Date Submitted: 4/01/08 Originator: J. M. Capron Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-FR-1 Waste Site Code: 100-F-54 Type of Reclassification Action: Closed Out ☒ Interim Closed Out ☐ No Action ☒ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2008-015

This form documents agreement among parties listed authorizing classification of the subject unit as Closed Out, Interim Closed Out, No Action, RCRA Postclosure, Rejected, or Consolidated. This form also authorizes backfill of the waste management unit, if appropriate, for Closed Out and Interim Closed Out units. Final removal from the NPL of No Action and Closed Out waste management units will occur at a future date.

Description of current waste site condition:

The 100-F-54 waste site, part of the 100-FR-2 Operable Unit, is the soil associated with the former pastures for holding domestic farm animals used in experimental toxicology studies. Evaluation of historical information resulted in identification of the experimental animal farm pastures as having potential for residual soil contamination due to excrement from experimental animals. Confirmatory sampling of the 100-F-54 waste site was conducted to determine a No Action or Remedial Action decision in accordance with the remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Basis for reclassification:

The 100-F-54 animal farm pastures confirmatory sampling results support a reclassification of this site to No Action. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the Remaining Sites ROD. The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-F-54 Animal Farm Pastures* (attached).

Waste Site Controls:

Engineered Controls: Yes ☐ No ☒ Institutional Controls: Yes ☐ No ☒ O&M Requirements: Yes ☐ No ☒
If any of the Waste Site Controls are checked Yes specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents.

S. L. Charboneau DOE Federal Project Director (printed)	Stacy Charboneau Signature	4/11/08 Date
NA Ecology Project Manager (printed)	Signature	Date
R. A. Lobos EPA Project Manager (printed)	Signature	4/17/08 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-54 ANIMAL FARM PASTURES

Attachment to Waste Site Reclassification Form 2008-015

April 2008

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-54 ANIMAL FARM PASTURES

EXECUTIVE SUMMARY

This remaining sites verification package documents evaluation of the confirmatory sampling results to support reclassification of the 100-F-54 waste site to No Action.

The 100-F-54 site, part of the 100-FR-1 Operable Unit, is the soil associated with the former pastures for holding domestic farm animals used in experimental toxicology studies. Evaluation of historical information resulted in identification of the experimental animal farm pastures as having potential for residual soil contamination due to excrement from animals housed for use in laboratory experiments conducted at the 100-F Area. Most of the animal studies were conducted in a laboratory complex of buildings located northeast of the 105-F Reactor Building. Three general pasture areas were associated with the experimental animal farm complex; however, some of these areas later were used for stockpiling soil associated with the 100-F Area Remedial Action excavations, were extensively disturbed during remediation activities, and were subsequently surveyed and/or sampled to demonstrate no residual radiological activity. Recent field observations indicate that only two pasture areas are present that are relatively undisturbed, potentially exhibit soil representative of the pasture, and are available for sampling. One area is within a pasture south of the former 141-C and 145-F Buildings, and the second area is within a pasture north of the former 141-T Building.

Confirmatory sampling at the site was conducted on November 19, 2007. A statistical sample design was selected for confirmatory sampling because the distribution of potential residual soil contamination was uncertain. Historical documents indicate strontium-90, iodide-131, isotopes of plutonium, cesium-137, and other radioisotopes were used in the animal exposure studies. Therefore, the contaminants of potential concern for this soil investigation included radionuclides evaluated using laboratory analytical methods for gamma-, beta-, and alpha-emitting radionuclides. The analytical results indicated no residual radiological activity above background activity or exceeding cleanup criteria. A summary of the evaluation of the sampling results against the applicable criteria is presented in Table ES-1.

The results of confirmatory sampling are used to make reclassification decisions for the 100-F-54 site in accordance with the TPA-MP-14 (DOE-RL 2007) procedure. In accordance with this evaluation, the confirmatory sampling results support a reclassification of this site to No Action. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

Table ES-1. Summary of Remedial Action Goals for the 100-F-54 Site.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure Radionuclides	Attain 15 mrem/yr dose rate above background over 1,000 years.	Maximum dose rate estimated using generic dose equivalence lookup values is 1.68 mrem/yr.	Yes
Direct Exposure Nonradionuclides	Attain individual COPC RAGs.	No nonradionuclides were identified as COPCs for confirmatory sampling.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	No nonradionuclides were identified as COPCs for confirmatory sampling.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.		
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.		
	Attain a total excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.		
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river protection RAGs.	None of the radionuclide COPCs are predicted to reach groundwater. All single COPC groundwater and river RAGs have therefore been attained.	Yes
	Attain national primary drinking water regulations:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	None of the radionuclide COPCs are predicted to reach groundwater within 1,000 years.	
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide from DOE Order 5400.5.[b]	No alpha-emitting radionuclides were detected above statistical background levels.	
	Meet total uranium standard of 21.2 pCi/L.[c]	Uranium was not identified as a COPC for confirmatory sampling; U-235 and U-238 were not detected in samples analyzed by gamma energy analysis.	
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	No nonradionuclides were identified as COPCs for confirmatory sampling.	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Areas, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).

COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for site contaminants of potential concern and other constituents. Screening levels were not exceeded for the site constituents. A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used as part of the final closeout decision for this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-54 ANIMAL FARM PASTURES

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-F-54 waste site meets the objectives for No Action as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-F-54 site, part of the 100-FR-1 Operable Unit, is the soil associated with the former pastures for holding domestic farm animals used in experimental toxicology studies. Evaluation of historical information resulted in identification of the experimental animal farm pastures as having potential for residual soil contamination due to excrement from experimental animals. Most of the animal studies were conducted in a laboratory complex of buildings located northeast of the 105-F Reactor Building. Three general pasture areas were associated with the experimental animal farm complex (see Figures 1 and 2):

- Area 1: A large, contiguous pasture from the 141-G Building north to the perimeter road
- Area 2: Two smaller pastures: "2a" west of the 141-H Building and "2b" north of the 141-T Building
- Area 3: Two larger pastures (one for hogs, one for goats) south of the 141-C and 145-F Buildings.

Some of these areas were used for stockpiling soil associated with the 100-F Area remedial action excavations, were extensively disturbed during remediation activities, and were subsequently surveyed and/or sampled to demonstrate no residual radiological activity. A site visit was performed on January 11, 2007, to verify the location of the pastures, determine if any areas of the pasture soil horizon are visible at the present soil surface, and evaluate field conditions and potential sampling issues. There were only two small areas where the original pasture surface was not disturbed and available for sampling. One area was within the Area 3 pasture, and the second area was within the Area 2b pasture. These areas are highlighted in Figure 2.

Figure 1. Annotated 1965 Aerial Photograph of the Animal Farm.

