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Department of Energy
Richland Operations Office
P.O. Box 550
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08-AMRC-0199

JUN 1 8 2008

Mr. Nicholas Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Blvd, Suite 115
Richland, Washington 99352

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EDMC

Dear Mr. Ceto:

TRANSMITTAL OF APPROVED REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-44:2 DISCOVERY PIPELINE NEAR 108-F BUILDING, REVISION 0

This letter transmits, "Remaining Sites Verification Package for the 100-F-44:2 Discovery Pipeline Near 108-F Building," Revision 0, for your use. Mr. R. A. Lobos, of your staff, has reviewed this document. If you have questions, please contact me or your staff may contact Chris Smith, of my staff, on (509) 372-1544.

Sincerely,

Joe R. Franco, Assistant Manager
for the River Corridor

AMRC:DCS

Enclosure

cc w/encl:
R. A. Lobos, EPA
Administrative Record, H6-08

cc w/o encl:
J. M. Capron, WCH

Date Submitted: 4/24/08 Originator: J. M. Capron Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-FR-1 Waste Site Code: 100-F-44:2 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☐ No Action ☒ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2007-006

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-44:2 waste site is a 0.05 m (2-in.) steel pipeline that was discovered in a junction box during confirmatory sampling of the 100-F-26:4 pipeline from December 2004 through January 2005. The 100-F-44:2 pipeline feeds into the 100-F-26:4 subsite 0.15 m (6-in.) vitrified clay pipe (VCP) process sewer pipeline from the 108-F Biology Laboratory at the junction box. Confirmatory sampling of this site has been performed in accordance with 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, 100-1U-2, ~~100-1U-6, and~~ 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington. The selected action involved (1) evaluating the site using available process information and confirmatory sampling data and (2) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

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 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-44:2, Discovery Pipeline Near108-F Building* (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.

R. F. Guercia DOE Federal Project Director (printed)	Signature	5/15/08 Date
N/A Ecology Project Manager (printed)	Signature	Date
R. A. Lobos EPA Project Manager (printed)	Signature	5/30/08 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-44:2, DISCOVERY PIPELINE NEAR 108-F BUILDING

Attachment to Waste Site Reclassification Form 2007-006

April 2008

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-44:2, DISCOVERY PIPELINE NEAR 108-F BUILDING

EXECUTIVE SUMMARY

The 100-F-44 site includes segments of miscellaneous underground pipelines that were not previously identified as part of any other waste site. These pipelines were either discovered during previous field activities or identified during historical review of 100-F Area engineering drawings. For the 100-F-44 waste site cleanup effort, the site has been divided into 10 subsites based on suspected use of the pipe (e.g., sanitary sewer or process water), expected sources of contamination, and potential remedial actions. The 100-F-44:2 subsite is a 0.05 m (2-in.) steel pipeline that was discovered in a junction box during confirmatory sampling of the 100-F-26:4 pipeline from December 2004 through January 2005. The 100-F-44:2 pipeline feeds into the 100-F-26:4 subsite 0.15 m (6-in.) vitrified clay pipe process sewer pipeline from the 108-F Biology Laboratory at the junction box.

The length and origin of the 100-F-44:2 pipeline is unknown; however, information supports the judgment that the 100-F-44:2 pipeline is associated with the former 1,140,000 L (300,000-gal) 187-F1 elevated water tower. This information includes the proximity of the junction box location (where the pipeline was discovered) to the 187-F1 elevated water tower and the geophysical results that demonstrate that the pipeline's path is to the water tower.

Confirmatory sampling was performed on January 16, 2008. Confirmatory samples were collected from beneath the pipe at depth of 2 m (7 ft) below the ground surface. There was no sediment or scale inside the pipe. The samples were analyzed for the same list of contaminants of potential concern as the 100-F-26:4 pipeline by gamma energy analysis, and for inductively coupled metals, mercury, hexavalent chromium, polychlorinated biphenyls, and pesticides. None of the contaminants exceeded the soil remedial action goals for direct exposure, the protection of groundwater, or the protection of the Columbia River. Assessment of the risk requirements for the 100-F-44:2 subsite was determined by calculation of the hazard quotient and excess carcinogenic risk values for nonradionuclides. The calculations indicated that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-F-44:2 subsite was less than 1.0. All individual cumulative carcinogenic risk values are less than 1×10^{-6}. The cumulative carcinogenic risk value was less than 1.0×10^{-5}. Therefore, nonradionuclide risk requirements are met.

A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 100-F-44:2 subsite 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 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 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.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999), based 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 site contaminants of potential concern and other constituents. Screening levels were not exceeded for the site constituents, with the exception 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 concentrations of manganese and vanadium are below site background levels, zinc is within the range of Hanford Site background levels, and boron concentrations are consistent with those seen elsewhere at 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 to support the final closeout decision for this site.

Table ES-1. Summary of Remedial Action Goals for the 100-F-44:2 Subsite. (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.	No radionuclide COPCs were detected in confirmatory samples.	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 (5.1×10^{-3}) is <1.	

Table ES-1. Summary of Remedial Action Goals for the 100-F-44:2 Subsite. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Risk Requirements Nonradionuclides (continued)	Attain an excess cancer risk of <1 x 10^{-6} for individual carcinogens.	The cancer risk value (1.3 x 10^{-7}) for hexavalent chromium, the only carcinogen detected, is <1 x 10^{-6}.	Yes
	Attain a total excess cancer risk of <1 x 10^{-5} for carcinogens.	The cancer risk value (1.3 x 10^{-7}) for hexavalent chromium, the only carcinogen detected, is <1 x 10^{-5}.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river protection RAGs.	No radionuclide COPCs were detected in confirmatory samples.	Yes
	Attain national primary drinking water regulations:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	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]		
	Meet total uranium standard of 21.2 pCi/L.[c]		
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	All the groundwater and river RAOs have been attained.	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
RAO = remedial action objective
RESRAD = RESidual RADioactivity (dose assessment model)

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-44:2, DISCOVERY PIPELINE NEAR 108-F BUILDING

