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Washington Closure Hanford

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U.S. Department of Energy
Richland Operations Office
J. J. Short, Contracting Officer
Procurement Services Division
P.O. Box 550, MSIN A7-80
Richland, Washington 99352

Subject: Contract No. DE-AC06-05RL14655
TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR 100-H-40, 100-H DISPOSAL PIT, REVISION 0

Dear Mr. Short:

Attached are five copies of the approved Waste Site Reclassification Form No. 2009-065 and supporting *Remaining Sites Verification Package for the 100-H-40, 100-H Disposal Pit*, Rev. 0, for your use.

If you have questions regarding this document, please contact me or call Ms. M. L. Proctor at 372-9227, or send an email to mlproctor@wch-rcc.com.

Sincerely,

T. A. Foster, Director
Field Remediation Project

MLP:dgs

Attachments: (1) Waste Site Reclassification Form No. 2009-065
(2) Supporting *Remaining Sites Verification Package for the 100-H-40, 100-H Disposal Pit*, Rev. 0

cc: D. C. Bryson (RL) A3-04, w/o
J. C. Chance (RL) A3-04, w/a
S. A. Christman (FH) H8-51, w/a
J. R. Franco (RL) A3-04, w/o
M. S. French (RL) A3-04, w/o
J. D. Kautzky (RL) A3-04, w/a

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bcc:
M. N. Brosee H4-24, w/o
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R. A. Carlson N3-30, w/o
S. W. Clark H4-23, w/o
J. W. Darby L6-06, w/o
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Document Control H4-11, w/a

Concurrence

Date	5/24/10	5/25/10	5/25/10
Initials	MLP	JAL	SLF

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-40, 100-H DISPOSAL PIT

Attachment to Waste Site Reclassification Form 2009-065

May 2010

Date Submitted: 05/13/2010 Originator: M. L Proctor Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-HR-1 Waste Site Code: 100-H-40 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☐ No Action ☒ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2009-065

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 site of the 100-H-40, 100-H Disposal Pit is an area containing debris pits and surface debris located southeast of the 118-H-1 Burial Ground between an access road and railroad tracks. Confirmatory sampling and evaluation of this site have been performed in accordance with remedial action objectives (RAOs) and remedial action goals (RAGs) 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, (2) demonstrating through confirmatory sampling that cleanup goals have been achieved, and (3) proposing the site for reclassification to No Action. The 100-H-40 waste site was included in the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009) as a candidate site for confirmatory sampling. Confirmatory sampling was performed in accordance with the *Work Instruction for Confirmatory Sampling of the 100-H-40, 100-H Disposal Pit* (WCH 2009c).

Basis for reclassification:

In accordance with this evaluation, the confirmatory sampling results support a reclassification of this site to No Action. The 100-H-40, 100-H Disposal Pit achieves the RAOs and the corresponding RAGs 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 show 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. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-H-40, 100-H Disposal Pit* (attached).

Regulator Comments:

Approval of this WSRF documents regulator agreement that the 100-H-40 waste site qualifies for "No Action" under the Interim Action ROD. In addition, Ecology has evaluated the data for this site against WAC 173-340 (2007) clean-up levels for direct contact, groundwater protection, and river protection. This evaluation is documented in the letter transmitting Ecology's approval of this sites's interim reclassification to "No Action."

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.

M. French DOE Federal Project Director (printed)	for MSF Signature	5/14/10 Date
N. Menard Ecology Project Manager (printed)	Signature	5/20/10 Date
N/A EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-40, 100-H DISPOSAL PIT

EXECUTIVE SUMMARY

The 100-H-40, 100-H Disposal Pit waste site is an area containing debris pits and surface debris that was reported to have been used for the disposal of maintenance shop waste between 1949 and 1950. The 100-H-40 site is located in the 100-HR-1 Operable Unit of the Hanford Site, southeast of the 118-H-1 Burial Ground between an access road and railroad tracks. The site is triangular in shape with each of the three sides measuring approximately 200 m (660 ft) in length. The center point of the triangular area has Washington State Plane coordinates of N 151890, E 577650.

The site was identified from information provided during an interview with a former employee that was conducted in 1990. The employee worked in the 100-H Area between 1949 and 1950 during the last 6 months of construction and the first year of 105-H Reactor operation following startup. He observed the disposal of wastes from the 1700-H Buildings (1709-H, 1716-H, 1717-H, and 1720-H) in a pit or cluster of pits west of a central access road. The employee stated during the interview that the wastes were covered with dirt after disposal.

