2018 Highlight

Quality Assurance and Quality Control Activities

Both field and laboratory quality assurance/quality control evaluations found no deficiencies in the sample collection, sample handling, analytical methods, or procedures employed to collect data for the Environmental Surveillance program.

Subcontracted laboratories used for this effort demonstrated acceptable analytical proficiency in independent quality control programs such as the Mixed Analyte Performance Evaluation Program and the U.S. Department of Energy Consolidated Audit Program.

12.0 Quality Assurance

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Quality assurance (QA) and quality control (QC) practices encompass all aspects of Hanford Site environmental monitoring and surveillance activities. Hanford Site contractors, subcontractors, and multiple U.S. Department of Energy (DOE) organizations are involved in and independently conduct environmental monitoring and surveillance activities. Each of these groups are driven by different missions and regulatory requirements but with the same goal in mind. This section describes the Environmental Surveillance (ES) program managed by the Environmental Integration Services Group at Mission Support Alliance. The ES program includes environmental surveillance across multiple media types both on and off the Hanford Site. The data collected is used to evaluate the potential impact of current and historic site operations on the environment and to assess associated human health exposures to radionuclides and chemicals. This section provides information on specific measures taken in 2018 to ensure quality and defensibility in project management, sample collection, and analytical results.

NOTE: QA/QC specifications for groundwater sampling and program management are reported independently by the CH2M Hill Plateau Remediation Company in DOE/RL-2017-66, *Hanford Site Groundwater Monitoring Report for 2018*, and are not discussed in this section. However, details of the groundwater monitoring program can be found in Section 8.0.

Quality assurances and QCs of the Hanford Site on and offsite surveillance programs are documented through QA program plans and describe applicable QA elements (e.g., MSC-23333). Sample analyses across all media types are performed by contracted laboratories, which are also required to meet plan specifications. To ensure the highest quality data are obtained, the accredited offsite laboratories were audited for equipment and services before the contract awards were made.

12.1 Program Management

Per federal requirements, environmental surveillance activities are subject to an overall QA program that satisfies requirements for collecting and assessing environmental data in compliance with the following:

- 10 CFR 830, "Nuclear Safety Management," Subpart A, "Quality Assurance Requirements"
- DOE O 414.1D, *Quality Assurance*
- Analytical Services – DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document*
- *EPA Requirements for Quality Assurance Project Plans* (EPA 2001)
- Richland Requirements Document 008, Quality Assurance Program Requirements
- Project-specific QA plans and documentation are found in MSC-23333, *Environmental Quality Assurance Program Plan,* and describe the QA/QC elements associated with the Environmental Surveillance program.

12.1.1 Personnel Training and Qualifications

Hanford Site personnel are provided with the knowledge and skills necessary to perform specific jobs safely, effectively, and efficiently with minimal supervision. This is accomplished by establishing sitewide policies, procedures, and guidance through training programs. These training programs provide general and specialized training classes using hands-on training facilities dedicated to ensuring personnel are qualified and confident to perform their tasks safely.

The following principles and practices are highlighted in the training programs and documented in MSC-23333:

- Develop training standards and procedures that meet valid requirements and regulations and are consistent with industry-proven best management practices
- Recognize management's responsibility to lead and coach their employees to ensure employees are trained and remain proficient to perform assigned tasks
- Conduct evaluations of employee training to ensure regulatory compliance, compliance with standards and instructions, and improve the training process
- Employ instructional staff and subject matter experts who are qualified and maintain their instructional and subject area skills and knowledge

DOE O 414.1D
QA Program Requirements

Management/QA Program
Personnel Training/Qualification
Quality Improvement
Documents and Records
Work Processes
Design
Procurement
Inspection and Acceptance Testing
Management Assessment
Independent Assessment

- Use a graded approach to develop training programs to ensure value and effectiveness
- Ensure that employee training records are current and complete.

12.2 Sample Collection Quality Assurance and Quality Control

Trained personnel collected environmental samples for air, surface water, biota (wildlife and food/farm products), soil, vegetation, and sediment in accordance with approved schedules, desk instructions, and procedures. Established sampling locations were identified with visible postings and/or global positioning system readings and documented to ensure data continuity. Samples collected in 2018 were analyzed by General Engineering Laboratories, LLC (GEL), TestAmerica Richland Laboratory (TARL), and ARS Aleut Analytical, LLC (ARS). (Table 12-1).