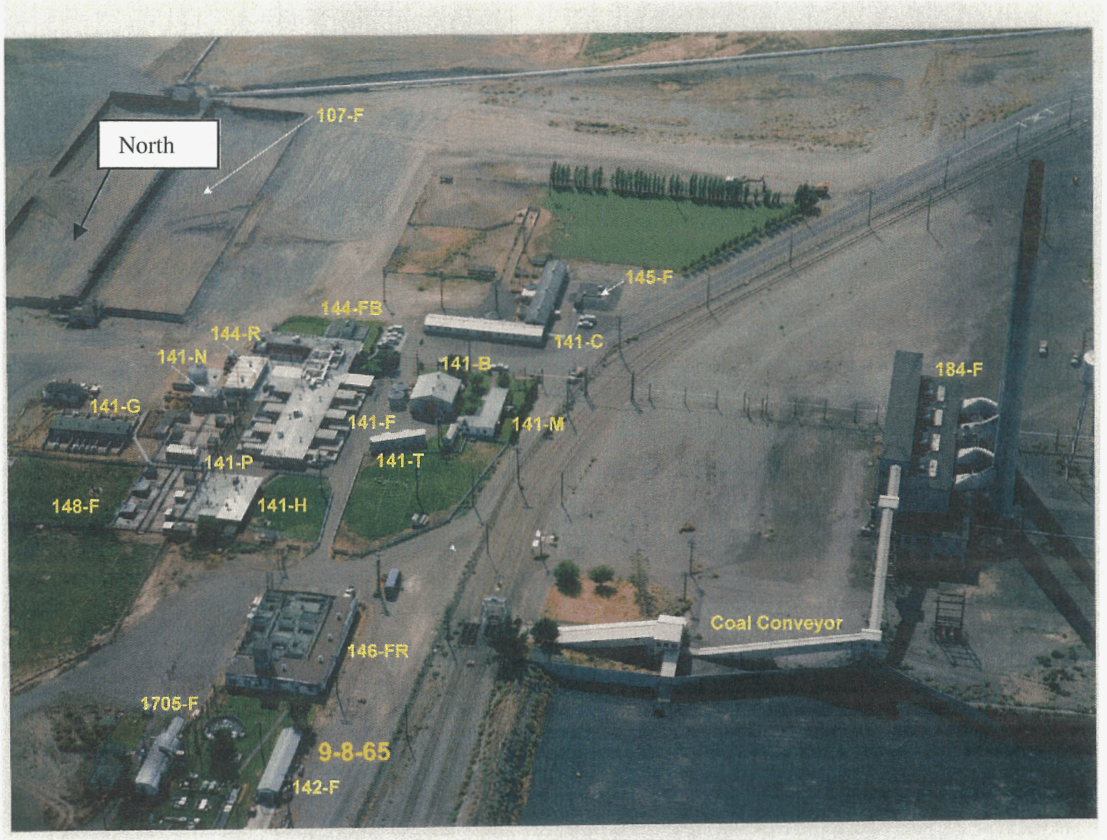


Figure 2. Locations (Highlighted) of Undisturbed Pasture Soil Available for Confirmatory Sampling.

CONFIRMATORY SAMPLING

The 100-F-54 waste site was evaluated to determine a No Action or Remedial Action decision in accordance with the RDR/RAWP (DOE-RL 2005b), the Remaining Sites ROD (EPA 1999), and the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2005a). This evaluation included investigation of the site by conducting confirmatory sampling. The following sections describe the contaminants of potential concern (COPCs), sample design, sampling activities, and sample results.

Contaminants of Potential Concern

Historical information concerning the animal farm studies was used to develop a list of COPCs. Stronium-90 was listed in the Waste Information Data System (WIDS) as the sole COPC; however, historical documents indicate strontium-90, iodide-131, isotopes of plutonium, cesium-137, and other radioisotopes were used in the animal exposure studies. Therefore, the COPCs for this soil investigation included radionuclides evaluated using laboratory analytical methods for gamma-, beta-, and alpha-emitting radionuclides.

Confirmatory Sample Design

Historical drawings and photographs showing the location of the 100-F Animal Farm Pastures, the extent of previous remedial actions, and field observations of the current site conditions were used to develop a site-specific sample design and to locate areas for sampling where the soil has not been disturbed by remedial action activities. As shown in Figure 3, remedial action of waste sites in the vicinity of the animal farm complex has greatly disturbed the original pasture soil, to the extent that it would be difficult to obtain meaningful and representative samples of the pasture soil. Recent field observations indicate that only two pasture areas are present that are relatively undisturbed, potentially exhibit soil representative of the pasture, and are available for sampling. One area is within the Area 3 pasture, and the second area is within the Area 2b pasture.

