8.0 Quality Assurance

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Quality assurance and quality control practices encompass all aspects of Hanford Site environmental monitoring and surveillance programs. Samples are collected and analyzed according to documented standard analytical procedures. Analytical data quality is verified by a continuing program of internal laboratory quality control, participation in interlaboratory crosschecks, replicate sampling and analysis, submittal of blind standard samples and blanks, and splitting samples with other laboratories.

Quality assurance/quality control for the Hanford Site environmental monitoring program also includes procedures and protocols to

- document instrument calibrations
- conduct program-specific activities in the field
- maintain groundwater wells to ensure representative samples are collected
- use dedicated well sampling pumps to avoid cross-contamination.

This section discusses specific measures taken to ensure quality in project management, sample collection, and analytical results.

8.0.1 Environmental Surveillance and Groundwater Monitoring

Comprehensive quality assurance programs, including various quality control practices, are maintained to ensure the quality of data collected through the Surface Environmental Surveillance Project and the Hanford Groundwater Monitoring Project. Quality assurance plans are maintained for all program activities and define the appropriate controls and documentation required by the U.S. Environmental Protection Agency (EPA) and/or the U.S. Department of Energy (DOE) for the project-specific requirements.

8.0.1.1 Project Management Quality Assurance

Site environmental surveillance, groundwater monitoring, and related programs such as processing of thermoluminescent dosimeters and performing dose calculations are subject to an overall quality assurance program. This program implements the requirements of DOE Order 5700.6C.

The site surveillance and groundwater monitoring projects have quality assurance plans that describe the specific quality assurance elements that apply to each project. These plans are approved by a quality assurance organization that conducts surveillances and audits to verify compliance with the plans. Work performed through contracts such as sample analysis must meet the same quality assurance requirements. Potential equipment and service suppliers are audited before service contracts or material purchases that could have a significant impact on quality within the project are approved and awarded.

8.0.1.2 Sample Collection Quality Assurance/Quality Control

Surface Environmental Surveillance Project samples are collected by staff trained to conduct sampling according to approved and documented procedures (PNL-MA-580, Rev. 2). Continuity of all sampling location identities is maintained through careful documentation. Field duplicates are collected for specific media and a summary of the results is provided in Table 8.0.1. The percentage of acceptable field duplicate results for 1999 was 89%.

Samples for the Hanford Groundwater Monitoring Project are collected by trained staff according to approved and documented procedures (ES-SSPM-001). Chain-of-custody procedures are followed (SW-846) that provide for the use of evidence tape in sealing sample bottles to maintain the integrity of the samples during shipping. Full trip blanks and field duplicates are obtained during field operations. Summaries of the 1999 groundwater field quality control sample results are provided in Appendix B of PNNL-13116 or at the web address http://hanford.pnl.gov/groundwater/gwrep99/html/start1.htm. The percentages of acceptable field blank and duplicate results in fiscal year 1999 were very high, 92% for blanks and 98% for field duplicates.

8.0.1.3 Analytical Results Quality Assurance/Quality Control

Routine chemical analyses of water samples were performed primarily by the Quanterra Laboratory, St. Louis, Missouri, for environmental and groundwater surveillance. Some routine analyses of hazardous and nonhazardous chemicals for the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) groundwater program were also performed by Recra Environmental, Inc., Lionsville, Pennsylvania. Each laboratory participates in the EPA Water Pollution and Water Supply Performance Evaluation Studies. Each laboratory maintains an internal quality control program that meets

Table 8.0.1. Summary of Surface Environmental Surveillance Project Field Duplicate Results, 1999

Medium	Radionuclides	Number of Results Reported	Number Within Control Limits[a]
Air filters	Gross alpha	26	17
	Gross beta	25	25
	^{3}H	12	6
	^{7}Be, ^{40}K, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	36	36
Water	Gross alpha	1	1
	Gross beta	1	0
	^{3}H	4	3
	^{7}Be, ^{40}K, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	9	8
	^{90}Sr	3	2
	^{234}U, ^{235}U, ^{238}U	9	9
Milk	^{7}Be, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	36	36
	^{90}Sr	4	4

(a) Control limit of ±30% for sample and duplicate results above the detection limit or minimum detectable concentration.

the requirements in SW-846, which is audited and reviewed internally and by Pacific Northwest National Laboratory. Pacific Northwest National Laboratory submits additional quality control double-blind spiked samples for analysis.