Table 12-1. Laboratories and Types of Environmental Surveillance Samples Analyzed.

Analytical Laboratory	Environmental Monitoring and Surveillance Samples			
	Air	Water	Biota	Other
General Engineering Laboratories, LLC	X	X	X	X
TestAmerica Richland Laboratory		X		
ARS Aleut Analytical, LLC		X		

12.3 Quality Control Samples

Multiple type QC samples are used by the ES program to evaluate the validity of sampling practices and laboratory results. The associated QC procedures followed in the field and in the laboratories ensure the highest quality data possible.

The potential for cross-contamination between samples is evaluated using trip blanks and equipment blanks. Field duplicates are collected to evaluate sample matrix heterogeneity and sample collection reproducibility. The precision and accuracy of laboratory data is evaluated using laboratory duplicates, matrix spikes, matrix spike duplicates, and method blanks. Table 12-2 summarizes the different types, characteristics, and frequencies of QC samples. A QC sample frequency goal of 5% (1 in 20 samples) is used for environmental surveillance activities when feasible.

Assessments of field sampling activities are routinely performed and documented by media task leads. In 2018, field duplicate samples were collected and analyzed for air, soil, Columbia River water, natural vegetation, farm products (e.g., milk, leafy vegetables, corn, apples, melons), wildlife, irrigation water, sediment, and seep samples. The accepted method of evaluating the precision or reproducibility of a duplicate sample pair is the calculation of the relative percent difference (RPD). RPDs are calculated for individual analytes. The generalized formula for calculating an RPD is as follows:

$$RPD = \left(\frac{|S - D|}{\frac{(S + D)}{2}} \right) \times 100$$

Where "S" and "D" are the sample and duplicate results, respectively.

Table 12-2. Field and Laboratory Quality Control Sample Types, Characteristics, and Frequency.

Sample Type	Primary Characteristics Evaluated	Frequency
Field QC Samples		
Trip blank	VOC cross-contamination during transportation	1 per field trip, if VOCs are collected
Equipment blank	Cross-contamination from non-dedicated equipment	1 per sampling method type per year for selected analytes
Field Duplicate	Sample matrix heterogeneity and sample collection reproducibility	1 per 20 samples, where feasible
Laboratory QC Samples		
Method blank	Laboratory contamination	As defined in the laboratory contract or QA plan and/or analysis procedures
Laboratory duplicates	Laboratory reproducibility	
Matrix spike	Matrix effect and laboratory accuracy	
Matrix spike duplicate	Laboratory reproducibility/accuracy	
QA = quality assurance VOC = volatile organic compound		

For the 2018 Environmental Surveillance effort, field duplicate samples were collected at the locations indicated in Table 12-3. Sample duplicate pair results for non-detected analytes are considered acceptable. For detected analytes, the RPD of the duplicate sample pair must be less than 30% to be considered acceptable. Duplicate results for 2018 are shown in Table 12-4.

Table 12-3. 2018 Field Duplicate Samples.

Media	Location	Number of Duplicate Sample Pairs
Air	Various	54
Air - Tritium	Various	14
Soil	Various	4
Natural Vegetation	Various	3
Columbia River Water Transects	Various	4
Columbia River Sediment	100-D-Spring	1
Seeps	100-D Springs	2
Wildlife – Carp	Hanford Townsite 300 Area - 100 Area	1
Wildlife – Elk	Route 11 / Route 2	3
Wildlife - Quail	Various	2
Water - Irrigation	Riverview Canal	1
Apples	Sagemoore Area	1
Corn	Riverview Area	1
Melons	Riverview Area	1
Milk	East Wahluke Area	1