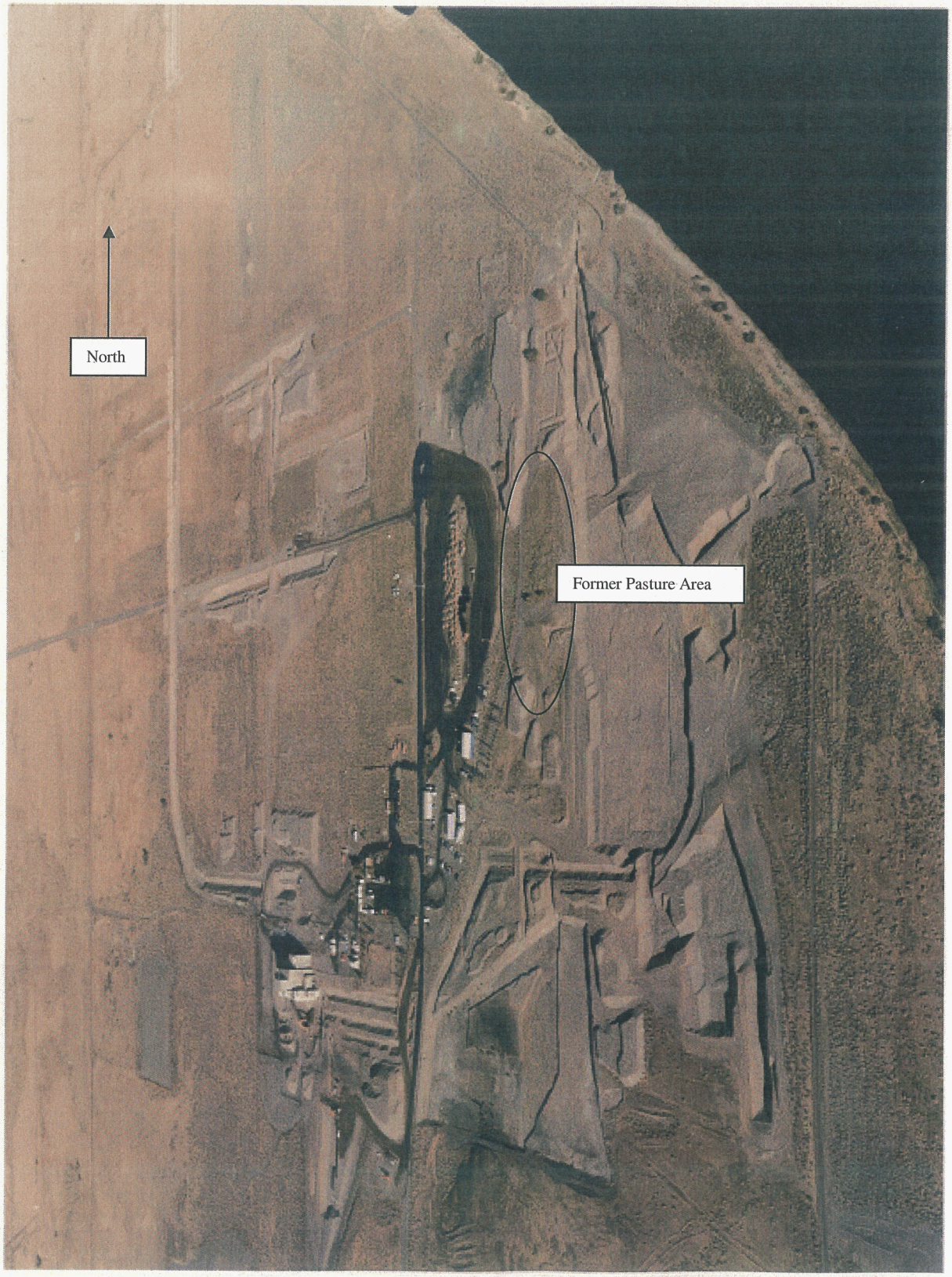
A statistical sampling design was used to evaluate the potential residual contamination for the surface soil within the two pasture areas that were identified as being relatively undisturbed. A statistical sampling design was selected because the distribution of potential residual soil contamination is uncertain. The Washington State Department of Ecology publication *Guidance on Sampling and Data Analysis Methods* (Ecology 1995) recommends that systematic sampling with sample locations distributed over the entire study area be used. This sampling approach is referred to by the Washington State Department of Ecology as "area-wide sampling."

Confirmatory Sample Activities

Confirmatory sampling at the 100-F-54 site was performed on November 19, 2007, in accordance with the *Work Instruction for Confirmatory Sampling of the 100-F-54 100-F Animal Farm Pastures* (WCH 2007). The pasture areas sampled were delineated in Visual Sampling Plan[1] and used as the basis for location of a random-start systematic grid for verification soil sample collection. Nine surface soil samples were collected on the grid as shown in Figure 4. Triangular grids were selected for this investigation based on studies that indicate triangular grids are superior to square grids (Gilbert 1987).

[1] Visual Sampling Plan is a site map-based user-interface program that may be downloaded at http://dqo.pnl.gov.

Figure 3. Photograph Showing Extensive Remediation in the Vicinity of the Historical Animal Farm.



A grab sample of the surface soil from 0- to 15.2-cm (0- to 6-in.) depth was collected from each statistical soil sample location. A summary of the sample coordinates and laboratory analyses is provided in Table 1.

Radiological field screening was conducted as specified in the confirmatory sampling work instruction (WCH 2007). The field screening campaign was used to determine if any field detectable residual radiological contamination is present, which would be flagged for focused sampling. Field screening at the site included radiological mapping over the site areas using a Global Positioning Environmental Radiological Surveyor (GPERS) with instrumentation specific to the detection of radiation associated with gamma emitting radionuclides. The GPERS surveys are provided in Figures 4 and 5. The results of the surveys indicated no field detectable residual radiological contamination above twice the background level in either pasture. Therefore, no focused surface soil samples were collected in addition to the statistical samples (WCH 2008). Statistical sample locations are shown in Figure 6.

Table 1. Sample Summary Table for the 100-F-54 Animal Pasture Site.

Sample Location	Sample Media	Sample Number	Coordinate Locations		Depth (bgs)	Sample Analysis
			Easting	Northing		
1[a]	Surface soil	J16215	580805.7	147736.4	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta, strontium-90
2	Surface soil	J16216	580825.6	147737.0	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta
3	Surface soil	J16217	580815.2	147754.0	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta
4	Surface soil	J16218	580835.1	147754.4	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta
5	Surface soil	J16219	580824.7	147771.5	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta
6	Surface soil	J16220	580834.2	147789.0	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta
7	Surface soil	J16221	580886.7	147911.7	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta
8[a]	Surface soil	J16222	580896.2	147929.2	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta, strontium-90
9	Surface soil	J16223	580905.7	147946.8	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta
Duplicate	Surface soil	J16224	580834.2	147789.0	0 - 15.2 cm (0 - 6-in.)	GEA, gross alpha, gross beta

[a] Strontium analysis was performed because gross beta activity was detected above background in this sample.

bgs = below ground surface
GEA = gamma energy analysis

Figure 4. GPERS Survey of the 100-F-54 Waste Site Southern Pasture.