Confirmatory sampling was performed from October 27 to 29, 2009. Eight test pit locations were identified from anomalous readings indicating potential disposal pit locations, which were reported in the *Geophysical Site Investigation Summary, 100-H-40 Disposal Pit* (WCH 2009a). The confirmatory sampling included collection of focused samples of anomalous debris/media and subsurface soil encountered in the test pits.

The analytical results indicated no residual concentrations exceeding cleanup criteria, except for copper, lead, zinc, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene, that exceeded the soil remedial action goals (RAGs) for the protection of groundwater and/or the Columbia River. However, based on Residual Radioactivity (RESRAD) modeling discussed in Appendix C of the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP)(DOE-RL 2009b) these constituents are not predicted to migrate to groundwater or to the Columbia River within 1,000 years, and their residual concentrations are, therefore, protective of groundwater and the Columbia River. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1.

Table ES-1. Summary of Remedial Action Goals for the 100-H-40 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.	There were no radionuclide COPCs for this site.	NA
Direct exposure nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes

Table ES-1. Summary of Remedial Action Goals for the 100-H-40 Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
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 (1.5×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for each individual carcinogenic contaminant detected above background levels, is less than 1×10^{-6}.	
	Attain a total excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk value (3.8×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/river protection – radionuclides	Attain single COPC groundwater and river protection RAGs.	There were no radionuclide COPCs for this site.	NA
	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.	Copper, lead, zinc, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are present at concentrations above soil RAGs for groundwater and/or river protection. However, vertical migration modeling predicts that these constituents will not reach groundwater (and, therefore, the Columbia River) within 1,000 years.[d] Therefore, the residual concentrations achieve the remedial action objectives for groundwater and 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 Area, 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 RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), copper, lead, zinc, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are not predicted to migrate through the 10 m (33 ft) thick vadose zone to the groundwater in 1,000 years (based on the copper soil-partitioning distribution coefficient of 22 mL/g, the lead and zinc copper soil-partitioning distribution coefficient of 30 mL/g, the benzo(a)anthracene soil-partitioning distribution coefficient of 360 mL/g, the benzo(a)pyrene soil-partitioning distribution coefficient of 5,500 mL/g, and the benzo[b]fluoranthene soil-partitioning distribution coefficient of 803 mL/g).

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
NA = not applicable
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose model)

The results of confirmatory sampling are used to make reclassification decisions for the 100-H-40 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 RAGs established in the (RDR/RAWP) (DOE-RL 2009b) 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.

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 site contaminants of potential concern and other constituents. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2009) under *Washington Administrative Code* 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 these tables. *Washington Administrative Code* 173-340 (1996) ecological screening levels were exceeded for arsenic, boron, and vanadium. The U. S. Environmental Protection Agency ecological soil screening levels were exceeded for antimony, cadmium, lead, manganese, vanadium, and zinc. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. Concentrations of antimony, cadmium, manganese, and vanadium values are below Hanford site background levels. No established background value is available for boron. A final cleanup level for boron, including consideration of background, will be established through the Integrated 100 Area Remedial Investigation/Feasibility Study. The table showing contaminant concentrations from the 100-H-40 waste site that exceeds ecological screening levels is provided in Appendix A.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-40, 100-H DISPOSAL PIT

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-H-40, 100-H Disposal Pit 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 2009b) 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.