Table 12-4. 2018 Field Duplicate Sample Results. (7 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
Air	Alpha (gross)	42 of 54	75
	Beta (gross)	46 of 54	85
	Americium-241	4 of 4	100
	Antimony-125	6 of 6	100
	Colbalt-60	6 of 6	100
	Cesium-134	6 of 6	100
	Cesium-137	6 of 6	100
	Europium-152	6 of 6	100
	Europium-154	6 of 6	100
	Europium-155	6 of 6	100
	Hydrogen-3 (tritium)	14 of 14	100
	Plutonium-238	5 of 5	100
	Plutonium-239/240	6 of 6	100
	Potassium-40	6 of 6	100
	Ruthenium-106	6 of 6	100
	Strontium-90	6 of 6	100
	Uranium-234	6 of 6	100
	Uranium-235	6 of 6	100
	Uranium-238	6 of 6	100
Soil	Americium-241	1 of 1	100
	Antimony-125	5 of 5	100
	Cesium-134	2 of 2	100
	Cesium-137	4 of 5	80
	Cobalt-60	6 of 6	100
	Europium-152	5 of 5	100
	Europium-154	5 of 5	100
	Europium-155	4 of 4	100
	Plutonium-238	5 of 5	100
	Plutonium-239/240	4 of 5	80
	Potassium-40	5 of 5	100
	Ruthenium-106	5 of 5	100
	Strontium-90	6 of 6	100
	Uranium-234	4 of 5	80
	Uranium-235	4 of 5	80
	Uranium-238	3 of 5	60
Natural Vegetation	Americium-241	2 of 2	100
	Antimony-125	8 of 8	100
	Cesium-134	8 of 8	100
	Cesium-137	8 of 8	100
	Cobalt-60	8 of 8	100
	Europium-152	8 of 8	100
	Europium-154	8 of 8	100
	Europium-155	8 of 8	100
	Plutonium-238	8 of 8	100

Table 12-4. 2018 Field Duplicate Sample Results. (7 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Plutonium-239/240	8 of 8	100
	Potassium-40	7of 8	87
	Ruthenium-106	8 of 8	100
	Strontium-90	8 of 8	100
	Uranium-234	7of 8	87
	Uranium-235	7 of 7	100
	Uranium-238	8 of 8	100
Irrigation Water	Alpha (gross)	1 of 1	100%
	Beta (gross)	1 of 1	100%
	Strontium-90	1 of 1	100%
	Uranium-234	1 of 1	100%
	Uranium-235	1 of 1	100%
	Tecnetium-99	1 of 1	100%
	Tritium	1 of 1	100%
	Cesium-137	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Berillium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Cesium-134	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
Columbia River Water Transects	Aluminum	4 of 4	100%
	Iron	4 of 4	100%
	Lead	4 of 4	100%
	Copper	4 of 4	100%
	Magnesium	4 of 4	100%
	Manganese	4 of 4	100%
	Molybdenum	3 of 4	75%
	Nickel	4 of 4	100%
	Potassium	4 of 4	100%
	Silver	4 of 4	100%
	Strontium	4 of 4	100%
	Sodium	4 of 4	100%
	Thallium	4 of 4	100%
	Thorium	4 of 4	100%
	Tin	4 of 4	100%
	Titanium	4 of 4	100%
	Antimony	4 of 4	100%
	Arsenic	4 of 4	100%
	Barium	4 of 4	100%
	Beryllium	4 of 4	100%
	Boron	4 of 4	100%
	Cadmium	4 of 4	100%
	Cesium	4 of 4	100%
	Chromium	4 of 4	100%

Table 12-4. 2018 Field Duplicate Sample Results. (7 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Cobalt	4 of 4	100%
	Uranium	4 of 4	100%
	Vanadium	4 of 4	100%
	Zinc	4 of 4	100%
	Zirconium	4 of 4	100%
	Bismuth	4 of 4	100%
	Calcium	4 of 4	100%
	Phosphorus	4 of 4	100%
	Selenium	4 of 4	100%
	Phosphate	2 of 2	100%
	Sulfate	2 of 2	100%
	Chloride	2 of 2	100%
	Fluoride	2 of 2	100%
	Bromide	2 of 2	100%
	Nitrogen in Nitrate	2 of 2	100%
	Nitrogen in Nitrite	2 of 2	100%
	Hexavalent chromium	4 of 4	100%
	Tritium	2 of 2	100%
	Cesium-137	2 of 2	100%
	Cesium-134	2 of 2	100%
	Cobalt-60	2 of 2	100%
	Potassium-40	2 of 2	100%
	Berillium-7	2 of 2	100%
	Ruthenium-106	2 of 2	100%
	Antimony-125	2 of 2	100%
	Europium-152	2 of 2	100%
	Europium-154	2 of 2	100%
	Europium-155	2 of 2	100%
	Strontium-90	2 of 2	100%
	Uranium-234	2 of 2	100%
	Uranium-235	2 of 2	100%
	Uranium-238	2 of 2	100%
Seep	Aluminum	1 of 2	50%
	Iron	1 of 2	50%
	Lead	2 of 2	100%
	Copper	0 of 2	0%
	Magnesium	2 of 2	100%
	Manganese	1 of 2	50%
	Molybdenum	2 of 2	100%
	Nickel	2 of 2	100%
	Potassium	2 of 2	100%
	Silver	2 of 2	100%
	Strontium	2 of 2	100%
	Strontium-90	1 of 1	100%
	Sodium	2 of 2	100%
	Thallium	2 of 2	100%
	Thorium	2 of 2	100%