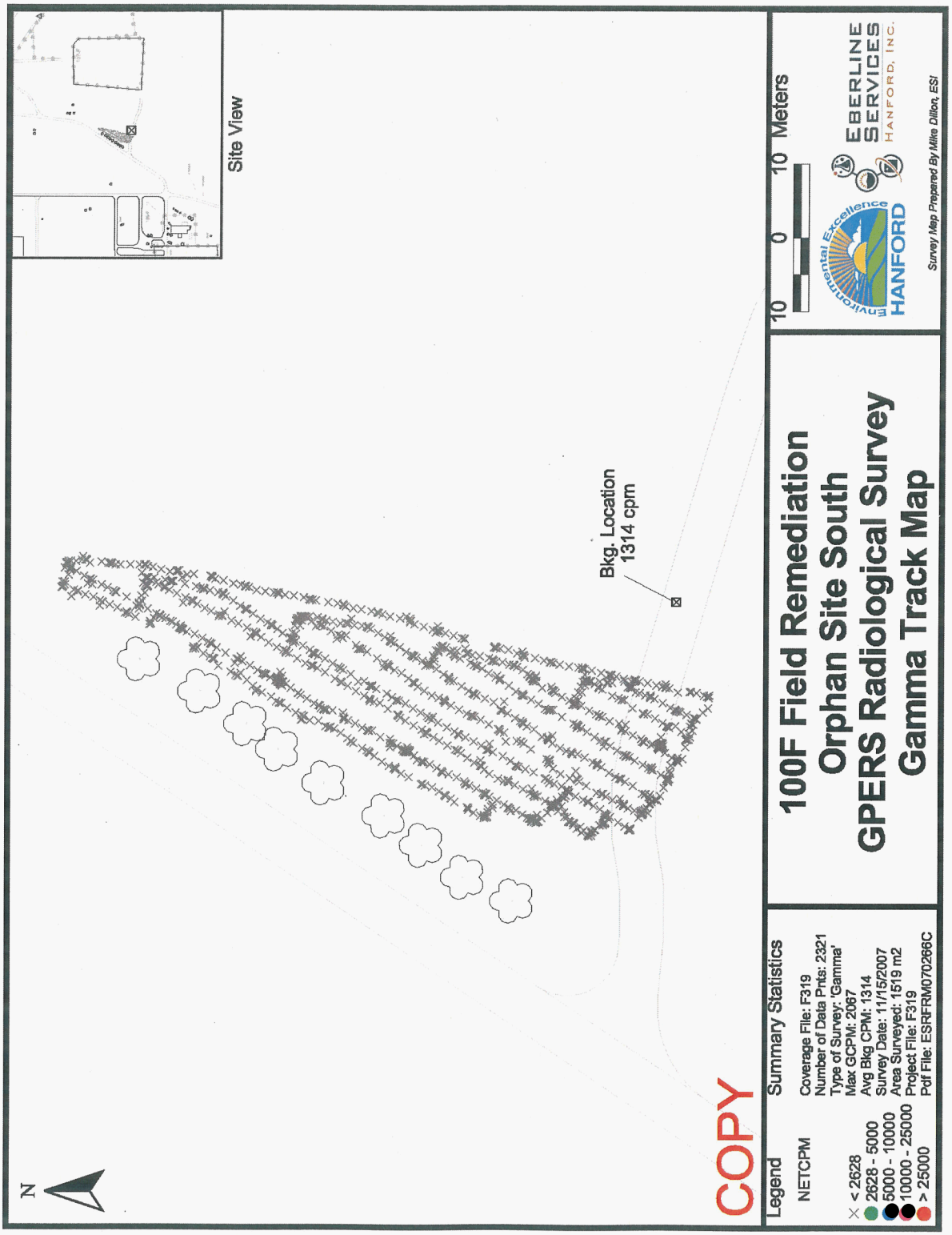


Figure 5. GPERS Survey of the 100-F-54 Waste Site Northern Pasture.

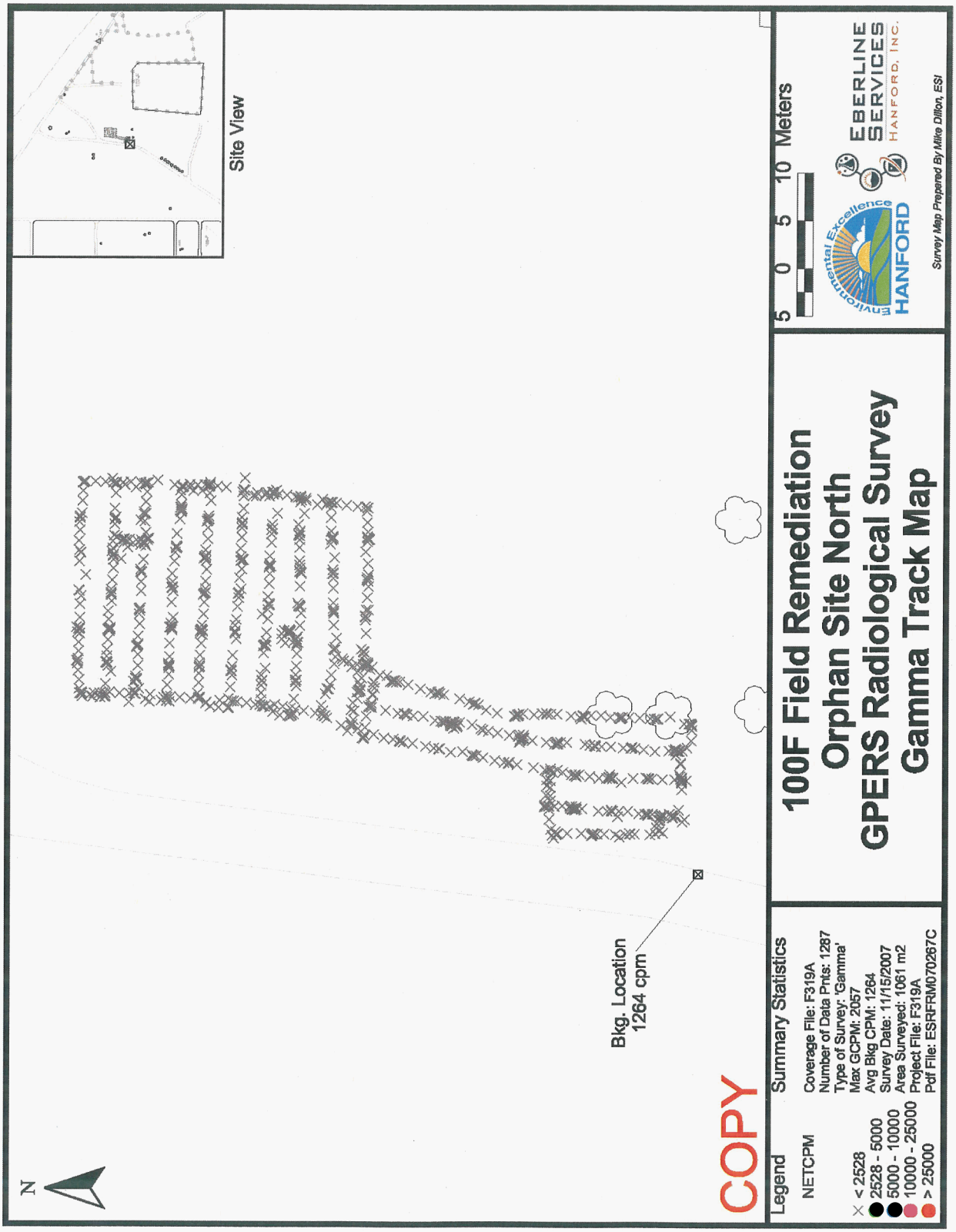
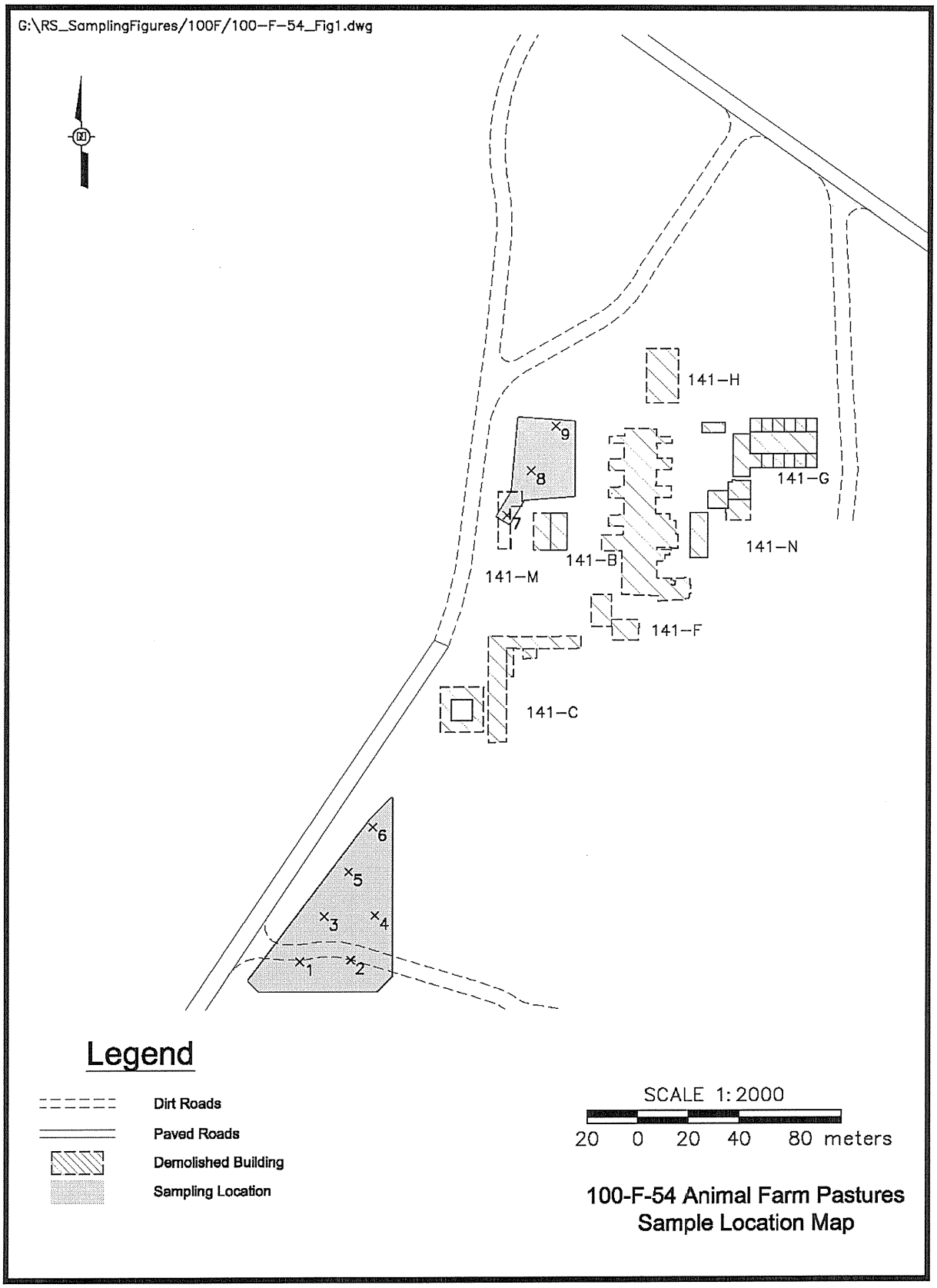


