0077013

Date Submitted: 4/1/08 Originator: J. M. Capron Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-FR-2 Waste Site Code: 100-F-50 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☐ No Action ☒ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2007-001 RECEIVED MAY 0 1 2008 EDMC

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-50 waste site, part of the 100-FR-2 Operable Unit, is a 0.36-m (14-in.) diameter steel stormwater runoff culvert that runs between two railroad grades in the south-central portion of the 100-F Area. The culvert exiting the west side of the railroad grade is mostly encased in concrete and surrounded by a 1-m (36-in.) diameter concrete stormwater collection depression partially filled with soil and vegetation. The drain pipe exiting the east side of the railroad grade embankment is partially filled with soil and rocks.

Confirmatory sampling of the 100-F-50 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-50 stormwater diversion culvert 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-50 Stormwater Runoff Culvert* (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	4-15-08 Date

00770182

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-50 STORMWATER RUNOFF CULVERT

Attachment to Waste Site Reclassification Form 2007-001

April 2008

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-50 STORMWATER RUNOFF CULVERT

EXECUTIVE SUMMARY

This remaining sites verification package documents evaluation of the confirmatory sampling results to support reclassification of the 100-F-50 waste site to no action.

The 100-F-50 site, part of the 100-FR-2 Operable Unit, is a stormwater diversion culvert within the 100-F Area of the Hanford Site. The 100-F-50 site is located southeast of the 116-F-6 disposal trench, between two railroad grades. The Washington State Plane coordinates are N 147257.6, E 580410.0. This site consists of a circular concrete basin and a steel culvert (pipe). The basin, approximately 1 m (3 ft) in diameter, collected surface water runoff that drained via a 36-cm (14-in.) diameter steel diversion culvert under one of the railroad grades and flowed down an embankment to the flat terrain below. The basin is partially filled with sediment, rocks, and vegetation; the steel culvert is partially filled with soil and rocks.

Confirmatory sampling at the site was conducted on November 19, 2007. The confirmatory sample design included focused sampling of surface and subsurface soil at the concrete collection basin and sampling at the base of the effluent end of the steel culvert (where it exits the embankment), because these areas were believed to be most likely to produce evidence of any contamination that may have accumulated due to excessive pooling and surface runoff.

The analytical results indicated no elevated residual concentrations exceeding cleanup criteria, except bis(2-ethylhexyl)phthalate that exceeded its river protection remedial action goals. Results of vertical migration modeling predict that this constituent will not migrate to groundwater or to the Columbia River within 1,000 years, and its residual concentration is, therefore, protective of the Columbia River (BHI 2005). A summary of the evaluation of the confirmatory 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-50 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-50 Site. (2 Pages)

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 7.4 mrem/yr.	Yes
Direct Exposure Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (7.4×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk values for individual carcinogens are $<1 \times 10^{-6}$.	
	Attain a total excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk value (1.2×10^{-6}) is $<1 \times 10^{-5}$.	
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 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.	

Table ES-1. Summary of Remedial Action Goals for the 100-F-50 Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	The residual concentration of bis(2-ethylhexyl) phthalate exceeded its soil RAGs for river protection. However, vertical migration modeling predicts that this constituent will not reach groundwater (and, therefore, the Columbia River) within 1,000 years.[d] Therefore, the residual concentration achieves the remedial action objectives for river protection.	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).
[d] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), bis(2-ethylhexyl)phthalate is not predicted to migrate through the 5 m (16 ft) thick vadose zone to the groundwater in 1,000 years (based on the bis(2-ethylhexyl)phthalate soil-partitioning coefficient distribution of 110 mL/g).
COPC = contaminant of potential concern
MCL = maximum contaminant level
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose model)

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 the 100-F-50 contaminants of potential concern. Screening levels were not exceeded for the site constituents, with the exceptions of boron, manganese, vanadium, and zinc. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. It is believed that the presence of these constituents does not pose a risk to ecological receptors because the concentrations of manganese, vanadium, and zinc are below site background levels, and boron concentrations are consistent with those seen elsewhere on the Hanford Site (no established background value is available for boron). 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-50 STORMWATER RUNOFF CULVERT

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-F-50 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

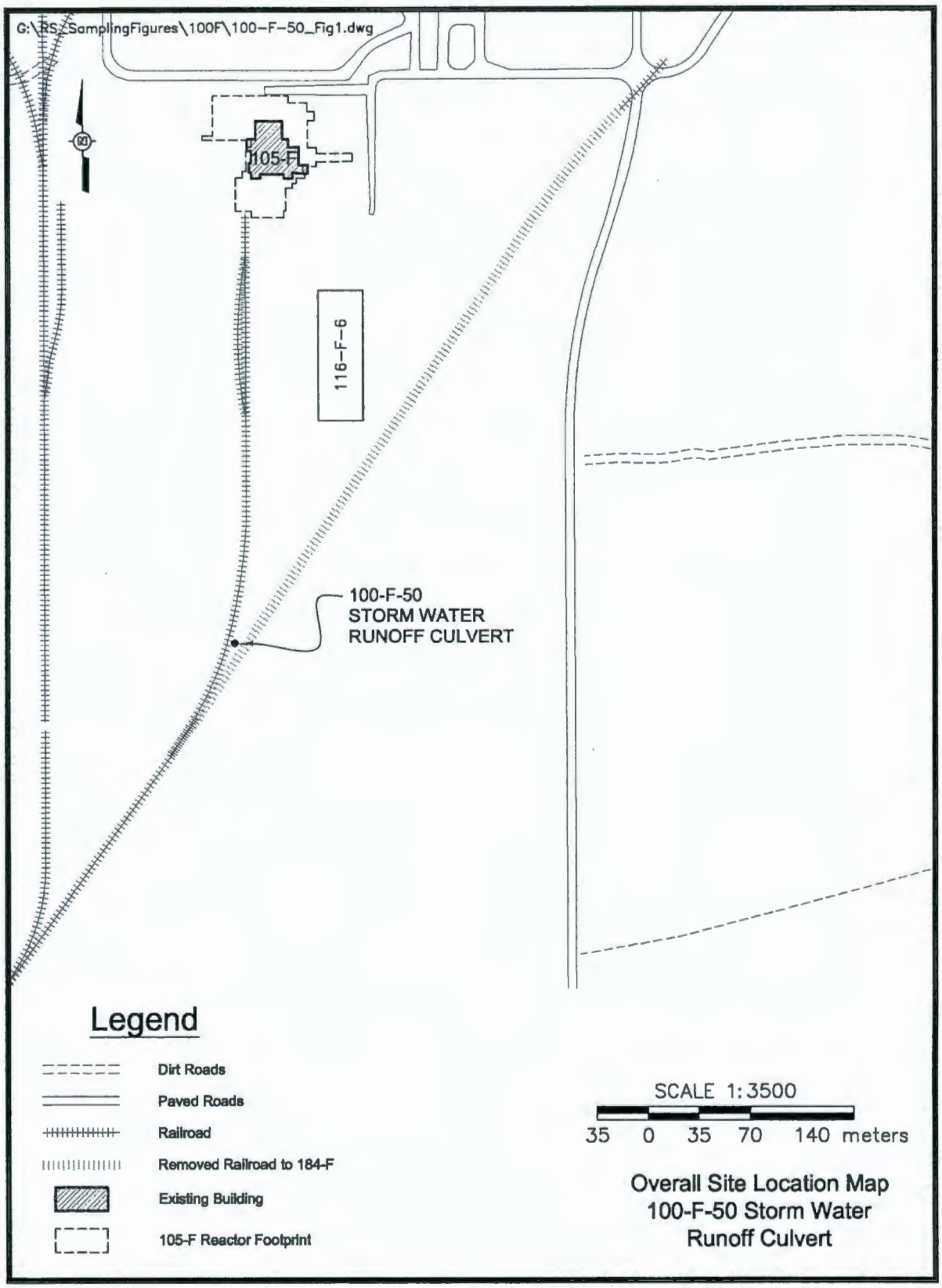
The 100-F-50 site, part of the 100-FR-2 Operable Unit, is a stormwater diversion culvert within the 100-F Area of the Hanford Site. The 100-F-50 site is located southeast of the 116-F-6 disposal trench, between two railroad grades (Figure 1). The Washington State Plane coordinates are N 147257.6, E 580410.0.