Table 12-4. 2018 Field Duplicate Sample Results. (7 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Tin	2 of 2	100%
	Titanium	2 of 2	100%
	Antimony	2 of 2	100%
	Arsenic	2 of 2	100%
	Barium	2 of 2	100%
	Beryllium	2 of 2	100%
	Boron	2 of 2	100%
	Cadmium	2 of 2	100%
	Cesium	2 of 2	100%
	Chromium	2 of 2	100%
	Cobalt	2 of 2	100%
	Uranium	2 of 2	100%
	Uranium-234	1 of 1	100%
	Uranium-235	1 of 1	100%
	Uranium-238	1 of 1	100%
	Vanadium	2 of 2	100%
	Zinc	1 of 2	50%
	Zirconium	2 of 2	100%
	Bismuth	2 of 2	100%
	Calcium	2 of 2	100%
	Phosphorus	1 of 2	50%
	Selenium	2 of 2	100%
	Tritium	2 of 2	100%
	Phosphate	1 of 1	100%
	Sulfate	1 of 1	100%
	Chloride	1 of 1	100%
	Fluoride	1 of 1	100%
	Bromide	1 of 1	100%
	Bicarbonate	1 of 1	100%
	Hydroxylion	1 of 1	100%
	Alkalinity	1 of 1	100%
	Carbonate Alakalinity	1 of 1	100%
	Nitrogen in Nitrate	2 of 2	100%
	Nitrogen in Nitrite	1 of 1	100%
	Lead	1 of 1	100%
	Copper	1 of 1	100%
	Mercury	0 of 1	0%
	Nickel	1 of 1	100%
	Silver	1 of 1	100%
	Strontium-90	1 of 1	100%
	Thallium	1 of 1	100%
	Antimony	1 of 1	100%
	Antimony-125	1 of 1	100%
	Arsenic	1 of 1	100%
	Beryllium	1 of 1	100%
	Beryllium-7	1 of 1	100%
	Cadmium	1 of 1	100%

Table 12-4. 2018 Field Duplicate Sample Results. (7 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Cesium-134	1 of 1	100%
	Cesium-137	1 of 1	100%
	Chromium	1 of 1	100%
	Hexavalent Chromium	0 of 1	0%
	Cobalt-60	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Uranium	1 of 1	100%
	Uranium-234	1 of 1	100%
	Uranium-235	0 of 1	0%
	Uranium-238	1 of 1	100%
	Potassium-40	1 of 1	100%
	Zinc	1 of 1	100%
	Plutonium-238	1 of 1	100%
	Plutonium-239/240	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Selenium	0 of 1	0%
	Phosphate	1 of 1	100%
	Sulfate	1 of 1	100%
	Chloride	1 of 1	100%
	Fluoride	1 of 1	100%
	Bromide	1 of 1	100%
	Nitrogen in Nitrate	1 of 1	100%
	Nitrogen in Nitrite	1 of 1	100%
Wildlife Carp	Aluminum	1 of 1	100%
	Lead	1 of 1	100%
	Copper	1 of 1	100%
	Manganese	1 of 1	100%
	Mercury	0 of 1	0%
	Nickel	1 of 1	100%
	Silver	1 of 1	100%
	Thallium	1 of 1	100%
	Thorium	1 of 1	100%
	Antimony	1 of 1	100%
	Arsenic	1 of 1	100%
	Barium	1 of 1	100%
	Beryllium	1 of 1	100%
	Cadmium	1 of 1	100%
	Chromium	1 of 1	100%
	Uranium	1 of 1	100%
	Zinc	1 of 1	100%
	Selenium	1 of 1	100%
	Cesium-137	3 of 3	100%
	Cesium-134	3 of 3	100%
	Cobalt-60	3 of 3	100%
	Potassium-40	3 of 3	100%