Figure 6. Sample Locations at the 100-F-54 Waste Site.



Confirmatory Sample Results

All confirmatory samples were analyzed using analytical methods approved by the U.S. Environmental Protection Agency (DOE-RL 2005a). Evaluation of the confirmatory sampling data from the site was performed using the 95% upper confidence limit on the true population mean for residual concentrations of COPCs as specified by the RDR/RAWP (DOE-RL 2005b). These calculations are provided in Appendix A. When a COPC was detected in fewer than 50% of the verification samples collected, the maximum detected value was used for comparison against the RAGs. If no detections for a given COPC were reported in the data set, then no statistical evaluation or calculations were performed for that COPC. These results are shown in Table 2. Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected in samples collected at the site, but are not included in Table 2, as these isotopes are unrelated to the operational history of the site and were detected below background levels (based on an assumption of secular equilibrium, the background activities for radium-228 and thorium-228 are equal to the statistical background activity of 1.32 pCi/g for thorium-232 provided in DOE-RL [1996]). The complete laboratory results are stored in the Environmental Restoration project-specific database prior to submitting to the Hanford Environmental Information System for archiving and are provided in Appendix A.

Table 2. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-F-54 Animal Farm Pastures.

COPC	Statistical Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Statistical Result Exceed Lookup Values?	Does the Statistical Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value[b]	Groundwater Protection Lookup Value	River Protection Lookup Value		
Cesium-137	0.254	6.2	--[c]	--[c]	No	--
Europium-152	0.234	3.3	--[c]	--[c]	No	--

[a] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2005b) or calculated per WAC-173-340-720, WAC 173-340-730, and WAC 173-340-740, Method B, 1996, unless otherwise noted.

[b] Activity corresponding to a single-radionuclide 15 mrem/yr exposure as calculated using the RESRAD model (DOE-RL 2005b).

[c] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup to be protective of groundwater and the Columbia River levels for this contaminant. Based on the lowest radionuclide soil partitioning distribution coefficient (for cesium-137 [50 mL/g]), this contaminant is not predicted to migrate more than 1 m (3.3 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 5 m (16 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
COPC = contaminant of potential concern
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*

DATA EVALUATION

Evaluation of the results listed in Table 2 from confirmatory sampling at the 100-F-54 waste site indicates that residual concentrations of all detected site COPCs are below soil shallow zone remedial action goals (RAGs). The RDR/RAWP (DOE-RL 2005b) does not specify soil cleanup to be protective of groundwater and the Columbia River levels for the site COPCs. Based on the lowest radionuclide

soil partitioning coefficient (for cesium-137 [50 mL/g]), this contaminant is not predicted to migrate more than 1 m (3.3 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 5 m (16 ft) thick. Therefore, residual concentrations of the 100-F-54 contaminants are predicted to be protective of groundwater. The only pathway for contamination to reach the Columbia River is via groundwater migration. Because contamination is not predicted to migrate vertically to groundwater in 1,000 years, these contaminant concentrations are also protective of the Columbia River.

Cesium-137 and europium-152 were detected in the confirmatory samples from the 100-F-54 site. Evaluation of RAG attainment for radionuclides was performed using the single-radionuclide dose-equivalence lookup values. The model used to develop these dose-equivalence lookup values is presented in the RDR/RAWP (DOE-RL 2005b). Table 3 compares the result (second column) for the COPC to direct exposure single radionuclide 15 mrem/yr dose-equivalence values and shows the sum of fractions evaluation. The third column presents the single radionuclide 15 mrem/yr dose-equivalence activity, and the last column presents the result divided by the dose-equivalence activity. As demonstrated by the summation of these fractions, the cumulative dose contributed by residual radionuclide populations will be significantly less than the 15 mrem/yr RAG. None of these radionuclides were predicted to migrate more than 1 m (3.3 ft) vertically in 1,000 years based on their respective soil-partitioning coefficients. Therefore, residual concentrations of these contaminants are predicted to be protective of groundwater and the Columbia River.