The 100-F-50 site was identified during the 100-F Area orphan sites visit in June 2005 as a french drain and drain pipe located between two railroad grades; however, it has characteristics typical of a stormwater runoff culvert and is addressed as such throughout this document.

This site consists of a circular concrete basin and a steel culvert (pipe). The basin, approximately 1 m (3 ft) in diameter, collected surface water runoff that drained via a 36-cm (14-in.) diameter steel diversion culvert under the south railroad grade and flowed down an embankment to the flat terrain below. The basin is partially filled with sediment, rocks, and vegetation; the steel culvert is partially filled with soil and rocks. See Appendix A for photographs of these features.

The history of the 100-F-50 site is not known, but it appears to be a typical stormwater drainage system that was installed to protect two railroad grades from washout and erosion due to snow and/or rain runoff and excessive pooling. One of the railroad tracks went to the 105-F Reactor, and the other was used to transport coal to the 184-F Powerhouse. Process knowledge indicates that cask car drainage and flushing were typically done at shipping or receiving areas with water mains and process sewers. No water piping sources were found on drawings depicting this area; therefore, rinsing processes and chemical dumping are not suspected at this site. Also, the topography of this area indicates downward sloping toward the basin, further suggesting that the purpose was to collect and divert runoff to prevent erosion of the railroad grades.

Figure 1. Location of the 100-F-50 Stormwater Runoff Culvert.



CONFIRMATORY SAMPLING

The 100-F-50 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

The COPCs for the 100-F-50 site were identified based on area topography and drainage. Based on evaluation of area topography, the contaminants of concern from the former 116-F-6 disposal trench site as listed in the *Cleanup Verification Package for the 116-F-6 Liquid Waste Disposal Trench* (BHI 2003) are added as COPCs and include hexavalent chromium, gamma-emitting radionuclides (cesium-137, cobalt-60, europium-152, europium-154), and strontium-90. Based on drainage, the following COPCs were added for the 100-F-50 site: the expanded list of inductively coupled plasma metals, mercury, semivolatile organic compounds, pesticides, polychlorinated biphenyls, herbicides, total petroleum hydrocarbons, and alpha- and beta-emitting radionuclides.

Confirmatory Sample Design

Process knowledge and field observations were used to develop a site-specific sample design for the 100-F-50 site. The confirmatory sample design included focused sampling of surface and subsurface soil at the concrete collection basin and sampling at the base of the effluent end of the steel culvert (where it exits the embankment), as these areas are most likely to produce evidence of any contamination that may have accumulated due to pooling and surface runoff.

Confirmatory Sample Activities

Confirmatory sampling at the 100-F-50 site was performed on November 19, 2007, in accordance with the *Work Instruction for Confirmatory Sampling of the 100-F-50 Storm Water Runoff Culvert* (WCH 2007). Field screening for volatile organic compounds was conducted during the sampling; no elevated detections were noted in the logbook (WCH 2008). Table 1 provides a summary of confirmatory sampling activities at the 100-F-50 site; sample locations are shown in Figure 2.

Table 1. 100-F-50 Stormwater Runoff Culvert Sample Summary Table.

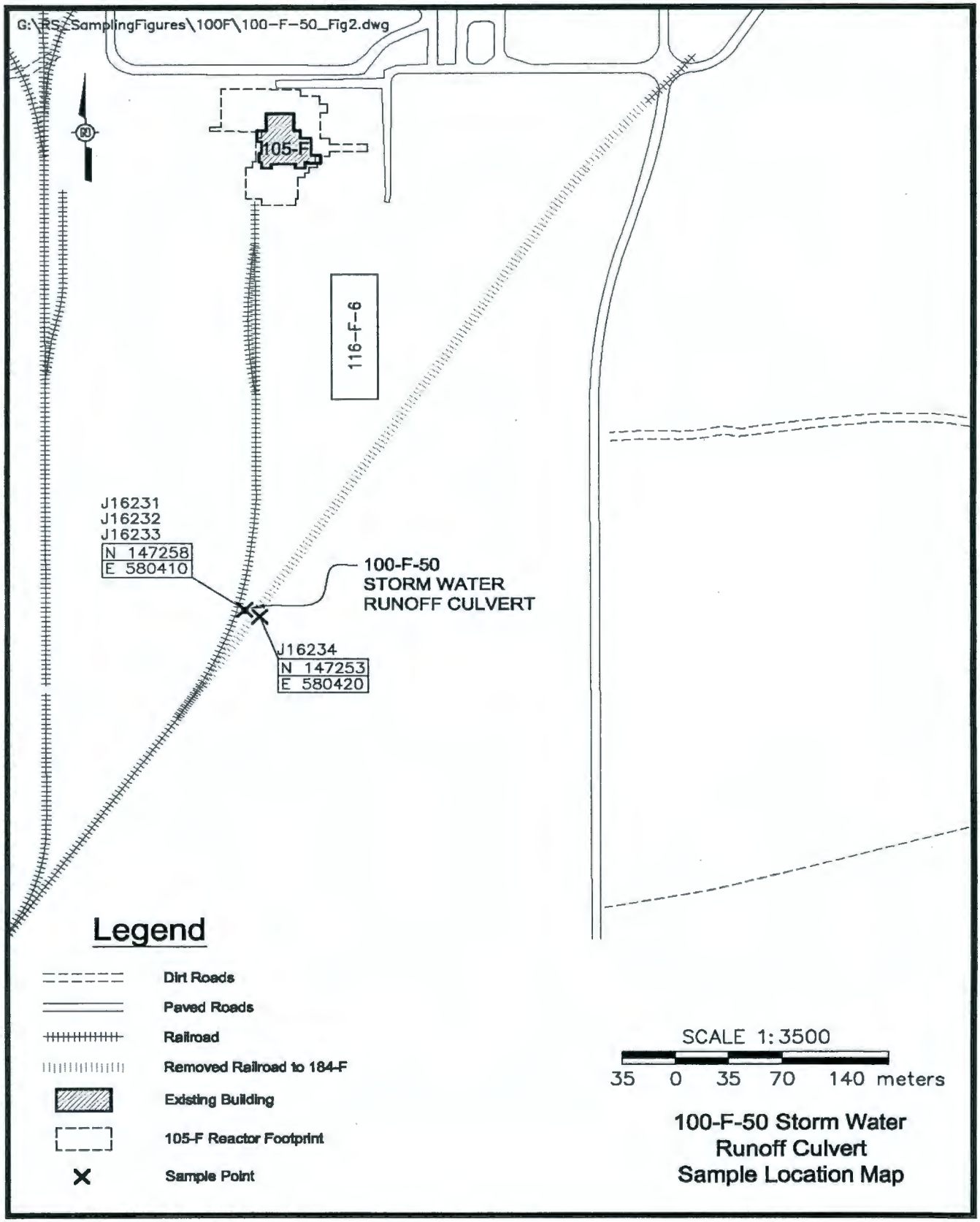
Sample Location	Sample Media	Sample Number	Coordinate Location	Depth (m bgs)	Sample Analysis
Concrete collection basin	Sediment	J16231	N 147257.6 E 580410.0	Surface	GEA, gross alpha, gross beta, ICP metals,[a] mercury, hexavalent chromium, PCB, SVOA, TPH, pesticides, herbicides
	Sediment	J16232		0.5 m	
Culvert (effluent)	Soil	J16234	N 147253.3 E 580420.2	0.0-0.5 m	GEA, gross alpha, gross beta, ICP metals,[a] mercury, hexavalent chromium, PCB, SVOA, TPH, pesticides, herbicides
Duplicate (concrete collection basin)	Sediment	J16233	N 147257.6 E 580410.0	0.5 m	GEA, gross alpha, gross beta, strontium-90,[b] ICP metals,[a] mercury, hexavalent chromium, PCB, SVOA, TPH, pesticides, herbicides
Equipment blank	Silica sand	J16236	N/A	N/A	ICP metals,[a] mercury, SVOA