Table 12-4. 2018 Field Duplicate Sample Results. (7 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Berillium-7	3 of 3	100%
	Plutonium-238	1 of 1	100%
	Plutonium-239/240	1 of 1	100%
	Ruthenium-106	3 of 3	100%
	Antimony-125	3 of 3	100%
	Europium-152	3 of 3	100%
	Europium-154	3 of 3	100%
	Europium-155	3 of 3	100%
	Strontium-90	3 of 3	100%
	Uranium-234	1 of 1	100%
	Uranium-235	1 of 1	100%
	Uranium-238	1 of 1	100%
	Tritium	1 of 1	100%
Wildlife Elk	Cesium-137	3 of 3	100%
	Cesium-134	3 of 3	100%
	Cobalt-60	3 of 3	100%
	Potassium-40	3 of 3	100%
	Berillium-7	3 of 3	100%
	Ruthenium-106	3 of 3	100%
	Antimony-125	3 of 3	100%
	Europium-152	3 of 3	100%
	Europium-154	3 of 3	100%
	Europium-155	3 of 3	100%
	Strontium-90	3 of 3	100%
Wildlife Quail	Cesium-137	2 of 2	100%
	Cesium-134	2 of 2	100%
	Cobalt-60	2 of 2	100%
	Potassium-40	2 of 2	100%
	Berillium-7	2 of 2	100%
	Ruthenium-106	2 of 2	100%
	Antimony-125	2 of 2	100%
	Europium-152	2 of 2	100%
	Europium-154	2 of 2	100%
	Europium-155	2 of 2	100%
	Strontium-90	2 of 2	100%
Corn	Cesium-137	1 of 1	100%
	Cesium-134	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Berillium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Strontium-90	1 of 1	100%
Apples	Cesium-137	2 of 2	100%

Table 12-4. 2018 Field Duplicate Sample Results. (7 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Cesium-134	2 of 2	100%
	Cobalt-60	2 of 2	100%
	Potassium-40	2 of 2	100%
	Beryllium-7	2 of 2	100%
	Ruthenium-106	2 of 2	100%
	Antimony-125	2 of 2	100%
	Europium-152	2 of 2	100%
	Europium-154	2 of 2	100%
	Europium-155	2 of 2	100%
	Tritium	2 of 2	100%
Melons	Cesium-137	1 of 1	100%
	Cesium-134	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Potassium-40	1 of 1	100%
	Beryllium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Tritium	1 of 1	100%
Milk	Cesium-137	1 of 1	100%
	Cesium-134	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Potassium-40	1 of 1	100%
	Beryllium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Tritium	1 of 1	100%

[a] Number of reported results within control limits are those with 1) Relative Percent Difference values less than 30% and 2) result greater than the minimum detectable activity or method detection limit.

12.4 Media Audits and Comparisons

Selected sediment, surface water, food and farm products, wildlife, soil, and vegetation samples were provided to the Washington State Department of Health (WDOH) for comparative analysis as part of the QA program (DOE/RL-91-50). The WDOH conducts the Hanford Environmental Radiation Oversight Program to independently verify the quality of U.S. Department of Energy, Richland Operations Office (DOE-RL) monitoring programs at the Hanford Site. Since 1985, WDOH and DOE-RL have collaboratively participated in the collection of environmental samples located on or in the surrounding areas of the Hanford Site (DOH 320-120, *Hanford Environmental Radiation Oversight Program: 2016 Data Summary Report*). This includes, but is not limited to, conducting split, collocated, and independent sampling at

locations that have the potential to release radionuclides to the environment or that could be impacted by such releases. This program is not intended to characterize completely the environmental radiation on the Hanford Site but provides oversight to Hanford Site contractors in determining the impact of Hanford releases on the environment and the public. More information can be found on the WDOH Environmental Sciences website at http://www.doh.wa.gov/CommunityandEnvironment/Radiation/EnvironmentalSciences.aspx.

Media types provided to the WDOH in 2018 included the following:

- Air filters from 15 locations
- Columbia River continuous water from one location
- Columbia River transects from six locations
- Columbia River shoreline springs (seeps) from seven locations
- Offsite irrigation water from two locations
- Columbia River Sediment from eight locations
- Melons from three locations
- Apples from three locations
- Leafy Vegetables from two locations
- Potatoes from four locations
- Corn from four locations
- Wine Must from three locations
- Upland Game Birds from two locations
- Bass from two locations
- Carp from one location
- Deer/Elk from one location
- Soil from three locations
- Vegetation from three locations.