Table 3. Attainment of Radionuclide Direct Exposure RAG.

Contaminant of Potential Concern	Maximum Values (pCi/g)	Activity Equivalent to 15 mrem/yr Dose[a] (pCi/g)	Fraction
Europium-152	0.232	3.3	0.070
Cesium-137	0.259	6.2	0.042
		Total	0.112
		Equivalent Dose (mrem/yr)	1.68

[a] Single radionuclide 15 mrem/yr dose-equivalence values and derivation methodology are presented in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b).

Assessment of the risk requirements is determined by calculation of the hazard quotient and excess cancer risk values for nonradionuclides. These calculations were not required for the 100-F-54 waste site, as the COPCs for the site are all radionuclides. Therefore, nonradionuclide risk requirements are met.

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the *Washington Administrative Code* 173-340-740(7)(e) three-part test. However, this test is not applicable to the confirmatory sampling results because the COPCs for the site are all radionuclides.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications. The DQA for the 100-F-54 site established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. All analytical data were found to be acceptable for decision-making purposes. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The detailed DQA is presented in Appendix B.

SUMMARY FOR NO ACTION

The 100-F-54 waste site has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2005b). Confirmatory sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the remedial action objectives for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 100-F-54 waste site to No Action. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*, as amended.

BHI, 2001, *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater*, 0100X-CA-V0038, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2005, *100 Area Analogous Sites RESRAD Calculations,* 0100X-CA-V0050, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

DOE Order 5400.5, *Radiation Protection of the Public and Environment*, as amended, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1996, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, DOE/RL-96-12, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2005a, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2005b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area,* DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2007, *Tri-Party Agreement Handbook Management Procedures,* RL-TPA-90-0001, Rev. 1, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 1995, *Guidance on Sampling and Data Analysis Methods*, Publication No. 94-49, Washington State Department of Ecology, Olympia, Washington.

EPA, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Gilbert, R. O., 1987, *Statistical Methods for Environmental Pollution Monitoring,* Wiley & Sons, Inc., New York, New York.

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WCH, 2007, *100-F-54 100-F Animal Farm Pastures*, Work Instruction No. 0100F-WI-G0046, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2008, *Miscellaneous Sampling*, Logbook EL-1601, pp. 90 and 92, Washington Closure Hanford, Richland, Washington.

APPENDIX A

CONFIRMATORY SAMPLING 95% UPPER CONFIDENCE LEVEL (UCL) CALCULATIONS

APPENDIX A

95% UCL CALCULATIONS

The following calculation is provided in this appendix:

100-F-54 Waste Site Confirmatory Sampling 95% UCL Calculations, 0100F-CA-V0345, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

The calculation provided in this appendix has been generated to document compliance with established cleanup levels. This calculation should be used in conjunction with other relevant documents in the administrative record.

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-F Area Field Remediation **Job No. 14655**

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0345

Subject: 100-F-54 Waste Site Confirmatory Sampling UCL Calculations

Computer Program: Excel Program No: Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations should be used in conjunction with other relevant documents in the administrative record.

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 4 Attm. 1 = 1 Total = 6	E. J. Farris	H. M. Sulloway		J. M. Capron	3/4/08

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007) *Obtain Calc. No. from Document Control and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator E. J. Farris EJF Date 03/03/08 Calc. No. 0100F-CA-V0345 Rev. No. 0
Project Field Remediation Job No. 14655 Checked H. M. Sulloway HMS Date 3/3/08
Subject 100-F-54 Waste Site Confirmatory Sampling 95% UCL Calculations Sheet No. 1 of 4

Summary

Purpose:
Calculate the 95% upper confidence limit (UCL) values to evaluate compliance with cleanup standards for the shallow zone excavation of the subject site. Also, calculate the relative percent difference (RPD) for primary-duplicate sample pairs, as necessary.

Table of Contents:

Given/References:
1) Sample Results (Attachment 1).
2) Background values and remedial action goals (RAGs) are from DOE-RL (2005b), DOE-RL (2001), and Ecology (2005).
3) DOE-RL, 2005a, *100 Area Remedial Action Sampling and Analysis Plan* (SAP), DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
5) DOE-RL, 2005b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
6) Ecology, 1992, *Statistical Guidance for Ecology Site Managers*, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
7) Ecology, 1993, *Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets),* Publication #92-54, Washington Department of Ecology, Olympia, Washington.
8) EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013. U.S. Environmental Protection Agency, Washington, D.C.

Solution:
Calculation methodology is described in Ecology publication #92-54 (Ecology 1992, 1993), below, and in the RDR/RAWP (DOE-RL 2005b). Use data from attached worksheets to perform the 95% UCL calculation for each analyte, and the RPD calculations for primary-duplicate sample pairs, as required.

Calculation Description:
The subject calculations were performed on data from soil confirmatory samples (Attachment 1) from the subject waste site. The data were entered into an EXCEL 2003 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2005b) is documented by this calculation. In addition to the statistical soil samples collected at this site, a duplicate sample was collected, and the results are also included in Attachment 1. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

CALCULATION SHEET

Washington Closure Hanford

Originator E. J. Farris EJF Date 03/03/08 Calc. No. 0100F-CA-V0345 Rev. No. 0
Project Field Remediation Job No. 14655 Checked H. M. Sulloway Date 4/3/08
Subject 100-F-54 Waste Site Confirmatory Sampling 95% UCL Calculations Sheet No. 2 of 4

Summary (continued)

Methodology:

For all detected radionuclide analytes, the statistical value calculated to evaluate the effectiveness of cleanup is the 95% UCL. The 95% UCL was not calculated for data sets with no reported detections. The 95% UCL values were not calculated for radium-226, radium-228, thorium-228, thorium-232, and potassium-40, as these isotopes are excluded from consideration as COCs/COPCs based on natural occurrence and analogous site information. Gross alpha and gross beta analyses are screening methods used to evaluate if additional isotopic analyses are required, and therefore, the 95% UCL was not calculated for gross alpha or gross beta results within the data set.

For radionuclide data, calculation of the statistics was done on the reported value. In cases where the laboratory does not report a value below the minimal detectable activity (MDA), half of the MDA is used in the calculation. For the statistical evaluation of duplicate sample pairs, the samples are averaged before being included in the data set, after adjustments for censored data as described above.

The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed in Table II-1 of the SAP (DOE-RL 2005a). Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

$$RPD = [\,|M-S|/((M+S)/2)]*100$$

where, M = main sample value S = split (or duplicate) sample value

When an analyte is detected in the primary or duplicate sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. This assessment is provided in the data quality assessment section of the RSVP.