[a] The expanded list of ICP metals was performed to include arsenic, antimony, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

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

bgs = below ground surface
GEA = gamma energy analysis
ICP = inductively coupled plasma
N/A = not applicable
PCB = polychlorinated biphenyl
SVOA= semivolatile organic analysis
TPH = total petroleum hydrocarbons

Figure 2. Sample Locations at the 100-F-50 Waste Site.



Confirmatory Sample Results

All confirmatory samples were analyzed using analytical methods approved by the U.S. Environmental Protection Agency (DOE-RL 2005a). Because the sample design was focused, the individual sample results were directly compared to the cleanup criteria using the maximum values. These results are shown in Table 2. Contaminants that were not detected by laboratory analysis are excluded from this table. Calculated cleanup levels are not presented in the *Cleanup Levels and Risk Calculations Database* (Ecology 2005) under *Washington Administrative Code* (WAC) 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered site COPCs and are also not included 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 confirmatory sample analytical data are stored in the Environmental Restoration (ENRE) project-specific database for data evaluation prior to their archival in the Hanford Environmental Information System (HEIS) and are summarized in Appendix B.

Table 2. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-F-50 Stormwater Runoff Culvert. (2 Pages)

COPC	Maximum Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Maximum Result Exceed Lookup Values?	Does the Maximum Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value[b]	Groundwater Protection Lookup Value	River Protection Lookup Value		
Cesium-137	0.912	6.2	--[c]	--[c]	No	--
Europium-152	0.365	3.3	--[c]	--[c]	No	--
Strontium-90	0.872	4.5	--[c]	--[c]	No	--
COPC	**Maximum Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**			**Does the Maximum Result Exceed RAGs?**	**Does the Maximum Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Arsenic	2.2 (<BG)	20	20	20	No	--
Barium	66.2 (<BG)	5,600	132[d]	224	No	--
Beryllium	0.81 (<BG)	10.4[e]	1.51[d]	1.51[d]	No	--
Boron[f]	2.6	16,000	320	--[g]	No	--
Chromium (total)	7.6 (<BG)	80,000	18.5[d]	18.5[d]	No	--
Cobalt	6.4 (<BG)	1,600	32	--[g]	No	--
Copper	12.8 (<BG)	2,960	59.2	22.0[d]	No	--
Lead	6.2 (<BG)	353	10.2[d]	10.2[d]	No	--
Manganese	310 (<BG)	11,200	512[d]	512[d]	No	--
Nickel	9.7 (<BG)	1,600	19.1[d]	27.4	No	--

Table 2. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-F-50 Stormwater Runoff Culvert. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Vanadium	53.1 (<BG)	560	85.1[d]	--[g]	No	--
Zinc	47.2 (<BG)	24,000	480	67.8[d]	No	--
Benzo(a)anthracene	0.019	1.37[h]	0.33[i]	0.33[i]	No	--
Benzo(a)pyrene	0.023	0.33[i]	0.33[i]	0.33[i]	No	--
Benzo(b)fluoranthene	0.055	1.37[h]	0.33[i]	0.33[i]	No	--
Benzo(k)fluoranthene	0.022	13.7[h]	0.33[i]	0.33[i]	No	--
Bis(2-ethylhexyl)phthalate	0.450	71.4	0.6	0.36	Yes	Yes[j]
Chrysene	0.044	137[h]	1.2[h]	0.33[h]	No	--
Di-n-butylphthalate	0.026	8,000	160	540	No	--
Fluoranthene	0.038	3,200	64	18.0	No	--
Pyrene	0.040	2,400	48	192	No	--
Dalapon	0.031	2,400	20	NA	No	--
DDE, 4,4'-	0.0014	2.94	0.0257	0.005[d]	No	--
Aroclor-1254	0.015	0.5	0.017[d]	0.017[d]	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 strontium-90 [25 mL/g]), this contaminant is not predicted to migrate more than 3 m (10 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.

[d] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996).

[e] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3]) (1996) and an airborne particulate mass-loading rate of 0.0001 g/m^3 (WDOH 1997).

[f] No Hanford Site-specific or Washington State background value available.

[g] No cleanup level is available from the *Cleanup Levels and Risk Calculations (CLARC) Database* (Ecology 2005), and no bioconcentration factor or ambient water quality criteria values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[h] Calculated using the appropriate formulas from WAC 173-340-740, with toxicity values updated through April 11, 2007, from the EPA Integrated Risk Information System (IRIS) at http://www.epa.gov/iris or from the Risk Assessment Information System (RAIS) database of the Oak Ridge National Laboratory (ORNL) on the Internet at http://risk.lsd.ornl.gov. Parameters have been checked against Ecology's CLARC Database on the Internet at https://fortress.wa.gov/ecy/clarc/CLARCOverview.html .

[i] Where RAGs are less than RDLs, RAGs default to RDLs (WAC 173-340-707(2), 1996 and DOE-RL, 2005b).

[j] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005) the semivolatile organic compounds are not predicted to migrate through the 5 m (16 ft) thick vadose zone between the shallow zone and groundwater at this site in 1,000 years, based on the lowest soil-partitioning distribution coefficient (bis[2-ethylhexyl]phthalate) of 110 mL/g).