No comparison data for 2018 were available at the time this report was written; however, links to past data summary reports and other environmental science publications for the Hanford Environmental Radiation Oversight program are available at: https://www.doh.wa.gov/CommunityandEnvironment/Radiation/EnvironmentalSciences/HanfordEnvironmentalRadiationOversightProgram.

12.5 Laboratory Quality Assurance Programs

Contracted analytical laboratories are required to participate in internal and independent QA and QC programs to ensure an appropriate level of performance.

Internal QC programs for contracted laboratories involve routine calibrations of counting instruments, yield determinations, radiochemical procedure reviews, radiation-source checks, background counts, replicate analyses, matrix spikes, reagent blanks, control charts, and other parameters that may identify potential analytical deficiencies.

Independent QA and QC programs are in part represented by the DOE Consolidated Audit Program (DOECAP) and the Mixed Analyte Performance Evaluation Program (MAPEP). DOECAP audits are conducted annually and MAPEP evaluations are conducted twice a year.

The DOECAP program audits laboratory operations by an extensive examination of licenses, procedures, practices, internal QA programs, and adherence to applicable regulation. In an ongoing process after each audit, a laboratory may receive direction to help improve laboratory operations. If needed, the laboratories submit plans to address deficiencies identified through the DOECAP process. The GEL, TARL, and ARS laboratories have all maintained a current and acceptable standing in the DOECAP program.

The MAPEP program evaluates laboratory performance by submitting standardized samples to participating laboratories for analysis. Analytical results from all participating laboratories are then compared to determine each laboratories performance, relative to the group, for each media and analyte tested.

In 2018, the GEL, TARL, and ARS laboratories participated in the MAPEP and DOECAP programs. All three of these laboratories had overall acceptable results under these programs.

Because the TARL and ARS laboratories only analyzed hexavalent chromium and low level tritium, respectively, for the ES program, and neither of these analytes were directly evaluated by MAPEP in 2018, the TARL and ARS MAPEP results are not presented here. The GEL MAPEP results are summarized in Table 12-5.

Table 12-5. 2018 DOE Mixed Analyte Performance Evaluation Program Results for General Engineering Laboratories, LLC. (2 Pages)

Environmental Sample Media and Analytes Evaluated		MAPEP 38 Series June 2018 [a]	MAPEP 39 Series December 2018 [a]
Radionuclides			
Air Filters	Americium-241, cesium-134, cesium-137, cobalt-57, cobalt-60, manganese-54, plutonium-238, plutonium-239/240, strontium-90, uranium-234/233, uranium-238, zinc-65	100% Acceptable	manganese-54 [b]
Water	Americium-241, cesium-134, cesium-137, cobalt-60, Hydrogen-3 (tritium), iron-55, manganese-54, Nickel-63, plutonium-238, plutonium-239/240, potassium-40, radium-226 technetium-99	100% Acceptable	Radium-226[b]
Vegetation	Americium-241, cesium-134, cesium-137, cobalt 57, cobalt-60, manganese-54 plutonium-238, plutonium-239/240, strontium-90, uranium-234/233, uranium-238, zinc-65	100% Acceptable	100% Acceptable
Soil	Americium-241, cesium-134, cesium-137, cobalt-57, colbalt-60, iron-55, manganese-54, nickel-63, plutonium-238, plutonium-239/240, potassium-40, strontium-90	100% Acceptable	100% Acceptable
Inorganic			
Air Filters	Uranium-235, Uranium-238, Uranium-total	100% Acceptable	100% Acceptable
Water	Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium,	100% Acceptable	Technetium-99[b]

Table 12-5. 2018 DOE Mixed Analyte Performance Evaluation Program Results for General Engineering Laboratories, LLC. (2 Pages)

Environmental Sample Media and Analytes Evaluated		MAPEP 38 Series June 2018 [a]	MAPEP 39 Series December 2018 [a]
	technetium-99, thallium, Uranium-235, Uranium-238, Uranium-total, vanadium, zinc		
Vegetation	Uranium-235, Uranium-238, Uranium-total	100% Acceptable	100% Acceptable
Soil	Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, technetium-99, thallium, Uranium-235, Uranium-238, Uranium-total, vanadium, zinc	100% Acceptable	Antimony[b] Technetium-99[b]

[a] Performance results 100% acceptable for all analytes reported unless otherwise noted.
[b] Result is acceptable but was issued a warning for having a bias between 20 and 30%.
MAPEP = Mixed Analyte Performance Evaluation Program

12.5.1 Laboratory Performance Evaluation and Proficiency Testing

To demonstrate administrative and analytical proficiency all three laboratories (GEL, TARL, ARS) participate in independent QA and QC programs including the MAPEP and the DOECAP. For calendar year 2018, two full MAPEP evaluations were conducted (numbered 38 and 39), each of which included multiple studies of different types of media (e.g., soil, water, vegetation, air filters).