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. No split samples were collected for confirmatory sampling of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP, as necessary.

Results:

The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the shallow zone excavation and the RPD calculations, and are for use in the RSVP for this site.

Results Summary - Shallow Zone Excavation

Analyte	95% UCL Value	Units
Cesium-137	0.259	pCi/g
Europium-152	0.232	pCi/g

RPD Results -QA/QC Analysis[a]

Analyte	Duplicate Analysis
Potassium-40	12.9%

[a]Relative percent difference evaluation was not required for analytes not included in this table.

Abbreviations/Acronyms:

The following abbreviations and/or acronyms are used in this calculation:

COC= contaminant of concern
COPC = contaminant of potential concern
GEA = gamma energy analysis
MDA = minimal detectable activity
PQL = practical quantitation limit
Q = qualifier
QA/QC = quality assurance/quality control
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RPD = relative percent difference
RSVP = remaining sites verification package
SAP = sampling and analysis plan
TDL = target detection limit
U = undetected
UCL = upper confidence limit
WAC = *Washington Administrative Code*

CALCULATION SHEET

Washington Closure Hanford
Originator E. J. Farris EJF Date 03/03/08
Project Field Remediation Job No. 14655
Subject 100-F-54 Waste Site Confirmatory Sampling 95% UCL Calculations

Calc. No. 0100F-CA-V0345 Rev. No. 0
Checked H. M. Sulloway HMS Date 3/3/08
Sheet No. 3 of 4

Shallow Zone Excavation Verification Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Q	MDA	Europium-152 pCi/g	Q	MDA
1	J16215	11/19/07	0.049	U	0.049	0.086	U	0.086
2	J16216	11/19/07	0.036	U	0.036	0.079	U	0.079
3	J16217	11/19/07	0.059		0.03	0.079	U	0.079
4	J16218	11/19/07	0.041		0.027	0.063	U	0.063
5	J16219	11/19/07	0.105		0.029	0.07	U	0.07
6	J16220	11/19/07	0.059		0.025	0.057	U	0.057
duplicate of J16220	J16224	11/19/07	0.041		0.028	0.069	U	0.069
7	J16221	11/19/07	0.673		0.041	0.598		0.088
8	J16222	11/19/07	0.155		0.036	0.242		0.073
9	J16223	11/19/07	0.148		0.035	0.113		0.072

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Cesium-137 pCi/g	Europium-152 pCi/g
6	J16220/ J16224	11/19/07	0.050	0.032
1	J16215	11/19/07	0.025	0.043
2	J16216	11/19/07	0.018	0.040
3	J16217	11/19/07	0.059	0.040
4	J16218	11/19/07	0.041	0.032
5	J16219	11/19/07	0.105	0.035
7	J16221	11/19/07	0.673	0.598
8	J16222	11/19/07	0.155	0.242
9	J16223	11/19/07	0.148	0.113

Statistical Computations

	Cesium-137	Europium-152
95% UCL based on	Radionuclide data set. Use nonparametric z-stat.	Radionuclide data set. Use nonparametric z-stat.
N	9	9
% < Detection limit	22%	67%
Mean	0.142	0.130
Standard deviation	0.206	0.188
95% UCL on mean	0.254	0.234
Maximum detected value	0.673	0.598
Background	NA	NA
Statistical value above background	0.254	0.234

Abbreviation/Acronym definitions are given on Sheet No. 2

CALCULATION SHEET

Washington Closure Hanford

Originator E. J. Farris EJF Date 03/03/08 Calc. No. 0100F-CA-V0345 HMS Rev. No. 0

Project Field Remediation Job No. 14655 Checked H. M. Sulloway HMS Date 3/5/08

Subject 100-F-54 Waste Site Confirmatory Sampling 95% UCL Calculations Sheet No. 4 of 4

Split/Duplicate Analysis

Sample Area	Sample Number	Sample Date	Cesium-137			Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL	mg/kg	Q	PQL
6	J16220	11/19/07	0.059		0.025	13		0.217	0.498		0.042	0.755		0.093	0.788		0.029	0.755		0.093
duplicate of J16220	J16224	11/19/07	0.041		0.028	14.8		0.256	0.599		0.049	0.863		0.144	1.13		0.059	0.863		0.144

Analysis:

TDL		0.1	0.5	0.1	0.2	1	1
Duplicate Analysis	Both > MDA?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No - evaluate	Yes (calc RPD)	No - evaluate	No - evaluate	No - evaluate	No - evaluate
	RPD		12.9%				
	Difference >2xTDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Abbreviation/Acronym definitions are given on Sheet No. 2

Attachment 1. 100-F-54 Confirmatory Sampling Results.

Sample Location	Sample Number	Sample Date	Americium-241 GEA			Cesium-137			Cobalt-60			Europium-152			Europium-154			Europium-155			Gross alpha			Gross beta		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
1	J16215	11/19/07	0.303	U	0.303	0.049	U	0.049	0.039	U	0.039	0.086	U	0.086	0.123	U	0.123	0.116	U	0.116	6.57	U	8.26	16.4		5
2	J16216	11/19/07	0.054	U	0.054	0.036	U	0.036	0.031	U	0.031	0.079	U	0.079	0.094	U	0.094	0.087	U	0.087	14.1		10.6	17.2		5.66
3	J16217	11/19/07	0.039	U	0.039	0.059		0.03	0.032	U	0.032	0.079	U	0.079	0.104	U	0.104	0.062	U	0.062	6.63	U	8.55	18.7		5.63
4	J16218	11/19/07	0.139	U	0.139	0.041		0.027	0.022	U	0.022	0.063	U	0.063	0.072	U	0.072	0.08	U	0.08	10.6		5.06	17		2.72
5	J16219	11/19/07	0.036	U	0.036	0.105		0.029	0.027	U	0.027	0.07	U	0.07	0.088	U	0.088	0.11	U	0.11	8.8	U	9.53	20.2		8.66
6	J16220	11/19/07	0.13	U	0.13	0.059		0.025	0.02	U	0.02	0.057	U	0.057	0.068	U	0.068	0.075	U	0.075	11.6		6.89	18.3		5.43
duplicate of J16220	J16224	11/19/07	0.05	U	0.05	0.041		0.028	0.03	U	0.03	0.069	U	0.069	0.106	U	0.106	0.082	U	0.082	13.8		11	22.3		5.68
7	J16221	11/19/07	0.2	U	0.2	0.673		0.041	0.029	U	0.029	0.598		0.088	0.099	U	0.099	0.11	U	0.11	12.4		7.7	17.5		5.55
8	J16222	11/19/07	0.043	U	0.043	0.155		0.036	0.033	U	0.033	0.242		0.073	0.109	U	0.109	0.119	U	0.119	11.4		8.38	20		6.9
9	J16223	11/19/07	0.048	U	0.048	0.148		0.035	0.025	U	0.025	0.113		0.072	0.101	U	0.101	0.081	U	0.081	9.72		8.2	17.2		5.68