Routine radiochemical analyses on samples for the Surface Environmental Surveillance Project and the Hanford Groundwater Monitoring Project were performed primarily by Quanterra's Richland, Washington laboratory. Data from Thermo NUtech, Richmond, California, were also used in the fiscal year 1999 groundwater evaluations. Each laboratory participates in DOE's Quality Assessment Program at the Environmental Measurements Laboratory in New York, and the Proficiency Testing Program at Environmental Resource Associates in Arvada, Colorado. The Environmental Resource Associates program replaced the EPA's Laboratory Intercomparison Studies Program which terminated in December 1998. Environmental Resource Associates prepares and distributes proficiency standard samples according to EPA requirements. Environmental Resource Associates is also accredited by the National Voluntary Laboratory Accreditation Program (NVLAP Lab Code 200386-0) to offer this program. An additional quality control blind spiked sample program is conducted for each project. Each laboratory also maintains an internal quality control program, which is audited and reviewed internally and by Pacific Northwest National Laboratory. Additional information on these quality control efforts is provided in the following sections.

8.0.1.4 DOE and EPA Comparison Studies

Standard water samples are distributed blind to participating laboratories as part of the EPA performance evaluation program. These samples contain specific organic and inorganic analytes that have concentrations unknown to the analyzing laboratories. After analysis, the results are submitted to Environmental Resource Associates, the EPA performance evaluation program sponsor, for comparison with known values and results from other participating laboratories. Summaries of the results for 1999 are provided in Table 8.0.2 for the primary laboratory, Quanterra, St. Louis, Missouri. The percentage of acceptable results is high for the laboratory, indicating acceptable performance.

Table 8.0.2. Summary of Performance on EPA Water Pollution and Water Supply Studies, 1999

Laboratory	Water Pollution Study November 1998 % Acceptable	Water Supply Study February 1999 % Acceptable	Water Pollution Study May 1999 % Acceptable	Water Supply Study August 1999 % Acceptable
Quanterra Laboratory, St. Louis, Missouri	85[a]	84[b]	91[c]	94[d]

(a) Unacceptable results were for alkalinity, Kjeldahl-nitrogen, Aroclor 1016/1242 in oil, Aroclor 1254 in oil, benzene, ethylbenzene, toluene, three dichlorobenzenes, and total phenolics.
(b) Unacceptable results were for alkalinity, orthophosphate, hardness, turbidity, boron, fluoride, nitrate, nitrite, 2,4,5-T, 2,4-D, 2,4-DB, chlorobenzene, 1,2-dichloroethane, and 1,1,2-trichloroethane.
(c) Unacceptable results were for hardness, orthophosphate, mercury, Aroclor 1016, Kjeldahl-nitrogen, 1,2-dichlorobenzene, 1,3-dichlorobenzene, tetrachloroethylene, and total suspended solids.
(d) Unacceptable results were for orthophosphate, mercury, carbon tetrachloride, 1,1,1,2-tetrachloroethane, and 1,2,3-trichloropropane.

The DOE Quality Assessment Program and Environmental Resource Associates' Proficiency Testing Program provide standard samples of environmental media (e.g., water, air filters, soil, vegetation) that contain specific amounts of one or more radionuclides that were unknown by the participating laboratory. After analysis, the results are forwarded to DOE or Environmental Resource Associates for comparison with known values and results from other laboratories. Both DOE and Environmental Resource Associates have established criteria for evaluating the accuracy of results (NERL-Ci-0045, EML-604, EML-605). Summaries of the 1999 results are provided in Tables 8.0.3 and 8.0.4.