--	= not applicable	RAG	= remedial action goal
BG	= background	RDL	= required detection limit
COPC	= contaminant of potential concern	RESRAD	= RESidual RADioactivity (dose assessment model)
DDE	= dichlorodiphenyldichloroethylene	WAC	= *Washington Administrative Code*

DATA EVALUATION

Evaluation of the results listed in Table 2 from confirmatory sampling at the 100-F-50 waste site indicates that residual concentrations of all site COPCs are below soil remedial action goals (RAGs), except for bis(2-ethylhexyl)phthalate. The residual concentration of this contaminant exceeds the soil RAG for the protection of the Columbia River. Data were not collected on the vertical extent of residual contamination, but RESidual RADioactivity (RESRAD) modeling predicts that compounds having a soil-partitioning coefficient (K_d) greater than 14 mL/g will not migrate through the 5-m (16-ft) thick vadose zone between the shallow zone and groundwater at this site (BHI 2005). The K_d for bis(2-ethylhexyl)phthalate is 110 mL/g. The only pathway for contamination to reach the Columbia River is via groundwater migration, so the contaminant concentration is also protective of the Columbia River.

Cesium-137, europium-152, and strontium-90 were detected in the confirmatory samples from the 100-F-50 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 maximum 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 is less than the 15 mrem/yr RAG. None of these radionuclides were predicted to migrate more than 3 m (10 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	0.365	3.3	0.276
Cesium-137	0.912	6.2	0.023
Strontium-90	0.872	4.5	0.194
		Total	0.493
		Equivalent Dose (mrem/yr)	7.4

[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 for the 100-F-50 waste site is determined by calculation of the hazard quotient and excess cancer risk values for nonradionuclides. These calculations are located in Appendix C. The requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. These risk values were not calculated for constituents that were not detected or were detected at concentrations below Hanford Site or Washington State background values. The results (Appendix C) indicate that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the noncarcinogenic constituents is 7.4×10^{-3}. All individual

carcinogen risk values for carcinogenic constituents are less than 1×10^{-6}. The cumulative carcinogenic risk value is 6.3×10^{-9}. Therefore, nonradionuclide risk requirements are met.

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test. However, this test is not applicable to the focused confirmatory sampling results because maximum detected concentrations are used as the compliance basis and evaluated individually against the cleanup criteria.

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 quality requirements specified by the project objectives and performance specifications. The DQA for the 100-F-50 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 D.

SUMMARY FOR NO ACTION

The 100-F-50 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-50 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.

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APPENDIX A

SITE PHOTOGRAPHY

Photograph A-1. Stormwater Runoff Basin (Concrete Bowl) and Culvert (Pipe) at the 100-F-50 Site.

Photograph A-2. Stormwater Runoff Basin Confirmatory Sampling (November 2007).

Photograph A-3. Culvert Exiting Railroad Embankment at the 100-F-50 Site.

Photograph A-4. Steel Culvert Sample Collection at the 100-F-50 Site.

APPENDIX B

CONFIRMATORY SAMPLING RESULTS

Table B-1. 100-F-50 Confirmatory Data Results. (4 pages)

Sample Location	Sample Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Concrete Collection Basin Surface Sediment	J16231	11/19/07	4790	C	12.6	0.94	U	0.94	2.2		1.6	55	C	0.31	0.7		0.16	2.1		1.6
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	4760	C	11.8	0.89	U	0.89	2.1		1.5	66.2	C	0.3	0.75		0.15	2.6		1.5
Duplicate of J16232	J16233	11/19/07	4510	C	12.3	0.93	U	0.93	1.7		1.5	62	C	0.31	0.71		0.15	2.6		1.5
Culvert Soil	J16234	11/19/07	5620	C	12.1	0.91	U	0.91	2.2		1.5	61.8	C	0.3	0.81		0.15	2.5		1.5
Equipment Blank	J16236	11/19/07	45	C	3.7	0.28	U	0.28	0.46	U	0.46	1.2	C	0.09	0.05	U	0.05	0.46	U	0.46

Sample Location	Sample Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Concrete Collection Basin Surface Sediment	J16231	11/19/07	0.16	U	0.16	3470	C	12.6	6.5		0.63	5		0.63	11.9		0.63	0.44	UD	0.44
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	0.15	U	0.15	3640	C	11.8	6.9		0.59	5.3		0.59	12.1		0.59	0.45	UD	0.45
Duplicate of J16232	J16233	11/19/07	0.15	U	0.15	3640	C	12.3	6.6		0.62	5.2		0.62	10.9		0.62	0.45	UD	0.45
Culvert Soil	J16234	11/19/07	0.15	U	0.15	3740	C	12.1	7.6		0.61	6.4		0.61	12.8		0.61	0.41	UD	0.41
Equipment Blank	J16236	11/19/07	0.05	U	0.05	24.6	C	3.7	0.19	U	0.19	0.19	U	0.19	0.19	U	0.19			

Sample Location	Sample Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Concrete Collection Basin Surface Sediment	J16231	11/19/07	17300	C	14.1	6.1		0.94	3350	C	7.8	263	C	0.13	0.01	U	0.01	0.94	U	0.94
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	18600	C	13.3	5.6		0.89	3540	C	7.4	287	C	0.12	0.01	U	0.01	0.89	U	0.89
Duplicate of J16232	J16233	11/19/07	17600	C	13.9	6.2		0.93	3530	C	7.7	279	C	0.12	0.009	U	0.009	0.93	U	0.93
Culvert Soil	J16234	11/19/07	21300	C	13.6	4.9		0.91	3980	C	7.6	310	C	0.12	0.008	U	0.008	0.91	U	0.91
Equipment Blank	J16236	11/19/07	83.6	C	4.2	0.28	U	0.28	7.8	C	2.3	2.6	C	0.04	0.009	U	0.009	0.28	U	0.28

Sample Location	Sample Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Concrete Collection Basin Surface Sediment	J16231	11/19/07	8.2		0.63	1500		155	1.9	U	1.9	1920	C	12.6	0.31	U	0.31	208	C	6.3
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	9.3		0.59	1320		146	1.8	U	1.8	1500	C	11.8	0.3	U	0.3	178	C	5.9
Duplicate of J16232	J16233	11/19/07	9.7		0.62	1340		152	1.9	U	1.9	2370	C	12.3	0.31	U	0.31	199	C	6.2
Culvert Soil	J16234	11/19/07	9.7		0.61	2530		149	1.8	U	1.8	1700	C	12.1	0.3	U	0.3	218	C	6.1
Equipment Blank	J16236	11/19/07	0.19	U	0.19	45.6	U	45.6	0.56	U	0.56	64.1	C	3.7	0.09	U	0.099	17.2	C	1.9

Sample Location	Sample Number	Sample Date	TPH			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Concrete Collection Basin Surface Sediment	J16231	11/19/07	148	U	148	44.4		0.44	41.5	C	1.9
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	148	U	148	48.9		0.41	47.2	C	1.8
Duplicate of J16232	J16233	11/19/07	150	U	150	44.6		0.43	41	C	1.9
Culvert Soil	J16234	11/19/07	137	U	137	53.1		0.42	44.4	C	1.8
Equipment Blank	J16236	11/19/07				0.13	U	0.13	0.84	C	0.56