Participation of Hanford Site analytical laboratories in DOE and U.S. Environmental Protection Agency laboratory performance evaluation programs serves to ensure data quality. Hanford Site environmental monitoring contract laboratories participate in MAPEP-sanctioned proficiency testing provided by an independent laboratory (e.g., Environmental Resource Associates).

DOE's MAPEP provides critical QA testing for environmental analytical services. Radiological and non-radiological (organic and inorganic) constituents are evaluated by performing semiannual proficiency testing of the Hanford Site DOE-RL laboratories and other federal, state, commercial, and international laboratories. MAPEP proficiency tests help to ensure the accuracy of analytical results reported to DOE-RL and other stakeholders while providing an efficient means for laboratories to demonstrate analytical proficiency. MAPEP reports can be found on the DOE's MAPEP webpage at http://www.id.energy.gov/resl/mapep/mapepreports.html.

MAPEP reports evaluate individual laboratory results against cumulative results from all of the participating laboratories for a standardized material by analyte. Where the individual results agree within 20% of the cumulative results an acceptable status is given. For individual results that differ from the cumulative result, in the range of 20 to 30%, an "acceptable with warning" status is given. For individual results that differ from the cumulative result by more than 30% an "unacceptable" result is given. Variability in the standardized material and analytical variability both play a role in determining these status rankings. It is not unusual, for a laboratory to receive "acceptable with warning" or "unacceptable" status rankings. Laboratories that repetitively receive other than "acceptable" results for the same analyte may receive technical assistance from the MAPEP team to resolve quality issues.

GEL is the primary laboratory for the ES program. GEL's 2018 MAPEP results were nearly all acceptable for all media and analytes. GEL received "acceptable with warning" status (bias in the range of 20 to

30%) for uranium-234/233, technetium-99, radium-226, manganese-54, and antimony. GEL did not receive any "unacceptable" results (bias greater than 30%). A summary of GEL's 2018 MAPEP results is presented in Table 12-5.

Water samples collected for hexavalent chromium analysis were sent to TARL because of the proximity of the laboratory to the Hanford Site and the short holding time specified by the analytical method. This is the only analysis performed for the ES program by TARL. MAPEP does not specifically evaluate the analysis of hexavalent chromium in water. TARL's MAPEP results for other radiological and chemical constituents are overall good, but there are multiple "acceptable with warning" (bias in the range of 20 to 30%) and several "unacceptable" (bias greater than 30%) ratings. Under the MAPEP program, these issues would be mitigated by future results and are not considered to be unrecoverable problems. However, it should be noted that the TARL stopped accepting samples in the first quarter of 2019 and will cease operations entirely by the end of the year.

Water samples collected for low-level tritium analysis by electrolytic enrichment were sub-contracted out to ARS. This is the only analytical method performed for the ES program by ARS. MAPEP does not specifically evaluate this method. ARS MAPEP program results for other radiological and chemical constituents were very good. Similar to the laboratories mentioned above, several analytes received "acceptable with warning" (bias in the range of 20 to 30%) and there were a few "unacceptable" (bias greater than 30%) ratings. Under the MAPEP program, these results will be mitigated by future results and are not considered unrecoverable.

12.6 Data Recording and Data Management

Record keeping is a vital part of all environmental programs on the Hanford Site. Maintenance of environmental data is essential for QA, regulatory compliance, trend analysis, and optimization purposes. The Environmental Surveillance program is responsible for ensuring that analytical data are appropriately reviewed, managed, and stored in accordance with applicable programmatic requirements governing data management procedures. Project documentation includes environmental sample logbooks; processing forms; and, as applicable, monthly, quarterly, and annual occurrence reports. Several electronic data repositories are used to house the environmental data, all of which have their own internal QA and QC policies and procedures.

12.7 References

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