8.0.1.5 Pacific Northwest National Laboratory Evaluations

In addition to DOE and EPA interlaboratory quality control programs, Pacific Northwest National Laboratory maintains a quality control program to evaluate analytical contractor precision and accuracy and to conduct special intercomparisons. This program includes the use of blind spiked samples. Blind spiked quality control samples and blanks were prepared and submitted to check the accuracy and precision of analyses at Quanterra. In 1999, blind

Table 8.0.3. Summary of Performance on DOE Quality Assessment Program Samples, 1999

Medium	Radionuclides	Number of Results Reported for Each Analyte	Number Within Acceptable Control Limits[a]
Quanterra Environmental Services, Richland, Washington			
Air filter particulate	Gross alpha, gross beta, ^{57}Co, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, total uranium	2	2
	^{54}Mn, ^{106}Ru, ^{125}Sb	1	1
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{212}Pb, ^{214}Bi, ^{214}Pb, ^{228}Ac, ^{234}U, ^{238}U, ^{239}Pu, ^{241}Am, total uranium	2	2
	^{234}Th	2	1
	^{238}Pu	1	1
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	2	2
Water	Gross alpha, gross beta, ^{3}H, ^{60}Co, ^{63}Ni, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}Pu, ^{239}Pu, ^{241}Am, total uranium	2	2
	^{238}U	2	1

(a) Control limits are from EML-604 and EML-605.

Table 8.0.4. Summary of Performance on Environmental Resource Associates Proficiency Testing Program, 1999

Medium	Radionuclides	Number of Results Reported for Each Analyte	Number Within Control Limits for Each Analyte[a]
Quanterra Environmental Services, Richland, Washington			
Water	Gross alpha, ^{226}Ra, ^{228}Ra	5	5
	Total uranium	5	4
	Gross beta	5	2
	^{90}Sr	4	4
	^{134}Cs, ^{137}Cs	4	3
	^{60}Co	4	2
	^{89}Sr	3	2
	^{3}H, ^{65}Zn, ^{133}Ba	2	2
	^{131}I	1	1

(a) Control limits are from NERL-Ci-0045.

spiked samples were submitted for groundwater (Table 8.0.5) and for air filters, vegetation, soil, and surface water (Table 8.0.6). For all water samples, 89% of nonradiochemistry blind spiked determinations were within control limits (see discussion of results in Appendix B of PNNL-13116). For all media, 91% of Quanterra's radiochemistry blind spiked determinations were within control limits, which indicates acceptable results.

Pacific Northwest National Laboratory also participates in a Quality Assurance Task Force, a program conducted by the Washington State Department of Health. Public and private organizations from Idaho, Oregon, and Washington participate in analyzing the intercomparison samples. Samples from a Hanford Site well were collected for the 1999 intercomparison sample exchange. The data have not yet been compiled. Results will appear in the annual 2000 Hanford Site Environmental Report.

8.0.1.6 Laboratory Internal Quality Assurance Programs

The analyzing laboratories are required to maintain an internal quality assurance and control program. Periodically, the laboratories are audited internally for compliance to the quality assurance and control programs. At Quanterra St. Louis, the quality control programs meet the quality assurance and control criteria in SW-846. The laboratories are also required to maintain a system for reviewing and analyzing the results of the quality control samples to detect problems that may arise from contamination, inadequate calibrations, calculation errors, or improper procedure performance. Method detection levels are determined at least annually for each analytical method.

The internal quality control program at Quanterra Richland involves routine calibrations of

Table 8.0.5. Summary of Hanford Groundwater Monitoring Project Double-Blind Spike Determinations, 1999[a]

Constituent	Sample Frequency	Number of Results Reported[b]	Number of Results Outside QC Limits[c]	Control Limits[d] (%)
General Chemical Parameters				
Specific conductance	Annually	3	0	±25
Total organic carbon (potassium hydrogen phthalate spike)	Quarterly	16	3	±25
Total organic halides (2,4,6-trichlorophenol spike)	Quarterly	14	0	±25
Total organic halides (carbon tetrachloride, chloroform, and trichloroethene spike)	Quarterly	14	7	±25
Anions				
Cyanide	Quarterly	14	3	±25
Fluoride	Quarterly	12	0	±25
Nitrate	Semiannually	6	0	±25
Metals				
Chromium	Semiannually	6	0	±20
Volatile Organic Compounds				
Carbon tetrachloride	Quarterly	16	1	±25
Chloroform	Quarterly	16	0	±25
Trichlorethylene	Quarterly	16	1	±25
Radiological Parameters				
Gross alpha (plutonium-239 spike)	Quarterly	16	3	±25
Gross beta (strontium-90 spike)	Quarterly	16	3	±25
Cesium-137	Semiannually	6	0	±30
Cobalt-60	Semiannually	6	0	±30
Iodine-129	Semiannually	6	0	±30
Plutonium-239	Quarterly	16	1	±30
Strontium-90	Semiannually	6	0	±30
Technetium-99	Quarterly	16	0	±30
Tritium	Quarterly	9	2	±30
Uranium-238	Quarterly	16	0	±30