Table B-1. 100-F-50 Confirmatory Data Results. (4 pages)

Sample Location	Sample Number	Sample Date	Americium-241 GEA			Cesium-137			Cobalt-60			Europium-152			Europium-154			Europium-155		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Concrete Collection Basin Surface Sediment	J16231	11/19/07	0.041	U	0.041	0.752		0.029	0.023	U	0.023	0.292		0.064	0.085	U	0.085	0.07	U	0.07
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	0.324	U	0.324	0.883		0.047	0.041	U	0.041	0.342		0.096	0.128	U	0.128	0.125	U	0.125
Duplicate of J16232	J16233	11/19/07	0.15	U	0.15	0.912		0.03	0.062	U	0.062	0.365		0.061	0.078	U	0.078	0.089	U	0.089
Culvert Soil	J16234	11/19/07	0.032	U	0.032	0.188		0.027	0.023	U	0.023	0.067	U	0.067	0.087	U	0.087	0.073	U	0.073

Sample Location	Sample Number	Sample Date	Gross alpha			Gross beta			Potassium-40			Radium-226			Radium-228			Thorium-228 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
Concrete Collection Basin Surface Sediment	J16231	11/19/07	10.2		7.08	15.8		5.45	11.8		0.209	0.422		0.046	0.58		0.116	0.585		0.035
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	2.74	U	8.2	16.3		5.6	11.9		0.444	0.384		0.076	0.653		0.152	0.48		0.052
Duplicate of J16232	J16233	11/19/07	13.2		9.12	18.2		4.1	12.2		0.264	0.398		0.049	0.564		0.097	0.529		0.037
Culvert Soil	J16234	11/19/07	5.79	U	7.89	16.3		5.66	11.4		0.26	0.343		0.046	0.613		0.082	0.539		0.029

Sample Location	Sample Number	Sample Date	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
Concrete Collection Basin Surface Sediment	J16231	11/19/07	0.58		0.116				0.116	U	0.116	2.51	U	2.51
Concrete Collection Basin Sediment (0.5 m)	J16232	11/19/07	0.653		0.152				0.162	U	0.162	4.38	U	4.38
Duplicate of J16232	J16233	11/19/07	0.564		0.097	0.872		0.266	0.116	U	0.116	2.76	U	2.76
Culvert Soil	J16234	11/19/07	0.613		0.082				0.093	U	0.093	2.97	U	2.97

Table B-1. 100-F-50 Confirmatory Data Results (Sample Date 11/19/07). (4 pages)

CONSTITUENTS	J16231 Concrete Collection Basin Surface Sediment			J16232 Concrete Collection Basin Sediment (0.5 m)			J16233 Duplicate of J16232			J16234 Culvert Soil		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Herbicides												
2,4,5-Trichlorophenoxyacetic acid	18	U	18	19	U	19	19	U	19	17	U	17
2,4-Dichlorophenoxyacetic acid	37	U	37	37	U	37	38	U	38	34	U	34
2-(2,4,5-Trichlorophenoxy)propionic acid	18	U	18	19	U	19	19	U	19	17	U	17
2-secButyl-4,6-dinitrophenol(DNBP)	18	U	18	19	U	19	19	U	19	17	U	17
4-(2,4-Dichlorophenoxy)butanoic acid	18	U	18	19	U	19	19	U	19	17	U	17
Dalapon	31	J	31	37	U	37	38	U	38	34	U	34
Dicamba	37	U	37	37	U	37	38	U	38	34	U	34
Dichloroprop	37	U	37	37	U	37	38	U	38	34	U	34
Pentachlorophenol	18	U	18	19	U	19	19	U	19	17	U	17
Polychlorinated Byiphenyls												
Aroclor-1016	15	U	15	15	U	15	15	U	15	14	U	14
Aroclor-1221	15	U	15	15	U	15	15	U	15	14	U	14
Aroclor-1232	15	U	15	15	U	15	15	U	15	14	U	14
Aroclor-1242	15	U	15	15	U	15	15	U	15	14	U	14
Aroclor-1248	15	U	15	15	U	15	15	U	15	14	U	14
Aroclor-1254	15	U	15	15	J	15	15	U	15	14	U	14
Aroclor-1260	15	U	15	15	U	15	15	U	15	14	U	14
Pesticides												
Aldrin	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Alpha-BHC	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
alpha-Chlordane	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Delta-BHC	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Dichlorodiphenyldichloroethane	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Dichlorodiphenyldichloroethylene	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	JD	1.4
Dichlorodiphenyltrichloroethane	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Dieldrin	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Endosulfan I	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Endosulfan II	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Endosulfan sulfate	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Endrin	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Endrin aldehyde	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Endrin ketone	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Gamma-BHC (Lindane)	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
gamma-Chlordane	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Heptachlor	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Heptachlor epoxide	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Methoxychlor	1.5	UD	1.5	1.5	UD	1.5	1.5	UD	1.5	1.4	UD	1.4
Toxaphene	15	UD	15	15	UD	15	15	UD	15	14	UD	14
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	370	U	370	370	U	370	380	U	380	340	U	340
1,2-Dichlorobenzene	370	U	370	370	U	370	380	U	380	340	U	340
1,3-Dichlorobenzene	370	U	370	370	U	370	380	U	380	340	U	340
1,4-Dichlorobenzene	370	U	370	370	U	370	380	U	380	340	U	340
2,4,5-Trichlorophenol	920	U	920	930	U	930	940	U	940	860	U	860
2,4,6-Trichlorophenol	370	U	370	370	U	370	380	U	380	340	U	340
2,4-Dichlorophenol	370	U	370	370	U	370	380	U	380	340	U	340
2,4-Dimethylphenol	370	U	370	370	U	370	380	U	380	340	U	340
2,4-Dinitrophenol	920	U	920	930	U	930	940	U	940	860	U	860
2,4-Dinitrotoluene	370	U	370	370	U	370	380	U	380	340	U	340
2,6-Dinitrotoluene	370	U	370	370	U	370	380	U	380	340	U	340
2-Chloronaphthalene	370	U	370	370	U	370	380	U	380	340	U	340
2-Chlorophenol	370	U	370	370	U	370	380	U	380	340	U	340
2-Methylnaphthalene	370	U	370	370	U	370	380	U	380	340	U	340
2-Methylphenol (cresol, o-)	370	U	370	370	U	370	380	U	380	340	U	340
2-Nitroaniline	920	U	920	930	U	930	940	U	940	860	U	860
2-Nitrophenol	370	U	370	370	U	370	380	U	380	340	U	340
3+4 Methylphenol (cresol, m+p)	370	U	370	370	U	370	380	U	380	340	U	340

Table B-1. 100-F-50 Confirmatory Data Results (Sample Date 11/19/07). (4 pages)