STATEMENT OF PROTECTIVENESS

The sample results for the 100-F-44:2 subsite (Discovery Pipeline Near 108-F Building) demonstrate that the site achieves the remedial action objectives and remedial action goals (RAGs) 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* (commonly called the Remaining Sites Record of Decision [ROD]) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil 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.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999), based 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 site contaminants of potential concern (COPCs) and other constituents. Screening levels were not exceeded for the site constituents, with the exception 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 concentrations of manganese and vanadium are below site background levels; zinc is within the range of Hanford Site background levels; and boron concentrations are consistent with those seen elsewhere at 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 to support the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-F-44 site includes segments of miscellaneous underground pipelines that were not previously identified as part of any other waste site. These pipelines were either discovered during previous field activities or identified during a historical review of 100-F Area engineering drawings. For the 100-F-44 waste site cleanup effort, the site has been divided into 10 subsites based on suspected use of the pipe (e.g., sanitary sewer or process water), expected sources of contamination, and potential remedial actions. The 10 subsites are as follows:

- 100-F-44:1 Discovery pipeline near 182-F Reservoir
- 100-F-44:2 Discovery pipeline near 108-F Building

- 100-F-44:3 1607-F3 sewer system pipeline
- 100-F-44:4 Discovery pipeline in silica gel pit
- 100-F-44:5 Process sewer pipelines
- 100-F-44:6 189-F refrigeration pipeline
- 100-F-44:7 1717-F blowdown pipeline
- 100-F-44:8 1717-F fuel oil supply and return pipelines
- 100-F-44:9 105-F process sewer pipeline
- 100-F-44:10 141-C sewer pipelines.

This remaining sites verification package only addresses areas within the 100-F-44:2 subsite (discovery pipeline near the 108-F Building). The 100-F-44:2 subsite is a 0.05 m (2-in.) steel pipeline that was discovered in a junction box during confirmatory sampling of the 100-F-26:4 pipeline from December 2004 through January 2005 (Figure 1). The 100-F-44:2 pipeline feeds into a 0.15 m (6-in.) vitrified clay pipe process sewer pipeline (100-F-26:4) from the 108-F Biology Laboratory at the junction box (Figure 2).

The subject junction box was installed in 1949 when the 108-F Building was expanded. A rough opening visible in the concrete wall at the 100-F-44:2 point of entry into the junction box indicates the 100-F-44:2 pipeline was added after installation of the junction box. A geophysical survey of the 100-F-44:2 subsite was conducted in January 2007 (Geophysical Site Investigation Summary form #0574490) using ground-penetrating radar. Two east-westerly trending linears were identified that appear to originate or pass through the former junction box location (Figure 3). The linear that extends to the east is consistent with the location and depth of the 100-F-26:4 pipeline. The linear that extends to the west is consistent with the location and orientation of the pipeline of interest (100-F-44:2). The assumed 100-F-44:2 pipeline linear is interpreted to be between 1 and 1.5 m (3 and 5 ft) deep.

Figure 1. Photograph of the 100-F-44:2 Pipeline Subsite (2004).

Figure 2. 100-F-44:2 Subsite Location Map.