(a) The Hanford Groundwater Monitoring Project reporting requirements are by fiscal year (October 1 through September 30).
(b) Blind standards were submitted in triplicate or quadruplicate.
(c) Quality control limits are given in the project Quality Assurance plan.
(d) Each result must be within the specified percentage of the known value to be acceptable.

counting instruments, yield determinations of radiochemical procedures, frequent radiation check sources and background counts, replicate and spiked sample analyses, matrix and reagent blanks, and maintenance of control charts to indicate analytical deficiencies. Available calibration standards traceable to the National Institute of Standards and Technology are used for radiochemical calibrations. Calculation of minimum detectable concentrations involves the use of factors such as the average counting efficiencies and background for detection instruments, length of time for background and sample counts,

Table 8.0.6. Summary of Surface Environmental Surveillance Project Blind Spiked Determinations, 1999

Medium	Radionuclides	Number of Results Reported	Number Within Control Limits[a]
Air filters	^{60}Co, ^{90}Sr, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{238}Pu, ^{239}Pu	15	14
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}U, ^{238}Pu, ^{239}Pu	10	8
Water	^{3}H, ^{60}Co, ^{90}Sr, ^{134}Cs, ^{137}Cs, ^{238}Pu, ^{239}Pu	13	13
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu	12	9

(a) Control limit of ±30%.

sample volumes, radiochemical yields, and a predesignated uncertainty multiplier (EPA 520/1-80-012).

Periodically, inspections of services are performed that document conformance with contractual requirements of the analytical facility and provide the framework for identifying and resolving potential performance problems. Responses to assessment and inspection findings are documented by written communication, and corrective actions are verified by follow-up audits and inspections. Assessments of Quanterra St. Louis and Quanterra Richland were conducted in 1999 by the Hanford Site's Integrated Contractor Assessment Team, consisting of representatives from Bechtel Hanford, Inc., Pacific Northwest National Laboratory, and Waste Management Federal Services of Hanford, Inc. The purpose of the assessment of services was to evaluate the continued capability of the laboratories to analyze and process samples for the Hanford Site as specified in the statement of work between the DOE contractors and the laboratories.

Internal laboratory quality control program data are reported with the analytical results. Scientists at Pacific Northwest National Laboratory summarized the results quarterly. The results of the quality control sample summary reports indicated an acceptably functioning internal quality control program.

8.0.1.7 Media Audits and Comparisons

Additional audits and comparisons are conducted on several specific types of samples. The Washington State Department of Health routinely cosampled various environmental media and measured external radiation levels at multiple locations during 1999. Media that were cosampled and analyzed for radionuclides included groundwater from 32 wells, water from 12 locations along and across the Columbia River, water from 4 riverbank springs, groundwater from 5 drive point locations near the Columbia River's edge, water from 1 onsite drinking water location, sediment from 10 Columbia River sites, surface soil samples from 8 locations, samples from 3 air monitoring stations, thermoluminescent dosimeters from 16 sites, a Canadian goose and an elk. Also cosampled and analyzed for radionuclides were upwind and downwind samples of leafy vegetables, fruit, potatoes, and wine. Results will be published in the Washington State Department of Health 1999 annual report.

The U.S. Food and Drug Administration also cosampled and analyzed cucumbers, cherries, leafy vegetables (swiss chard and spinach), and potatoes for radionuclides from upwind and downwind sampling locations. The data are presented in Table 8.0.7.