CONSTITUENTS	J16231 Concrete Collection Basin Surface Sediment			J16232 Concrete Collection Basin Sediment (0.5 m)			J16233 Duplicate of J16232			J16234 Culvert Soil		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
3,3'-Dichlorobenzidine	370	U	370	370	U	370	380	U	380	340	U	340
3-Nitroaniline	920	U	920	930	U	930	940	U	940	860	U	860
4,6-Dinitro-2-methylphenol	920	U	920	930	U	930	940	U	940	860	U	860
4-Bromophenylphenyl ether	370	U	370	370	U	370	380	U	380	340	U	340
4-Chloro-3-methylphenol	370	U	370	370	U	370	380	U	380	340	U	340
4-Chloroaniline	370	U	370	370	U	370	380	U	380	340	U	340
4-Chlorophenylphenyl ether	370	U	370	370	U	370	380	U	380	340	U	340
4-Nitroaniline	920	U	920	930	U	930	940	U	940	860	U	860
4-Nitrophenol	920	U	920	930	U	930	940	U	940	860	U	860
Acenaphthene	370	U	370	370	U	370	380	U	380	340	U	340
Acenaphthylene	370	U	370	370	U	370	380	U	380	340	U	340
Anthracene	370	U	370	370	U	370	380	U	380	340	U	340
Benzo(a)anthracene	370	U	370	370	U	370	19	J	380	340	U	340
Benzo(a)pyrene	370	U	370	23	J	370	380	U	380	340	U	340
Benzo(b)fluoranthene	370	U	370	35	J	370	55	J	380	340	U	340
Benzo(ghi)perylene	370	U	370	370	U	370	380	U	380	340	U	340
Benzo(k)fluoranthene	370	U	370	370	U	370	22	J	380	340	U	340
Bis(2-chloro-1-methylethyl)ether	370	U	370	370	U	370	380	U	380	340	U	340
Bis(2-Chloroethoxy)methane	370	U	370	370	U	370	380	U	380	340	U	340
Bis(2-chloroethyl) ether	370	U	370	370	U	370	380	U	380	340	U	340
Bis(2-ethylhexyl) phthalate	96	J	370	160	J	160	450	B	450	100	J	100
Butylbenzylphthalate	370	U	370	370	U	370	380	U	380	340	U	340
Carbazole	370	U	370	370	U	370	380	U	380	340	U	340
Chrysene	26	J	370	25	J	370	44	J	380	340	U	340
Di-n-butylphthalate	370	U	370	370	U	370	26	J	380	340	U	340
Di-n-octylphthalate	370	U	370	370	U	370	380	U	380	340	U	340
Dibenz[a,h]anthracene	370	U	370	370	U	370	380	U	380	340	U	340
Dibenzofuran	370	U	370	370	U	370	380	U	380	340	U	340
Diethylphthalate	370	U	370	370	U	370	380	U	380	340	U	340
Dimethyl phthalate	370	U	370	370	U	370	380	U	380	340	U	340
Fluoranthene	370	U	370	23	J	370	38	J	380	21	J	340
Fluorene	370	U	370	370	U	370	380	U	380	340	U	340
Hexachlorobenzene	370	U	370	370	U	370	380	U	380	340	U	340
Hexachlorobutadiene	370	U	370	370	U	370	380	U	380	340	U	340
Hexachlorocyclopentadiene	370	U	370	370	U	370	380	U	380	340	U	340
Hexachloroethane	370	U	370	370	U	370	380	U	380	340	U	340
Indeno(1,2,3-cd)pyrene	370	U	370	370	U	370	380	U	380	340	U	340
Isophorone	370	U	370	370	U	370	380	U	380	340	U	340
N-Nitroso-di-n-dipropylamine	370	U	370	370	U	370	380	U	380	340	U	340
N-Nitrosodiphenylamine	370	U	370	370	U	370	380	U	380	340	U	340
Naphthalene	370	U	370	370	U	370	380	U	380	340	U	340
Nitrobenzene	370	U	370	370	U	370	380	U	380	340	U	340
Pentachlorophenol	920	U	920	930	U	930	940	U	940	860	U	860
Phenanthrene	370	U	370	370	U	370	380	U	380	340	U	340
Phenol	370	U	370	370	U	370	380	U	380	340	U	340
Pyrene	23	J	370	370	U	370	40	J	380	340	U	340

APPENDIX C

RELATIVE PERCENT DIFFERENCE, HAZARD QUOTIENT, AND CARCINOGENIC RISK CALCULATIONS

APPENDIX C

RELATIVE PERCENT DIFFERENCE, HAZARD QUOTIENT, AND CARCINOGENIC RISK CALCULATIONS

The following calculation is provided in this appendix:

100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogenic Risk Calculations, 0100F-CA-V0344, 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-V0344

Subject: 100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogen Risk Calculation

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 Summary = 6 Total = 7	E. J. Farris EJFarris	H. M. Sulloway HM Sulloway		J. M. Capron JMCapron	3/1/08

SUMMARY OF REVISION

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJF	Date:	2/25/08	Calc. No.:	0100D-CA-V0344	Rev.:	0
Project:	100-F Area Field Remediation	Job No:	14655	Checked:	H. M. Sullowayd	Date:	2/25/08
Subject:	100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 6	

EJF 3/3/08

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and carcinogenic (excess cancer) risk for the 100-F-50 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2005b), the following criteria must be met:

1) An HQ of <1.0 for all individual noncarcinogens
2) A cumulative HQ of <1.0 for noncarcinogens
3) An excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.

Also, calculate the relative percent difference (RPD) for primary-duplicate sample pairs from 100-F-50 confirmatory sampling, as necessary.

GIVEN/REFERENCES:

1) 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.

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

3) 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.

4) WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, 1996.

5) WCH, 2008, *Remaining Sites Verification Package for the 100-F-50 Storm Water Runoff Culvert*, Attachment to Waste Site Reclassification Form 2007-001, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

1) Generate an HQ for each noncarcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the individual HQ of <1.0 (DOE-RL 2005b).

2) Sum the HQs and compare this value to the cumulative HQ of <1.0.

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the excess cancer risk of $<1 \times 10^{-6}$ (DOE-RL 2005b).

Washington Closure Hanford, Inc. CALCULATION SHEET F EJF 3/3/08

Originator:	E. J. Farris EJF	Date:	2/25/08	Calc. No.:	0100D-CA-V0344	Rev.:	0
Project:	100-F Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	2/25/08
Subject:	100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 6	

4) Sum the excess cancer risk value(s) and compare it to the cumulative cancer risk of $<1 \times 10^{-5}$.

5) Use data from WCH (2008) to perform the RPD calculations for primary-duplicate sample pairs, as required.

METHODOLOGY:

Hazard quotient and carcinogenic risk calculations for the 100-F-50 waste site were conservatively calculated for the entire waste site using the highest of the focused results for each analyte (WCH 2008). Boron requires the HQ and risk calculations because this analyte was detected and a Washington State or Hanford Site background value is not available. Multiple organic COPCs (as listed in Table 1) are included because they were detected by laboratory analysis and cannot be attributed to natural occurrence. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 2.6 mg/kg, divided by the noncarcinogenic RAG value of 16,000 mg/kg (calculated in accordance with the noncarcinogenic toxic effects WAC 173-340-740[3]), is 1.6×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. The sum of the HQ values is 7.4×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum value is divided by the carcinogenic RAG value, then multiplied by 1×10^{-6}. For example, the maximum value for bis(2ethylhexyl)phthalate is 0.45 mg/kg; divided by 71.4 mg/kg, and multiplied as indicated, is 6.3×10^{-9}. Comparing this value and all other individual values to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. The sum of the excess cancer risk values is 1.2×10^{-6}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

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:

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

where, M = main sample value D = 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

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Originator:	E. J. Farris EJF	Date:	2/25/08	Calc. No.:	0100D-CA-V0344	Rev.:	0
Project:	100-F Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	2/25/08
Subject:	100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 6	

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) 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 cleanup verification of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP (WCH 2008), as necessary.