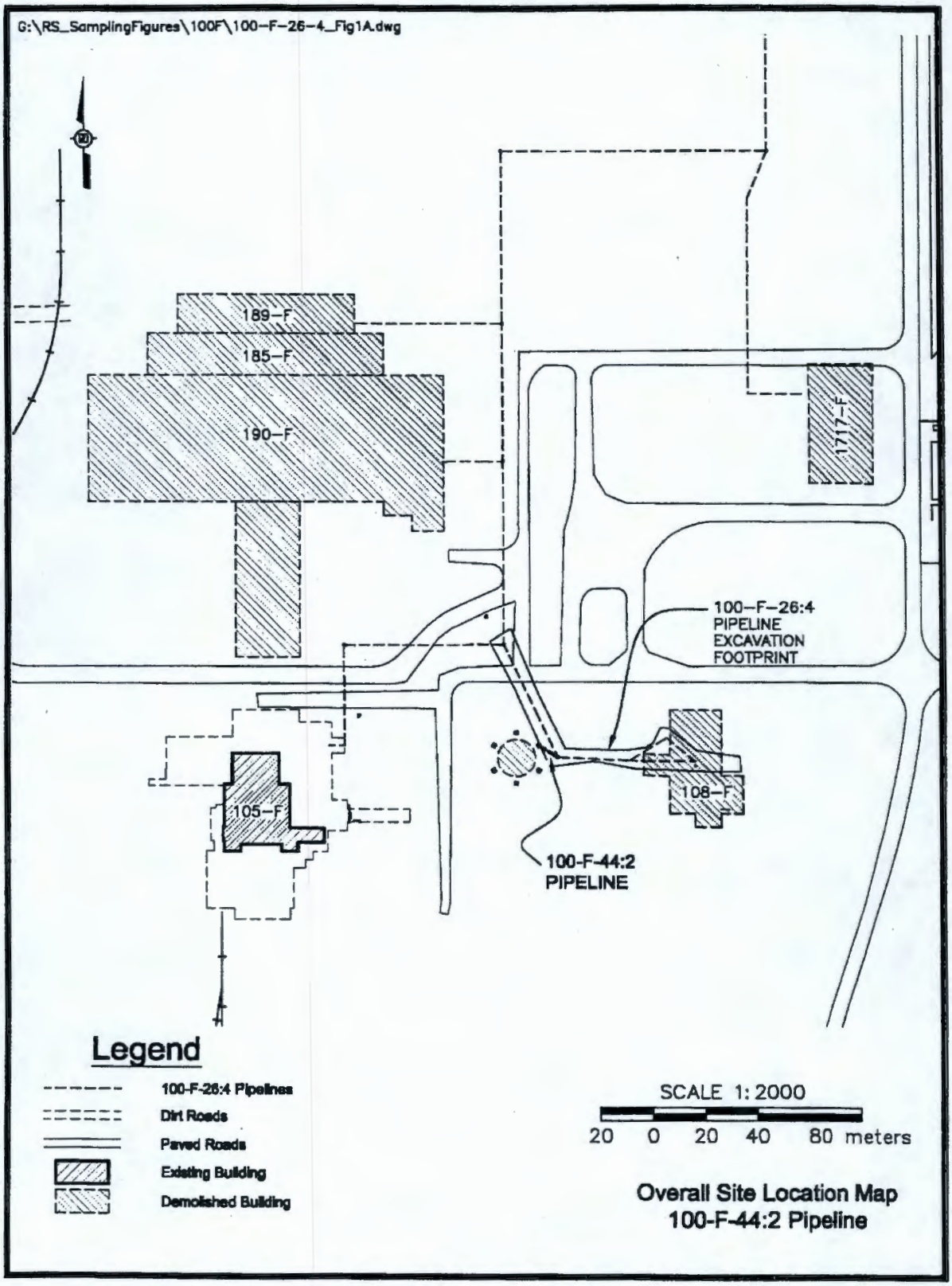
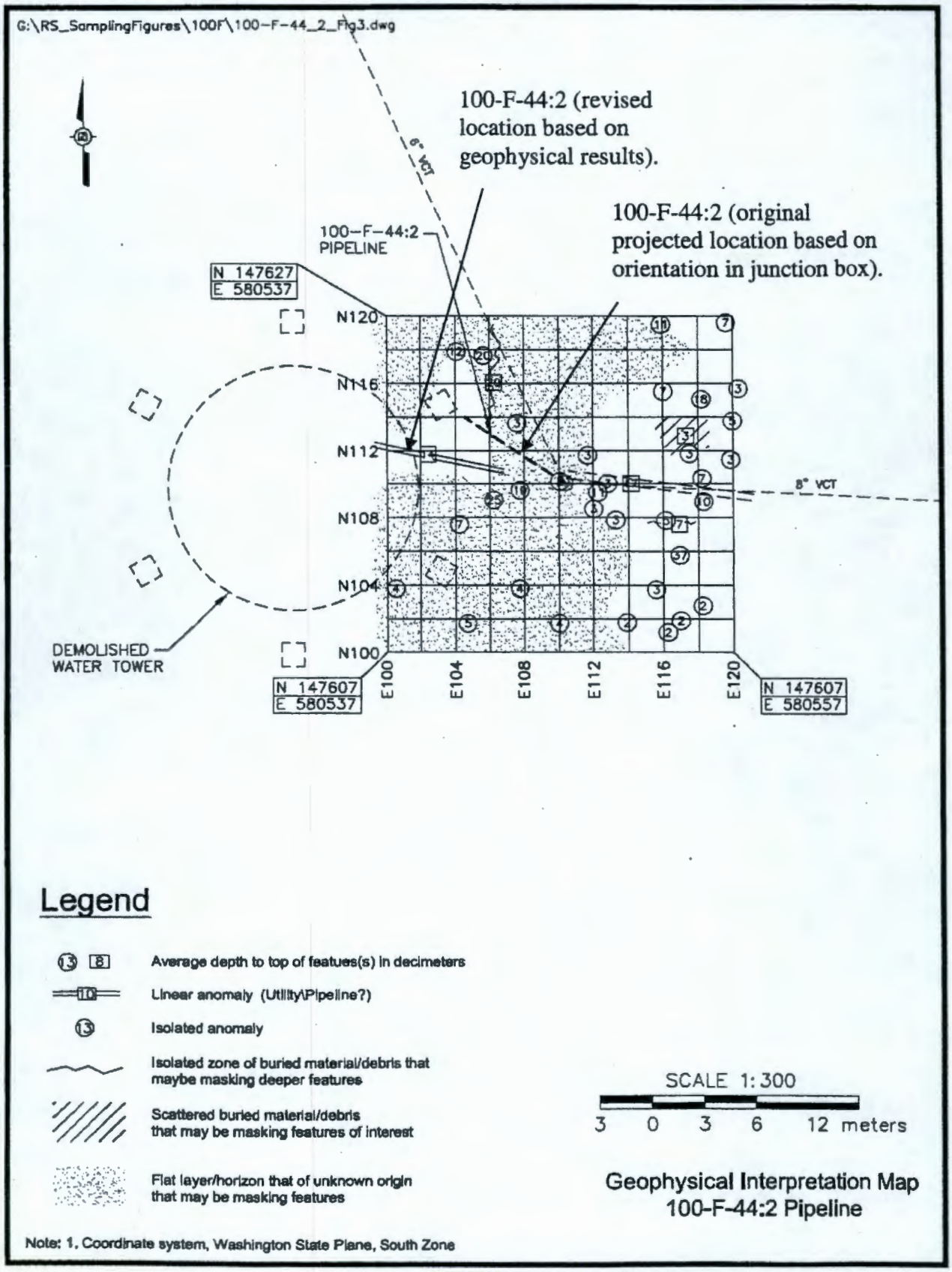


Figure 3. Geophysical Survey of the 100-F-44:2 Pipeline.



The 187-F1 elevated water tower was designed to discharge clean water to waste under certain conditions. The waste tower had a bleed line, drain line, and overflow line. In addition, the valve pit for the water tower had a sump with a gravity drain. The lines are described in various historical records and water tower engineering drawings but are apparently omitted from the facility sewer main drawings (i.e., GE 1954).

The overflow line was a standard feature of this water tower design and was intended to control mechanical stresses on the tower structure from high water levels. The engineering drawings are not clear as to where the overflow discharged to. Modern designs often discharge to ground.

The bleed line was installed to attain maximum cooling effectiveness of water delivered to the reactor (GE 1962). Makeup water was added to the water tower, while an equal volume was bled back to the storage basin for reuse. The bleed line was subsequently moved during water system improvements in the mid-to late 1950s (GE 1955). The drain line was also installed at this time. It was intended to drain the water level in the water tower to below the 2.5 cm (1-ft) extension of its stand pipe and remove any particulate buildup. The original water tower design had steam condensate being drained from its sump by gravity through a small drain line. The destination of that drain line is not known.

CONFIRMATORY SAMPLING ACTIVITIES

Confirmatory sampling was performed in accordance with the *Work Instruction for 100-F-44:2 Discovery Pipeline Near 108-F Building* (WCH 2007) and the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2005a) on January 16, 2008, to locate the 0.05 m (2-in.) steel pipeline and to collect data for determining whether the RAGs had been met. RAGs are the specific numeric goals against which the cleanup verification data are evaluated to demonstrate attainment of the remedial action objectives for the site. The following subsections provide additional discussion of the information used to develop the confirmatory sampling design. The results of confirmatory sampling are also summarized to the reclassification of the site to no action.

