP program. A copy of the letter is sent to DOE/contractor oversight points of contact (POCs), including DOE Field Office and Headquarters POCs and contractor sample management

POCs. Intended to be informative and not punitive, each letter states, “This letter is solely intended to alert your laboratory to a potential quality concern that you may wish to investigate for corrective action.” Table 8–4 summarizes MAPEP concerns from 2009 for the primary full-service subcontracted laboratories. Eberline Services Oak Ridge Lab and Lionville Laboratory were under subcontracts for a portion of 2009; however, as indicated earlier, no samples were sent to these laboratories for analyses in 2009, and no letters of concern were issued to them for MAPEP–20 or MAPEP–21.

Soil/Sediment

Environmental investigations of soils and sediments, primarily for RCRA/Comprehensive Environmental Response, Compensation, and Liability Act units,

Table 8-3
Subcontract-Laboratory Performance on Mixed-Analyte Performance Evaluation Program (MAPEP)

Study	Matrix	General Engineering	TestAmerica
MAPEP-09-GrF20	Air Filter	100%	100%
MAPEP-09-GrF21	Air Filter	100%	100%
MAPEP-09-GrW20	Water	100%	100%
MAPEP-09-GrW21	Water	100%	100%
MAPEP-09-MaS20	Soil	98.4% ^{b,c}	99.2% ^a
MAPEP-09-MaS21	Soil	98.4% ^{d,e}	97.6% ^{f,g,h}
MAPEP-09-MaW20	Water	100%	100%
MAPEP-09-MaW21	Water	100%	100%
MAPEP-09-OrW20	Water	100%	95.9% ^{i,j,l}
MAPEP-09-OrW21	Water	100%	97.3% ^{n,o}
MAPEP-09-RdF20	Air Filter	100%	94.4%
MAPEP-09-RdF21	Air Filter	100%	100%
MAPEP-09-RdV20	Vegetation	100%	88.9% ^{k,m}
MAPEP-09-RdV21	Vegetation	100%	100%

Results Not Acceptable

^a Selenium	ⁱ Chrysene
^b Technetium-99	^j Benzo(a)anthracene
^c 2,4-Dimethylphenol	^k Zinc-65
^d Benzo(k)fluoranthene	^l Hexachlorobenzene
^e Endrin Aldehyde	^m Cesium-137
^f Uranium-235	ⁿ 4,4'-DDE
^g Uranium-238	^o 4,4'-DDT
^h Total Uranium	

are performed by subcontract laboratories. Data are validated by ACP according to EPA standards for analytical data quality, or as specified by SRS onsite customers.

The environmental validation program is based in part on two EPA guidance documents, "Guidance for the Data Quality Objectives Process for Superfund" [EPA, 1993] and "Systematic Planning: A Case Study for Hazardous Waste Site Investigations" (QA/CS-1) [EPA, 2006]. These documents identify QA issues to be addressed, but they do not formulate a procedure

for data evaluation or provide pass/fail criteria to apply to data and document acceptance. Hence, the SRS validation program contains elements from—and is influenced by—several other references, including

- "Guidance on Environmental Data Verification and Data Validation" (QA/G-8) [EPA, 2002b]
- "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review," [EPA, 1999b]

- “USEPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review,” [EPA, 2005]
- “USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review,” [EPA, 2004]
- “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” EPA, November 1986, SW-846, Third Edition; Latest Update, February 2008 [EPA, 2008f]
- “DOE Quality Systems for Analytical Services,” Revision 2.4, October 2008 [DOE, 2008]
- “Analytical Data Qualification,” ER-SOP-033, Revision 3 [SRNS, 2007]

Many QA parameters are evaluated by automated processing of electronically reported data. Others are selectively evaluated by manual inspection of associated analytical records. A summary of findings

is presented in each project narrative or validation report prepared by DMWE personnel.

Data Review

The QA program’s detailed data review for ground-water and soil/sediment analyses is described in WSRC-3Q1-2, Section 1100.

The following issues from 2009 were resolved and closed:

- incomplete record packages for validation are no longer a significant issue
- issues involving logic failures and omissions in electronically reported data have been satisfactorily resolved

The identification and resolution of quality and technical issues illustrates that, although laboratory procedures are well defined, analytical data quality does benefit from technical scrutiny.

**Table 8-4
Subcontract-Laboratory Performance MAPEP Letters of Concern**

General Engineering	TestAmerica
None	Cobalt-57 (MAPEP-20) Plutonium-239/240 (MAPEP-20) Zinc-65 (MAPEP-20)