RESULTS:

1) List individual noncarcinogens and corresponding HQs >1.0: None
2) List the cumulative noncarcinogenic HQ >1.0: None
3) List individual carcinogens and corresponding excess cancer risk >1 x 10^{-6}: None
4) List the cumulative excess cancer risk for carcinogens >1 x 10^{-5}: None.

Table 1 shows the results of the hazard quotient and excess cancer risk calculations.

None of the RPDs calculated in the field duplicate pair for sample delivery group (SDG) K1026 are above the acceptance criteria (30%), with the exception of silicon. The RPD calculated for silicon in SDG K1026 was 45.0%. The evaluation of the QA/QC duplicate RPD calculations is performed within the data quality assessment section of the RSVP (WCH 2008). Table 2 shows the results of the calculations for SDG K1026.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris	Date:	2/25/08	Calc. No.:	0100D-CA-V0344	Rev.:	0
Project:	100-F Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	2/25/08
Subject:	100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 6	

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-F-50 Waste Site.

Contaminants of Potential Concern	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.6	16,000	1.6E-04	--	--
Semivolatiles					
Benzo(a)anthracene	0.019	--	--	0.137	1.4E-07
Benzo(a)pyrene	0.023	--	--	0.137	1.7E-07
Benzo(b)fluoranthene	0.055	--	--	0.137	4.0E-07
Benzo(k)fluoranthene	0.022	--	--	0.137	1.6E-07
Bis(2-ethylhexyl) phthalate	0.450	1,600	2.8E-04	71.4	6.3E-09
Chrysene	0.044	--	--	0.137	3.2E-07
Di-n-butylphthalate	0.026	8,000	3.3E-06	--	--
Fluoranthene	0.038	3,200	1.2E-05	--	--
Pyrene	0.040	2,400	1.7E-05	--	--
Pesticides					
Dalapon	0.031	2,400	1.3E-05	--	--
DDE, 4,4'-	0.0014	--	--	2.94	4.8E-10
Polychlorinated Biphenyls					
Aroclor-1254	0.011	1.6	6.9E-03	0.5	2.2E-08
Totals					
Cumulative Hazard Quotient:			**7.4E-03**		
Cumulative Excess Cancer Risk:					**1.2E-06**

Notes:

[a] = From WCH (2008).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2005) or *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJF	Date:	2/25/08	Calc. No.:	0100F-CA-V0344	Rev.:	0
Project:	100-F Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	2/25/08
Subject:	100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 5 of 6	

F EJF 3/3/08

Table 2. Relative Percent Difference Calculations for SDG K1026. (2 Pages)

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Sediment (0.5 m)	J16232	11/19/07	4760	C	11.8	2.1		1.5	66.1	C	0.30	0.75		0.15
Duplicate of J16232	J16233	11/19/07	4510	C	12.3	1.7		1.5	62.0	C	0.31	0.71		0.15

Analysis:

TDL		5	10	2	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	5.4%		6.4%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable

Sampling Area	Sample Number	Sample Date	Boron			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Sediment (0.5 m)	J16232	11/19/07	2.6		1.5	3640	C	11.8	6.9		0.59	5.3		0.59
Duplicate of J16232	J16233	11/19/07	2.6		1.5	3640	C	12.3	6.6		0.62	5.2		0.62

Analysis:

TDL		2	100	1	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		0.0%	4.4%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Copper			Iron			Lead			Magnesium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Sediment (0.5 m)	J16232	11/19/07	12.1		0.59	18600	C	13.3	5.6		0.89	3540	C	7.4
Duplicate of J16232	J16233	11/19/07	10.9		0.62	17600	C	13.9	6.2		0.93	3530	C	7.7

Analysis:

TDL		1	5	5	75
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	10.4%	5.5%		0.3%
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable

Sampling Area	Sample Number	Sample Date	Manganese			Nickel			Potassium			Silicon		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Sediment (0.5 m)	J16232	11/19/07	287	C	0.12	9.3		0.59	1320		146	1500	C	11.8
Duplicate of J16232	J16233	11/19/07	279	C	0.12	9.7		0.62	1340		152	2370	C	12.3

Analysis:

TDL		5	4	400	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	2.8%			45.0%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable

Washington Closure Hanford, Inc. CALCULATION SHEET

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Project:	100-F Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	2/25/08
Subject:	100-F-50 Relative Percent Difference (RPD) and Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 6 of 6	

Table 2. Relative Percent Difference Calculations for SDG K1026. (2 Pages)

Sampling Area	Sample Number	Sample Date	Sodium			Vanadium			Zinc			Benzo(b)fluoranthene		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	µg/kg	Q	PQL
Sediment (0.5 m)	J16232	11/19/07	178	C	5.9	48.9		0.41	47.2	C	1.8	35	J	370
Duplicate of J16232	J16233	11/19/07	199	C	6.2	44.6		0.43	41.0	C	1.9	55	J	380

Analysis:

TDL		50	2.5	1	330
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No - evaluate difference
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	
	RPD		9.2%	14.1%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

Sampling Area	Sample Number	Sample Date	Bis(2-ethylhexyl) phthalate			Chrysene			Fluoranthene			Cesium-137		
			µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	pCi/g	Q	MDA
Sediment (0.5 m)	J16232	11/19/07	160	J	160	25	J	370	23	J	370	0.883		0.047
Duplicate of J16232	J16233	11/19/07	450	B	450	44	J	380	38	J	380	0.912		0.030

Analysis:

TDL		330	330	330	0.05
Duplicate Analysis	Both > PQL/MDA?	No - evaluate difference	No - evaluate difference	No - evaluate difference	Yes (continue)
	Both >5xTDL?				Yes (calc RPD)
	RPD				3%
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	Not applicable

Sampling Area	Sample Number	Sample Date	Europium-152		
			pCi/g	Q	MDA
Sediment (0.5 m)	J16232	11/19/07	0.342		0.096
Duplicate of J16232	J16233	11/19/07	0.365		0.061

Analysis:

TDL		0.1
Duplicate Analysis	Both > MDA?	Yes (continue)
	Both >5xTDL?	No - evaluate difference
	RPD	
	Difference > 2 TDL?	No - acceptable

Notes:

B =estimate
C = method blank contamination
MDA = minimum detectable activity
J = estimate
PQL = practical quantitation limit
Q = qualifier
RPD = relative percent difference
TDL = target detection limit
U = undetected

CONCLUSION:

The calculations in Table 1 demonstrate that the 100-F-50 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005). The hazard quotients and carcinogenic (excess cancer) risk and RPD calculations are for use in the RSVP for this site.