Nonintrusive Investigation Results

As indicated in the previous section, a geophysical investigation of the area was conducted in January 2007. The geophysical results suggested that the pipeline's path was to the water tower. Subsequent attempts to further define the extent of the pipeline were unsuccessful due to interference from buried debris in the area of the former 187-F1 elevated water tower.

Contaminants of Potential Concern

The COPCs for the 100-F-44:2 subsite comprised the COPC list for the 100-F-26:4 verification sampling. The rationale was that the 100-F-44:2 pipeline was previously connected to the 100-F-26:4 pipeline. Cesium-137, lead, mercury, hexavalent chromium, polychlorinated biphenyls, and total petroleum hydrocarbons were considered COPCs for 100-F-44:2 confirmatory sampling. Although not COPCs, the expanded list of inductively coupled plasma

metals and pesticides were analyzed by the laboratory. In addition, the laboratory reported other analytes included in the gamma energy analysis beyond cesium-137. The results of all the analytes are reported herein regardless of whether they are COPCs.

Contingencies were provided for adding to the COPC list if anomalies were discovered during confirmatory sampling. No suspected asbestos-containing material, petroleum-stained soil, or evidence of burning was observed during field activities. Radiological activity was not detected above background levels by field instrumentation, so gross alpha and gross beta analysis was not requested. Field screening for volatile organic compounds (VOCs) was performed and none were detected during sampling; therefore, laboratory analysis for VOCs was not requested.

Confirmatory Sample Design

Historical data, process knowledge, site visit observations, and other available information were used to develop the site-specific sample design. The 100-F-44:2 pipeline is presumed to be associated with the water tower. Historical documents and engineering drawings show that all the pipelines that ran to or from the water tower contained only raw water. The only chemical added to the water received by the water tower was sodium silicate for corrosion control purposes. Sodium silicate is considered a benign chemical additive and is not a contaminant of concern.

The sample design was based on sampling from locations most likely to contain contaminants or where leaks may have occurred. The portion of the 100-F-44:2 pipeline that connected to the 100-F-26:4 pipeline at the junction box, where contamination was judged most likely to occur, was removed during 100-F-26:4 remediation. The results from confirmatory sampling of sediment within the junction box indicated that all of the COPCs (same as those listed above for 100-F-44:2) were below the RAGs. Remediation of the 100-F-26:4 pipeline was performed due to COPC exceedances of the RAGs at other locations.

Given that the junction box was previously remediated, the design called for digging a test pit to expose the pipeline near the 100-F-26:4 boundary. The confirmatory work instruction required that samples of the pipeline sediment/scale and the underlying soil be collected, if possible.

Confirmatory Sampling

Confirmatory sampling at the 100-F-44:2 subsite was performed on January 16, 2008 (Figures 4 through 6; additional photographs are provided in Appendix A). A test pit was excavated to a depth of approximately 2 m (7 ft) where the pipeline was located (Washington State Plane Coordinates N 147619, E 580539) (WCH 2008). The pipe was located and uncovered eastward toward the 100-F-26:4 excavation boundary. The pipe was cut open at coordinates N 14618, E 580542. There was no sediment or scale inside the pipe. Therefore an interior pipe sample could not be taken. Confirmatory samples were collected from beneath the pipe at depth of 2 m (7 ft) below the ground surface (Table 1).

Figure 4. 100-F-44:2 Pipeline Subsite – Test Pit Being Excavated (View is to the Northeast).

Figure 5. Location Where Pipe Was Cut and Underlying Soil Sample Was Collected.

Figure 6. Close-Up View Showing Empty Pipe.

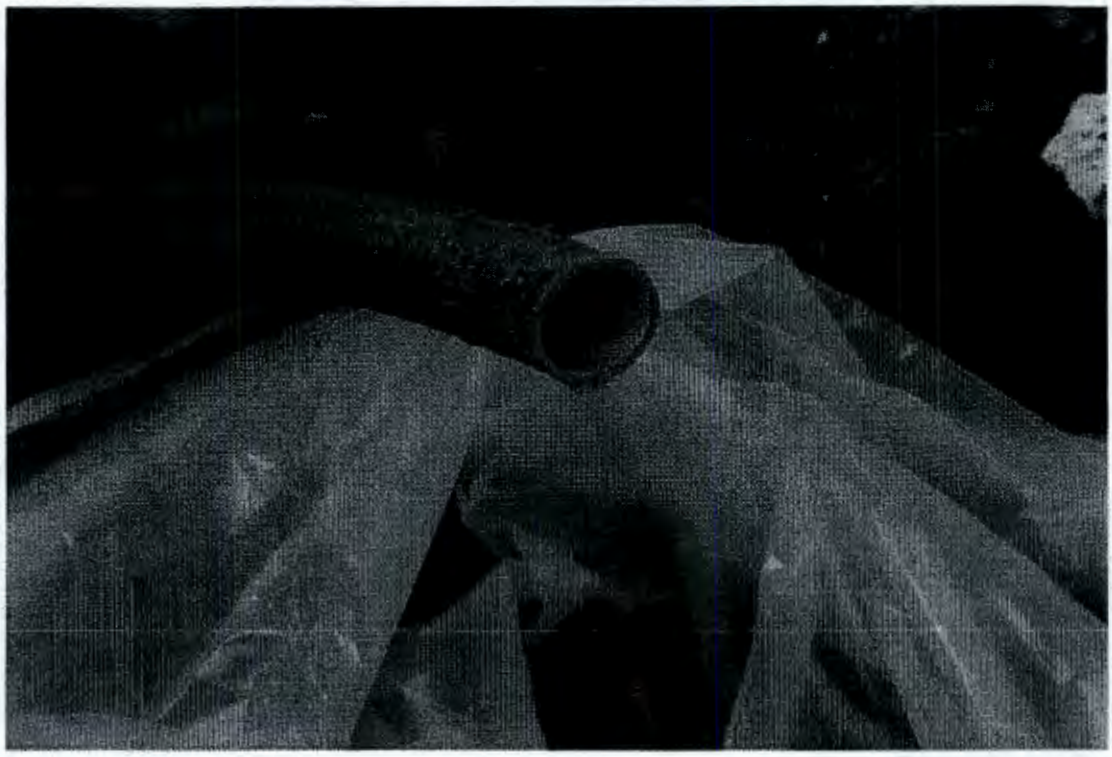


Table 1. Sample Summary for the 100-F-44:2 Pipeline Subsite.