Table 8.0.7. Comparison of U.S. Food and Drug Administration Cosampling, 1999

Medium	Area[a]	Organization[b]	Strontium-90, pCi/g[c]	Cesium-137, pCi/g[c]	Ruthenium-106, pCi/g[c]	Iodine-131 pCi/g[c]
Leafy vegetables	Riverview	FDA[d]	0.0043 ± 0.0013[e]	<0.045	<0.045	
		FDA	0.0044 ± 0.0012[e]	<0.045	<0.045	
		PNNL[f]	<0.032	<0.062	<0.022	
	Sunnyside	FDA	<0.002	<0.045	<0.045	
		FDA	<0.002	<0.045	<0.045	
		PNNL	<0.035	<0.044	<0.37	
Potatoes	Sunnyside	FDA	<0.002	<0.045	<0.045	
		FDA	<0.002	<0.045	<0.045	
		PNNL	<0.0026	<0.0063	<0.052	
	Horn Rapids	FDA	<0.002	<0.045	<0.045	
		FDA	<0.002	<0.045	<0.045	
		PNNL	<0.0028	<0.0061	<0.052	
Cherries	Sagemoor	FDA	<0.002	<0.045	<0.045	
		FDA	<0.002	<0.045	<0.045	
		PNNL	<0.00351	<0.0045	<0.0677	
Cucumber	Eltopia	FDA	<0.002	<0.045	<0.045	<0.1
		FDA	<0.002	<0.045	<0.045	<0.1
		PNNL	NA[g]	<0.0025	<0.022	<0.0026

(a) Locations are identified in Figure 4.4.1.
(b) Two samples of each medium were collected for FDA, one for PNNL.
(c) Less than (<) values are the 2 sigma total propagated analytical uncertainties.
(d) FDA = U.S. Food and Drug Administration.
(e) ±2 sigma total propagated analytical uncertainty.
(f) PNNL = Pacific Northwest National Laboratory.
(g) NA = Not analyzed.

Quality control for environmental thermoluminescent dosimeters includes the audit exposure of three environmental thermoluminescent dosimeters per quarter to known values of radiation (between 18 and 28 mR). A summary of 1999 results is shown in Table 8.0.8. On average, the thermoluminescent dosimeter measurements were biased 3% higher than the known values.

8.0.2 Effluent Monitoring and Near-Facility Environmental Monitoring

The Effluent Monitoring and Near-Facility Environmental Monitoring Programs are subject to the quality assurance requirements specified in the Hanford Analytical Services Quality Assurance Requirements Document (DOE/RL-96-68). These quality assurance programs comply with DOE Order 5700.6C, using standards from the American Society of Mechanical Engineers (ASME NQA-1-1997 Edition) as their basis. The programs also adhere to the guidelines and objectives in EPA/005/80 and EPA QA/R-5.

The monitoring programs each have a quality assurance project plan describing applicable quality

Table 8.0.8. Comparison of Thermoluminescent Dosimeter Results with Known Exposure, 1999

Quarter	Exposure Date	Known Exposure, mR[a]	Determined Exposure, mR[b]	% of Known Exposure
1st	February 10, 1999	18 ± 0.67	17.85 ± 0.35	99
	February 10, 1999	21 ± 0.78	19.86 ± 0.39	95
	February 10, 1999	27 ± 1.00	29.60 ± 0.12	110
2nd	May 14, 1999	19 ± 0.70	20.38 ± 0.20	107
	May 14, 1999	23 ± 0.85	24.78 ± 0.48	108
	May 14, 1999	28 ± 1.04	30.78 ± 1.83	110
3rd	August 13, 1999	19 ± 0.70	19.79 ± 0.02	104
	August 13, 1999	24 ± 0.89	24.59 ± 0.08	102
	August 13, 1999	27 ± 1.00	27.39 ± 1.40	101
4th	November 15, 1999	18 ± 0.67	17.80 ± 0.70	99
	November 15, 1999	22 ± 0.81	22.27 ± 0.65	101
	November 15, 1999	26 ± 0.96	26.21 ± 0.24	101

(a) ±2 sigma total propagated analytical uncertainty.
(b) ±2 times the standard deviation.

assurance elements. These plans are approved by contractor quality assurance groups, who conduct surveillances and audits to verify compliance with the plans. Work such as sample analysis performed through contracts must meet the requirements of these plans. Suppliers are audited before the contract selection is made for equipment and services that may significantly impact the quality of a project.

8.0.2.1 Sample Collection Quality Assurance

Samples for the Effluent Monitoring and Near-Facility Environmental Monitoring Programs are collected by staff trained for the task in accordance with approved procedures. Established sampling locations are accurately identified and documented to ensure continuity of data for those sites and are described in DOE/RL-91-50, Rev. 2.