APPENDIX D

DATA QUALITY ASSESSMENT

APPENDIX D

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 2005a). This DQA was performed in accordance with site-specific data quality objectives found in the sampling and analysis plan (SAP) (DOE-RL 2005b).

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.

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. Confirmatory sample data collected at the 100-F-50 waste site were provided by the laboratories in one sample delivery group (SDG): SDG K1026. In the analytical data set, SDG K1026 had an elevated result for gross beta for sample J16233. Elevated gross beta results lead to additional analyses for strontium, which was requested for this sample.

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-50, the data had inconsistent results between the gross beta and the strontium isotopic analyses. The strontium-90 results of 0.872 pCi/g and 0.800 pCi/g for the J16233 laboratory primary and duplicate are inconsistent with the elevated result of 36.6 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-50 gross beta analyses were rerun for sample J16233, with results of 18.2 pCi/g and 20.6 pCi/g for the laboratory primary and duplicate.

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 B.

SDG K1026 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed below.

SDG K1026

This SDG comprises four field samples (J16231-J16235), and one equipment blank (J16236). A field duplicate pair (J16232/J16233) is included in this SDG. These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), pesticides, herbicides, gross alpha and gross beta by proportional counting, and by gamma spectroscopy. In addition, sample J16233 was analyzed for total strontium by beta counting. SDG K1026 was submitted for formal third-party validation. Minor deficiencies found in SDG K1026 are as follows:

Reported analytical detection levels are compared against the required quantitation limits (RQLs) to ensure that laboratory detection levels meet the required criteria. In the radiochemical analysis, three analytes exceeded the RQL. The reported PQL is below the lowest remedial action goal (RAG). Under the Washington Closure Hanford (WCH) statement of work (SOW), no qualification is required.

All of the toxaphene data in SDG K1026 was qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS), matrix spike duplicate (MSD), or lab control sample (LCS) analysis for the analyte. Estimated, or "J"-flagged, data are acceptable for decision-making purposes. Also, all toxaphene results exceeded the RQL. Under the WCH SOW, no qualification is required.

For the aroclor-1254 result in sample J16232, the LCS recovery was outside quality control (QC) limits at 139%, and a surrogate recovery was outside QC limits at 142%. Third-party validation qualified as estimated, and assigned a "J" flag to, the aroclor-1254 result in sample J16232. Estimated data are useable for decision-making purposes.

In the pesticide analysis, the MS recovery for delta-BHC is out of acceptance criteria, at 52%. This analyte has been qualified by third-party validation as estimates with "J" flags for all samples in SDG K1026. Estimated, or "J"-flagged, data are useable for decision-making purposes.

The relative percent differences (RPDs) for dichloroprop (35%), 2,4-D (43%), and 2,4-DB (85%) are outside QC limits. The results for these analytes were qualified as estimates and flagged "J" by third-party validation. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, the calcium, sodium, and zinc results for sample J16236 (the equipment blank) are of similar magnitude as the method blank (MB) results, and are qualified by third-party validation as undetected estimates with "UJ" flags, due to MB contamination. The data are useable for decision-making purposes.

Also in the ICP metals analysis, the MS recoveries for three ICP metals (aluminum, iron, and silicon) are out of acceptance criteria. For these analytes, the spiking concentration is insignificant compared to the native concentration in the sample from which the MS was prepared. Therefore, the deficiency in the MS result is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. To confirm quantitation, post digestion spikes (PDSs) and serial dilutions were prepared for all three analytes with acceptable results.

All petroleum hydrocarbon results were qualified by third-party validation as estimates with "J" flags due to the holding time being exceeded by less than twice the limit. The samples were taken on November 19, 2007, and extracted on December 4, 2007, exceeding the holding time requirement (14

days) by one day. Estimated data are useable for decision-making purposes.

All petroleum hydrocarbon results exceeded the RQL. The reported PQL is below the lowest RAG. Under the WCH SOW, no qualification is required, and these small exceedances were not qualified by third-party validation. The data are useable for decision-making purposes.

In the SVOC analysis, the common laboratory contaminants bis(2-ethylhexyl)phthalate is detected in the MB. Third-party validation raised the reported values for bis(2-ethylhexyl)phthalate for all samples to the required quantitation limit of 660 µg/kg and qualified them as undetected and flagged "U". The data are useable for decision-making purposes.

Also in the SVOC analysis, 17 of 128 MS recoveries are below the acceptance criteria. The MS for 1,3-dichlorobenzene is 42%, and the MSD is 47%. The nitrobenzene and 2-nitrophenol MS recoveries are 42%, and 47%, respectively. The 1,2,4-trichlorobenzene MS recovery is 41%, and the MSD is 48%. The hexachloroethane MS recovery is 41%, and the MSD is 45%.The MS for 2,2'oxybis(1-chloropropene) is 42%. The MS for isophorone is 53%, and the MSD is 57%. The MS recovery for bis(2-chloroethyl) ether is 47%. The MS for 1,4 dichlorobenzene is 46%, and the MSD is 48%. The MS is 44% for 1,2-dichlorobenzene. LCS recoveries were outside QC limits for isophorone (58%), 2,4-dinitrophenol (19%), 4,6-dinitro-2-methylphenol (33%), pentachlorophenol (42%), bis(2-chloroethoxy)methane (48%), 4-chloroanaline (39%), 1,2,4-trichlorobenzene (53%) and 2-methylnaphthalene (57%). The results for these analytes were qualified as estimates and flagged "J" by third-party validation. Estimated data are useable for decision making purposes.

Thirty six SVOC results exceeded the RQL. The reported PQL is below the lowest RAG. Under the WCH SOW, no qualification is required.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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-50 sample primary and duplicate (J16232/J16233). The main and QA/QC sample results are presented in Appendix B.

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 contaminant of concern (COC). Only analytes with values above five times the detection limits for both the main and duplicate samples are compared. The RPD calculation brief in Appendix C provides details on duplicate pair evaluation and RPD calculation.

Radionuclides.

None of the RPD calculated for the field QA/QC sample radionuclide results exceeded the acceptance criteria of 30%. The data are useable for decision making purposes.

Nonradionuclides.

The RPD calculated for silicon was 45%, which exceeded the acceptance criteria of 30%. An elevated RPD, such as this, in the analysis of environmental soil samples, is largely attributed to heterogeneities in the soil matrix and only in small part attributed to precision and accuracy issues at the laboratory. The data are useable for decision-making purposes.

RPDs for the remaining radionuclides and nonradionuclide analytes are not calculated because an evaluation of the data shows the analytes are not detected in both the main and duplicate sample at more than 5 times the target detection limit (TDL). RPDs of analytes detected at low concentrations (less than five times the detection limit) are not considered to be indicative of the analytical system performance. The data are useable for decision-making purposes.

A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the TDL, including undetected analytes. In these cases, a control limit of ± 2 times the TDL is used (Appendix C) to indicate that a visual check of the data is required by the reviewer. For the 100-F-50 duplicate sample, the difference was less than 2 times the TDL (for all analytes with one or both of the samples less than 5 times the TDL), and did not require the visual check. However, a 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-50 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 the 100-F-50 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 (ENRE) project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System (HEIS) database. The confirmatory sample analytical data are also summarized in Appendix B.

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