Test Pit	Sample Location	Sample Media	Sample Number	Coordinate Locations[a]	Depth (bgs)	Sample Analysis
1	Soil beneath pipe	Soil	J16358	N 147618 E 580542	2 m (7 ft)	GEA, ICP metals, mercury, hexavalent chromium, PCB, and pesticides
Equipment blank	NA	Silica sand	J16375	NA	NA	ICP metals and mercury
Duplicate	Soil beneath pipe	Soil	J16359	N 147618 E 580542	2 m (7 ft)	GEA, ICP metals, mercury, hexavalent chromium, PCB, and pesticides

[a] Washington State Plane (meters).

bgs = below ground surface
GEA = gamma energy analysis
ICP = inductively coupled plasma
NA = not applicable
PCB = polychlorinated biphenyl

Confirmatory Sample Results

Confirmatory samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. The laboratory-reported data results for all constituents are stored in the Environmental Restoration project-specific database prior to submission for archival in the Hanford Environmental Information System site-wide database and are summarized in Appendix B.

Comparisons of the maximum results for analytes with the shallow zone RAGs for the confirmatory samples using both the primary and duplicate results are summarized in Table 3. 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 contaminants of concern. Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were detected in samples collected at the site, but are not considered within statistical calculations or Table 3, as these isotopes are not related 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]).

Table 3. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-F-44:2 Confirmatory Sampling Event. (2 Pages)

COPC	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the 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	51.8 (<BG)	5,600	132[b]	224	No	--
Beryllium	0.14 (<BG)	10.4[c]	1.51[b]	1.51[b]	No	--
Boron[d]	1.8	16,000	320	--[e]	No	--
Cadmium	0.07 (<BG)	13.9[c]	0.81[b]	0.81[b]	No	--
Chromium (total)	9.2 (<BG)	80,000	18.5[b]	18.5[b]	No	--
Cobalt	4.8 (<BG)	1,600	32	--[e]	No	--
Copper	14.8 (<BG)	2,960	59.2	22.0[b]	No	--
Hexavalent chromium[d]	0.28	2.1	4.8	2	No	--
Lead	3.2 (<BG)	353	10.2[b]	10.2[b]	No	--
Manganese	235 (<BG)	11,200	512[b]	512[b]	No	--

Table 3. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-F-44:2 Confirmatory Sampling Event. (2 Pages)

COPC	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Mercury	0.02 (<BG)	24	0.33[b]	0.33[b]	No	--
Nickel	10.6 (<BG)	1,600	19.1[b]	27.4	No	--
Vanadium	31.6 (<BG)	560	85.1[b]	--[e]	No	--
Zinc	90.7	24,000	480	67.8[b]	Yes	Yes[f]

[a] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (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] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).

[c] 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).

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

[e] 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]).

[f] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), residual concentrations are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the soil-partitioning distribution coefficient for zinc of 30 mL/g). The vadose zone underlying the waste site is more than 5 m (16 ft) thick. Therefore, the residual concentration of zinc is predicted to be protective of groundwater and the Columbia River.

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

DATA EVALUATION

Evaluation of the results listed in Table 3 indicates that all detected COPCs were quantified below RAGs for direct exposure, the protection of groundwater, and the protection of the Columbia River, except for zinc. Zinc (90.7 mg/kg) exceeded the soil RAG for river protection (67.8 mg/kg). Data was not collected on the vertical extent of contamination for this area, but given the soil-partitioning coefficient for zinc (30 mL/g), this contaminant would not be expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying the waste site is more than 5 m (16 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of the Columbia River.

Assessment of the risk requirements for the 100-F-44:2 subsite is determined by calculation of the hazard quotient and excess carcinogenic 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 excess carcinogenic risk of less than 1×10^{-5}. These risk values were conservatively calculated for the entire waste site using the maximum values as presented in Table 3. 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 calculations indicated that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-F-44:2 subsite is 5.1×10^{-3}. All individual cumulative carcinogenic risk values are less than 1×10^{-6}. The cumulative carcinogenic risk value is 1.3×10^{-7}. Therefore, nonradionuclide risk requirements are met.

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-44:2 subsite 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 INTERIM CLOSURE

Confirmatory sampling of the 100-F-44:2 subsite was completed in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2005b). Confirmatory sampling has shown that the site meets the cleanup objectives for direct exposure, groundwater protection, and river protection. Accordingly, a No Action reclassification is supported for the 100-F-44:2 subsite. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls.