Sample Location	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228 GEA			Thorium-232 GEA			Strontium-90			Uranium-235 GEA			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
1	J16215	11/19/07	13.2		0.403	0.514		0.064	0.823		0.143	0.638		0.046	0.823		0.143	0.046	U	0.262	0.156	U	0.156	3.81	U	3.81
2	J16216	11/19/07	12.1		0.358	0.765		0.058	1.01		0.125	1.26		0.061	1.01		0.125				0.151	U	0.151	3.4	U	3.4
3	J16217	11/19/07	13		0.24	0.443		0.05	0.711		0.12	0.859		0.038	0.711		0.12				0.11	U	0.11	3.82	U	3.82
4	J16218	11/19/07	12.5		0.258	0.428		0.045	0.66		0.097	0.654		0.031	0.66		0.097				0.108	U	0.108	2.58	U	2.58
5	J16219	11/19/07	12.6		0.257	0.498		0.047	0.8		0.099	0.992		0.034	0.8		0.099				0.104	U	0.104	3.24	U	3.24
6	J16220	11/19/07	13		0.217	0.498		0.042	0.755		0.093	0.788		0.029	0.755		0.093				0.102	U	0.102	4.34	U	4.34
duplicate of J16220	J16224	11/19/07	14.8		0.256	0.599		0.049	0.863		0.144	1.13		0.059	0.863		0.144				0.137	U	0.137	3.11	U	3.11
7	J16221	11/19/07	12.4		0.336	0.576		0.065	0.833		0.148	0.722		0.046	0.833		0.148				0.146	U	0.146	3.63	U	3.63
8	J16222	11/19/07	15.2		0.282	0.659		0.066	0.972		0.133	0.916		0.04	0.972		0.133	0.068	U	0.247	0.125	U	0.125	4.3	U	4.3
9	J16223	11/19/07	12.7		0.163	0.583		0.059	0.724		0.095	0.991		0.062	0.724		0.095				0.131	U	0.131	3.36	U	3.36

Note: The following abbreviations apply to Attachment 1.
GEA = gamma energy analysis
MDA = minimum detectable activity
Q = qualifier
U = undetected

Attachment	1	Sheet No.	1 of 1
Originator	E. J. Farris	Date	03/03/08
Checked	H. M. Sulloway	Date	3/5/08
Calc. No.	0100F-CA-V0345	Rev. No.	0

APPENDIX B

CONFIRMATORY SAMPLING DATA QUALITY ASSESSMENT

APPENDIX B

CONFIRMATORY SAMPLING DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the confirmatory sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample designs (WCH 2007, DOE-RL 2005b). This DQA was performed in accordance with site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2005a).

To ensure quality data, the SAP data assurance requirements and the data validation procedures for chemical and radiochemical analysis (BHI 2000a, 2000b) are used as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., evaluate against cleanup criteria to support a no action or remedial action decision). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2000).

A review of the sample design (WCH 2007), the field logbook (WCH 2008), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design. The sample design included a statistical sampling approach. In order to calculate the number of samples needed in the statistical sampling plan, the standard deviation for each contaminant of potential concern (COPC) in the target population was assumed to be less than or equal to 25% of the corresponding decision threshold for each COPC. Examination of the resulting data set shows that the sample standard deviations are consistent with those assumptions.

Confirmatory sample data collected at the 100-F-54 waste site were provided by the laboratories in one sample delivery group (SDG): SDG K1025. SDG K1025 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed below.

SDG K1025

This SDG comprises 10 field samples (J16215-J16224). A field duplicate pair (J16220/J16224) is included in this SDG. These samples were analyzed for gross alpha and gross beta by proportional counting and by gamma spectroscopy. In addition, samples J16215 and J16222 were analyzed for total strontium by beta counting. SDG K1025 was submitted for formal third-party validation. Minor deficiencies found in SDG K1025 are as follows:

Gross alpha and gross beta were required analyses for all samples. Gross alpha and/or gross beta analyses are screening methods used to evaluate if additional isotopic analyses are required. In the analytical data set, SDG K1025 had elevated results for gross beta for samples J16215 and J16222. Elevated gross beta results lead to additional analyses for strontium, which was requested for these samples.

Usually, the isotopic analyses determine if specific Hanford Site-related contaminants are the source of the elevated gross alpha or gross beta results. However, in the analytical data set for 100-F-54, the data had inconsistent results between the gross beta and the strontium isotopic analyses. The strontium-90 nondetect results for the J16215 laboratory primary and duplicate are inconsistent with the elevated

result of 112 pCi/g reported for the gross beta. The strontium-90 nondetect result for sample J16222 is inconsistent with the elevated result of 101 pCi/g reported for the gross beta. It is possible that variability in the background levels is responsible for these results. In instances without a clear explanation of the data, the laboratory is asked to rerun samples. The 100-F-54 gross beta analyses were rerun for samples J16215 and J16222, with results of 16.4 pCi/g and 15.20 pCi/g for the J16215 laboratory primary and duplicate, and 20.0 pCi/g for the J16222 sample.

Where two sets of data are created during the investigation of the elevated gross alpha/beta results, an examination of both sets of data is made in comparison to the isotopic analyses. Because they are specific, the isotopic results are more reliable than the screening methods. The data set most consistent with the isotopic analysis is considered more reliable. If the second data set is determined to be more reliable, the first data set is excluded and the second data set is used for decision-making purposes. If an evaluation of the two data sets is inconclusive, then the first (original) data set is retained and used for decision-making purposes, while the second data set is excluded from the data set. Duplicated data are accepted or excluded in sets. Individual results from multiple data sets are not mixed to create a desired result. Examination of the data determined that the second data set is more reliable than the first data set, and is presented in Appendix A.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

Relative percent differences (RPD) evaluations of main sample(s) versus the laboratory duplicate(s) are routinely performed and reported by the laboratory. Any deficiencies in those calculations are reported by SDG in the previous sections.

Field quality assurance/quality control (QA/QC) measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbook (WCH 2008), are the 100-F-54 sample primary and duplicate (J16220/J16224). The main and QA/QC sample results are presented in Appendix A.

Field duplicate samples are collected to provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by comparison of the RPD of the duplicate samples for each COPC. The RPD calculated for the field duplicate is within the acceptance criteria. The data are useable for decision making purposes.

An overall visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-F-54 confirmatory sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 100-F-54 waste site concludes that the data are of the right type, quality, and quantity to support the intended use. The confirmatory sample

analytical data are stored in the Environmental Restoration project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System database. The confirmatory sample analytical data are also summarized in Appendix A.

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