8.0.2.2 Analytical Results Quality Assurance

Samples for the Effluent Monitoring and Near-Facility Environmental Monitoring Programs are analyzed by four different analytical laboratories. The use of these laboratories is dependent on the Hanford contractor collecting the samples and contract(s) established between the contractor and the analytical laboratory(s). Table 8.0.9 provides a summary of the Hanford Site's analytical laboratories used for effluent monitoring and near-facility monitoring samples.

The quality of the analytical data is ensured by several means. Counting room instruments, for instance, are kept within calibration limits through daily checks, the results of which are stored in computer databases. Radiochemical standards used in analyses are regularly measured and the results are

Table 8.0.9. Hanford Site Laboratories Used by Contractor and Sample Type, 1999

Analytical Laboratory	Effluent Monitoring Samples					Near-Facility Environmental Monitoring Samples		
	Fluor Hanford, Inc.		Pacific Northwest National Laboratory	Bechtel Hanford, Inc.		Fluor Hanford, Inc.		
	Air	Water	Air	Air	Water	Air	Water	Other
Waste Sampling and Characterization Facility[a]	X	X		X	X	X	X	X
222-S Analytical Laboratory[a]								X
Quanterra Environmental Services, Richland	X	X	X	X	X			
Analytical Chemistry Laboratory[b]	X	X	X					

(a) Operated by Fluor Hanford, Inc.
(b) Operated by Pacific Northwest National Laboratory.

reported and tracked. Formal, written laboratory procedures are used in analyzing samples. Analytical procedural control is ensured through administrative procedures. Chemical technologists at the laboratory qualify to perform analyses through formal classroom and on-the-job training.

The participation of the Hanford Site analytical laboratories in EPA and DOE laboratory performance programs also serves to ensure the quality of the data produced. Laboratory performance program results for calendar year 1999 for the Waste Sampling and Characterization Facility were evaluated in two different studies. In the EPA Water Pollution Study # WP-55, 50 different parameters, analytes, and compounds were submitted to the Waste Sampling Characterization Facility for analysis. Analysis results were unacceptable for only 2 analytes (4,4'-DDD [4,4'-dichlorodiphenyldichloroethane] and methoxychlor [dimethoxy-DDT]), for a total of 96% acceptable analysis results. In the DOE Mixed Analyte Performance Evaluation Program study MAPEP-99-S6, 49 analytes and/or compounds were submitted to the Waste Sampling Characterization Facility for analysis. Analysis results were unacceptable for only one analyte (strontium-90), for a total of 98% acceptable analysis results. Other performance results are presented in Tables 8.0.10 through 8.0.12.

Table 8.0.10. Waste Sampling and Characterization Facility[a] Performance on DOE Quality Assessment Program Samples, 1999

Medium	Radionuclide	Number of Results Reported	Number Within Control Limits
Air filters	^{54}Mn, ^{57}Co, ^{60}Co, ^{90}Sr, ^{125}Sb, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, gross alpha, gross beta	23	21
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}U, ^{239}Pu, ^{241}Am	12	10
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	13	11
Water	^{3}H, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, gross alpha, gross beta	22	19

(a) Onsite laboratory operated by Fluor Hanford, Inc.

Table 8.0.11. 222-S Analytical Laboratory[a] Performance on DOE Quality Assessment Program Samples, 1999

Medium	Radionuclide	Number of Results Reported	Number Within Control Limits
Air filters	^{54}Mn, ^{57}Co, ^{60}Co, ^{90}Sr, ^{125}Sb, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{241}Am	15	15
Soil	^{90}Sr, ^{137}Cs, ^{239}Pu, total uranium	5	4
Vegetation	^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	10	9
Water	^{3}H, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{241}Am, total uranium	15	11

(a) Onsite "high-level" radiological laboratory operated by Fluor Hanford, Inc. (Note: These samples are "low-level" environmental activity samples.)

Table 8.0.12. 222-S Analytical Laboratory[a] Performance on Environmental Resource Associates Laboratory Water Pollution Inorganic Studies, 1999

Laboratory	Water Pollution Study April 1999 % Acceptable	Water Pollution Study November 1999 % Acceptable
222-S Analytical Laboratory	91[b]	97[c]

(a) Onsite "high-level" radiological laboratory operated by Fluor Hanford, Inc.
(b) Unacceptable results were for chloride, fluoride, and copper.
(c) Unacceptable result was for conductivity.

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