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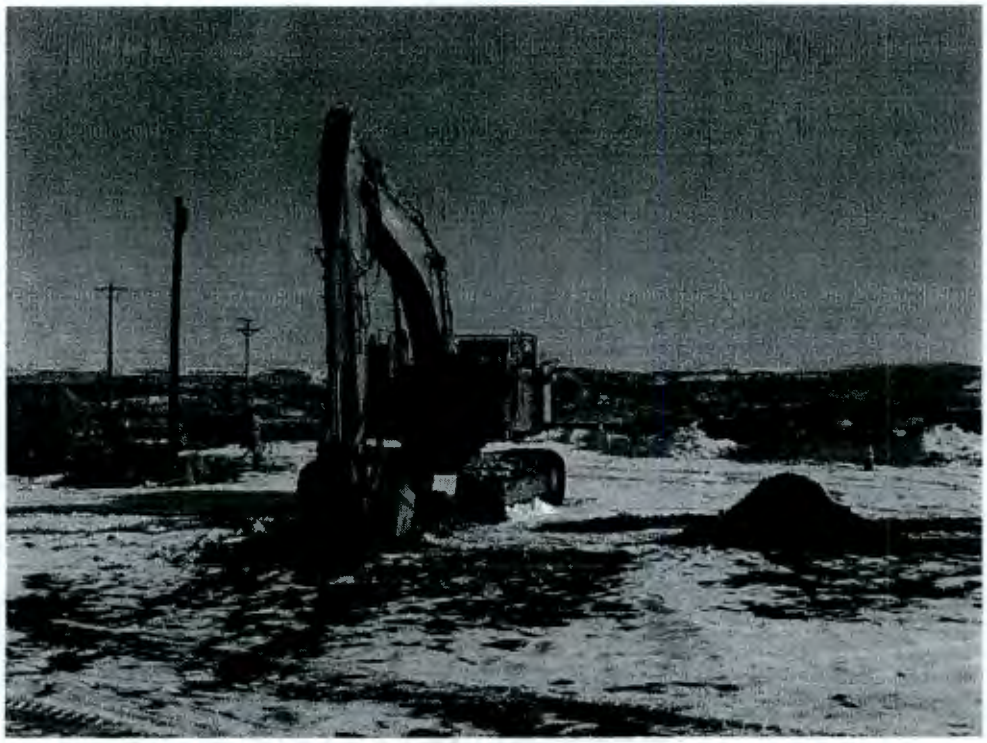
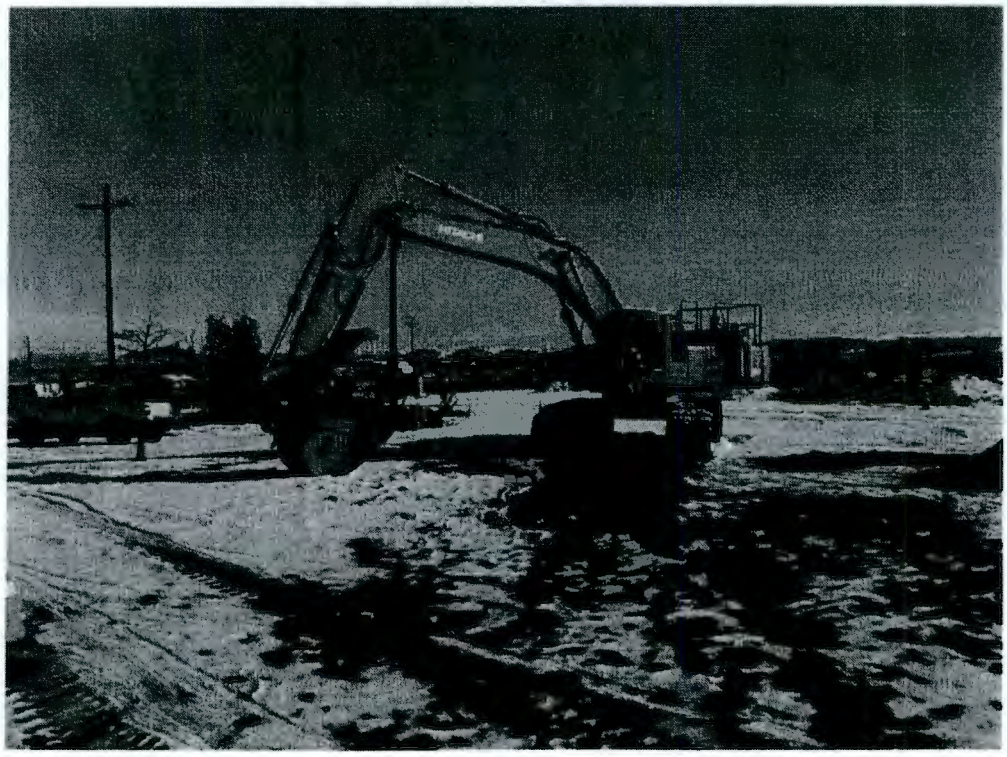
APPENDIX A

CONFIRMATORY ACTIVITY PHOTOGRAPHS

Test Pit Being Dug at 100-F-44:2 Looking Northeast Near the Former 108-F Building (January 16, 2008).



Test Pit Being Dug at 100-F-44:2 Looking Northeast Near the Former 108-F Building (January 16, 2008).



Steel Pipeline (0.05 m [2-in.]) Uncovered in Test Pit (January 16, 2008).

Close-Up View of 0.05 m (2-in.) Steel Pipeline (January 16, 2008).

APPENDIX B

100-F-44:2 PIPELINE SUBSITE CONFIRMATORY DATA SUMMARY TABLES

Table B-1. 100-F-44:2 Radionuclide Results.

Sample Location	HEIS Number	Sample Date	Americium-241 (GEA)			Cesium-137			Cobalt-60			Europium-152		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil	J16358	1/16/08	0.090	U	0.090	0.017	U	0.017	0.019	U	0.019	0.055	U	0.055
Duplicate of Soil	J16359	1/16/08	0.274	U	0.274	0.029	U	0.029	0.036	U	0.036	0.084	U	0.084

Sample Location	HEIS Number	Sample Date	Europium-154			Europium-155			Potassium-40			Radium-226		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil	J16358	1/16/08	0.055	U	0.055	0.068	U	0.068	14.0		0.163	0.368		0.034
Duplicate of Soil	J16359	1/16/08	0.127	U	0.127	0.104	U	0.104	14.1		0.345	0.468		0.071

Sample Location	HEIS Number	Sample Date	Radium-228			Thorium-228			Thorium-232			Uranium-235		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil	J16358	1/16/08	0.680		0.074	0.568		0.030	0.680		0.074	0.100	U	0.100
Duplicate of Soil	J16359	1/16/08	0.638		0.166	0.730		0.063	0.638		0.166	0.154	U	0.154

Sample Location	HEIS Number	Sample Date	Uranium-238		
			pCi/g	Q	MDA
Soil	J16358	1/16/08	2.34	U	2.34
Duplicate of Soil	J16359	1/16/08	4.39	U	4.39

Note: Data qualified with B, C, D and/or J, are considered acceptable values.
C = blank contamination
D = secondary dilution factor applied
J = estimated result less than PQL.
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
U = undetected

Table B-2. 100-F-44:2 Inorganic Results (2 pages).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J16358	1/16/08	5190		3.5	0.27	U	0.29	2.1		0.44	51.8		0.09
Duplicate of Soil	J16359	1/16/08	4170		3.8	0.29	U	0.27	2.2		0.48	32.9		0.10
Equipment Blank	J16375	1/16/08	35.4		3.8	0.29	U	0.29	0.56		0.48	1.1		0.10

Sample Location	HEIS Number	Sample Date	Beryllium			Boron			Cadmium			Calcium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J16358	1/16/08	0.14		0.04	1.8		0.44	0.05		0.04	3590	C	3.5
Duplicate of Soil	J16359	1/16/08	0.13		0.05	1.4		0.48	0.07		0.05	2990	C	3.8
Equipment Blank	J16375	1/16/08	0.05	U	0.05	0.48	U	0.48	0.05	U	0.05	25.8	CUJ	3.8

Sample Location	HEIS Number	Sample Date	Chromium			Hex. Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J16358	1/16/08	9.2		0.18	0.20	U	0.20	4.8		0.18	14.8	C	0.18
Duplicate of Soil	J16359	1/16/08	7.0		0.19	0.28		0.20	4.1		0.19	14.4	C	0.19
Equipment Blank	J16375	1/16/08	0.19	U	0.19				0.19	U	0.19	0.39	CUJ	0.19

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J16358	1/16/08	13000		4.0	3.2	C	0.27	3630		2.2	235		0.04
Duplicate of Soil	J16359	1/16/08	9920		4.3	3.1	C	0.29	2940		2.4	188		0.04
Equipment Blank	J16375	1/16/08	82.2		4.3	0.29	U	0.29	8.6		2.4	2.6		0.04

Table B-2. 100-F-44:2 Inorganic Results (2 pages).

Sample Location	HEIS Number	Sample Date	Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J16358	1/16/08	0.02		0.009	0.27	U	0.27	10.6		0.18	614		3.5
Duplicate of Soil	J16359	1/16/08	0.009	U	0.009	0.29	U	0.29	9.3		0.19	520		3.8
Equipment Blank	J16375	1/16/08	0.009	U	0.009	0.29	U	0.29	0.19	U	0.19	19.1		3.8

Sample Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J16358	1/16/08	0.53	U	0.53	2050		3.5	0.09	U	0.09	141	C	1.8
Duplicate of Soil	J16359	1/16/08	0.57	U	0.57	2900		3.8	0.1	U	0.1	149	C	1.9
Equipment Blank	J16375	1/16/08	0.58	U	0.58	53.8		3.8	0.1	U	0.1	16.7	CUJ	1.9

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
Soil	J16358	1/16/08	31.6		0.12	90.7	C	0.53
Duplicate of Soil	J16359	1/16/08	22.0		0.13	81.6	C	0.57
Equipment Blank	J16375	1/16/08	0.13	U	0.13	2.0	CUJ	0.58

Table B-3. 100-F-44:2 Organic Results.

Constituents	J16358 Soil Sample Date 1/16/08			J16359 Duplicate of Soil Sample Date 1/16/08		
	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls						
Aroclor-1016	13	U	13	13	U	13
Aroclor-1221	13	U	13	13	U	13
Aroclor-1232	13	U	13	13	U	13
Aroclor-1242	13	U	13	13	U	13
Aroclor-1248	13	U	13	13	U	13
Aroclor-1254	13	U	13	13	U	13
Aroclor-1260	13	U	13	13	U	13
Pesticides						
Aldrin	1.3	UD	1.3	1.3	UD	1.3
Alpha-BHC	1.3	UD	1.3	1.3	UD	1.3
alpha-Chlordane	1.3	UD	1.3	1.3	UD	1.3
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.3	UD	1.3	1.3	UD	1.3
Delta-BHC	1.3	UDJ	1.3	1.3	UDJ	1.3
Dichlorodiphenyldichloroethane	1.3	UD	1.3	1.3	UD	1.3
Dichlorodiphenyldichloroethylene	1.3	UD	1.3	1.3	UD	1.3
Dichlorodiphenyltrichloroethane	1.3	UD	1.3	1.3	UD	1.3
Dieldrin	1.3	UD	1.3	1.3	UD	1.3
Endosulfan I	1.3	UD	1.3	1.3	UD	1.3
Endosulfan II	1.3	UD	1.3	1.3	UD	1.3
Endosulfan sulfate	1.3	UD	1.3	1.3	UD	1.3
Endrin	1.3	UD	1.3	1.3	UD	1.3
Endrin aldehyde	1.3	UD	1.3	1.3	UD	1.3
Endrin ketone	1.3	UDJ	1.3	1.3	UDJ	1.3
Gamma-BHC (Lindane)	1.3	UD	1.3	1.3	UD	1.3
gamma-Chlordane	1.3	UD	1.3	1.3	UD	1.3
Heptachlor	1.3	UD	1.3	1.3	UD	1.3
Heptachlor epoxide	1.3	UD	1.3	1.3	UD	1.3
Methoxychlor	1.3	UD	1.3	1.3	UD	1.3
Toxaphene	13	UDJ	13	13	UDJ	13
Bulk Parameters						
	mg/kg	Q	PQL	mg/kg	Q	PQL
Total petroleum hydrocarbons	134	UJ	134	134	UJ	134

APPENDIX C

CALCULATIONS

APPENDIX D

CALCULATION BRIEFS

The following calculation briefs have been prepared in accordance with ENG-1, *Engineering Services*, ENG-1-4.5, "Project Calculations," Washington Closure Hanford, Richland, Washington.

100-F-44:2 Pipeline Hazard Quotient and Carcinogenic Risk Calculations, Calculation No. 0100F-CA-V0349, Rev. 0.

DISCLAIMER FOR CALCULATIONS

The calculation that is 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 Field Remediation **Job No. 14655**

Area: 100-F

Discipline: Environmental *Calculation No: 0100F-CA-V0349

Subject: 100-F-44:2 Pipeline Hazard Quotient and Carcinogenic Risk 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	Total = 4	L. D. Habel	H. M. Sulloway	N/A	J. M. Capron	
						3/19/08

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	L. D. Habel	Date:	3/17/08	Calc. No.:	0100F-CA-V0349	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	3/17/08
Subject:	100-F-44:2 Pipeline Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 3	

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and carcinogenic (excess cancer) risk values for the 100-F-44:2 waste site confirmatory sampling. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2005), 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.

GIVEN/REFERENCES:

1) DOE-RL, 2005, *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.

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

3) WCH, 2008, *Remaining Sites Verification Package for 100-F-44:2, Discovery Pipeline Near 108-F Building*, Attachment to Waste Site Reclassification Form 2007-006, March 2008, Washington Closure Hanford, Richland, Washington.

SOLUTION:

1) Calculate an HQ for each noncarcinogenic constituent detected above background and compare it to the individual HQ of <1.0 (DOE-RL 2005).

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

3) Calculate an excess cancer risk value for each carcinogenic constituent detected above background and compare it to the individual excess cancer risk criterion of $<1 \times 10^{-6}$ (DOE-RL 2005).

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

Washington Closure Hanford CALCULATION SHEET

Originator:	L. D. Habel	Date:	3/17/08	Calc. No.:	0100F-CA-V0349	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	3/17/08
Subject:	100-F-44:2 Pipeline Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 3	

METHODOLOGY:

The HQ and carcinogenic risk calculations were conservatively calculated for the entire 100-F-44:2 waste site using the higher value of the primary and duplicate sample results for each analyte (WCH 2008). Of the nonradionuclide contaminants of potential concern (COPCs), zinc required the HQ and risk calculations because it was quantified above background. Additionally, boron required the HQ and risk calculations because it was detected and a Washington State or Hanford Site background value is not available. Hexavalent chromium was included because it was 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 result for boron (1.8 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 1.1×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculations are completed for the appropriate analytes, the cumulative HQ is obtained by summing the individual values. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation.) The sum of the HQ values is 5.1×10^{-3} Comparing this values 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 hexavalent chromium is 0.28 mg/kg; divided by 2.1 mg/kg, and multiplied as indicated, is 1.3×10^{-7}. Comparing this value 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 is obtained by summing the individual values. The sum of the excess cancer risk values is 1.3×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

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 $>1 \times 10^{-6}$: None
4) List the cumulative excess cancer risk for carcinogens $>1 \times 10^{-5}$: None.

Table 1 shows the results of the calculation.

Washington Closure Hanford CALCULATION SHEET

Originator:	L. D. Habel	Date:	3/17/08	Calc. No.:	0100F-CA-V0349	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	3/17/08
Subject:	100-F-44:2 Pipeline Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 3	

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-F-44:2 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	1.8	16,000	1.1E-04	--	--
Chromium, hexavalent[c]	0.28	240	1.2E-03	2.1	1.3E-07
Zinc	90.7	24,000	3.8E-03	--	--
Totals					
Cumulative Hazard Quotient:			**5.1E-03**		
Cumulative Excess Cancer Risk:					**1.3E-07**

Notes:
RAG = remedial action goal
-- = not applicable
[a] = Table 2 (WCH 2008).
[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.
[c] = Value for the carcinogen RAG calculated based on the inhalation exposure pathway (WAC) 173-340-750(3), 1996.

CONCLUSION:

This calculation demonstrates that the 100-F-44:2 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005).

APPENDIX D

DATA QUALITY ASSESSMENT

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 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. In addition, toxicity characteristics leaching procedure (TCLP) metals analysis was performed on the confirmatory samples collected at the 100-F-44:2 waste site. TCLP analytical results are requested for waste characterization purposes and do not support no action or remedial action decisions for waste sites. This DQA limited the data review for the 100-F-44:2 confirmatory sampling to the data required per the sample design. Confirmatory sample data collected at the 100-F-44:2 waste site were provided by the laboratory in sample delivery group (SDG) K1091. SDG K1091 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed below.

SDG K1091

This SDG comprises a field duplicate pair (J16358/J16359) sampled from the soils underlying the pipeline at the 100-F-44:2 waste site and sample J16375 (equipment blank). These samples were analyzed for inductively coupled plasma (ICP) metals and mercury. In addition, the field duplicate pair (J16358/J16359) was analyzed for hexavalent chromium, total petroleum hydrocarbons (TPH), pesticides, polychlorinated biphenyls (PCBs), and by gamma spectroscopy. SDG K1091 was submitted for formal third-party validation. No major deficiencies were identified in SDG K1091. Minor deficiencies found in SDG K1091 are as follows:

- All of the toxaphene data in SDG K1091 were qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS), matrix spike duplicate (MSD), or laboratory control sample (LCS) analysis for the analyte. Estimated or "J"-flagged data are acceptable for decision-making purposes. Also, all toxaphene results exceeded the required quantitation limit (RQL). Under the Washington Closure Hanford (WCH) statement of work, no qualification is required.

- For the pesticides analysis, the LCS recovery for endrin ketone was outside quality control (QC) limits at 82%. Third-party validation qualified the results as estimated, and assigned a "J" flag to the endrin ketone results in SDG K1091. Estimated data are useable for decision-making purposes.

- In the pesticide analysis, the MS and MSD recoveries for delta-BHC are out of acceptance criteria, at 49% and 46%, respectively. This analyte has been qualified by third-party validation as estimates with "J" flags for all samples in SDG K1091. Estimated, or "J"-flagged, data are useable for decision-making purposes.

- In the ICP metals analysis, the calcium, copper, sodium, and zinc results for sample J16375 (the equipment blank) are of similar magnitude as the method blank result, and are qualified by third-party validation as an undetected estimate with a "UJ" flag, due to method blank 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.

- For the TPH analysis, the holding time of 14 days was exceeded by less than twice the limit, and all TPH results were qualified as estimates and flagged "J" by third-party validation. Estimated data are useable for decision-making purposes.

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 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-44:2 sample primary and duplicate (J16358/J16359). 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. The results of the field duplicate RPD calculation were reported in the final validation package for SDG K1091 and are summarized below.

Radionuclides

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

Nonradionuclides

The RPDs calculated for barium and selenium were 44% and 36%, respectively. These RPDs exceeded the acceptance criteria of 30%. Elevated RPD such as these in the analysis of environmental soil samples are 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.

An overall visual inspection of all of the data is also performed. No additional major or minor deficiencies were 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-44:2 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-44:2 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 B.

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