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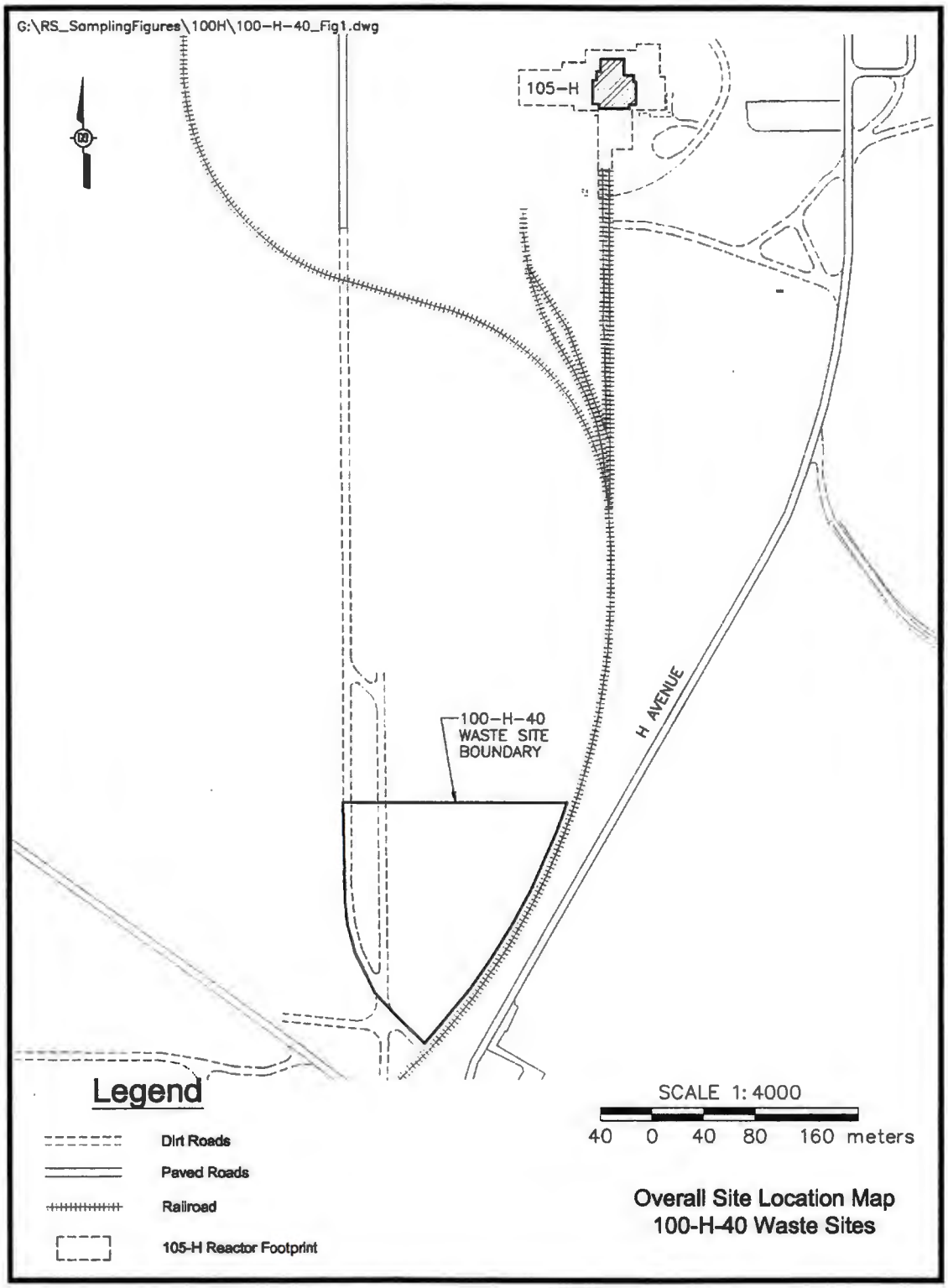
GENERAL SITE INFORMATION AND BACKGROUND

The 100-H-40 waste site is an area containing debris pits and surface debris that was reported to have been used for the disposal of maintenance shop waste between 1949 and 1950. The 100-H-40 site is located in the 100-HR-1 Operable Unit of the Hanford Site, south of the 105-H Reactor between an access road and railroad tracks (Figure 1). The site is triangular in shape with each of the three sides measuring approximately 200 m (660 ft) in length. The center point of the triangular area has Washington State Plane coordinates of N 151890, E 577650.

Figure 1. Location of the 100-H-40, 100-H Disposal Pit Waste Site.



The site was identified from information provided during an interview with a former employee that was conducted in 1990 (WHC 1994). The employee worked in the 100-H Area between 1949 and 1950 during the last 6 months of construction and the first year of the 105-H Reactor operation following startup. He observed the disposal of wastes from the 1700-H Buildings (1709-H, 1716-H, 1717-H, and 1720-H) in a pit or cluster of pits west of a central access road and recalled seeing paint cans and auto repair wastes. The employee stated during the interview that the wastes were covered with dirt after disposal.

A historical photograph dated August 26, 1949 (Figure 2), shows a surface feature in the area described by the interviewee that resembles a pit or cluster of pits. The feature is absent from both a previous photograph taken on April 6, 1949 (Figure 3), and a subsequent photograph taken on October 20, 1949 (Figure 4). Four bare spots with metal debris, approximately 1 m (3 ft) in diameter, were observed during a site visit on May 7, 2008. No location coordinates were provided for the observed bare spots in the logbook (WCH 2008).

Figure 2. Surface Feature Resembling a Pit at the 100-H-40 Location (August 26, 1949).

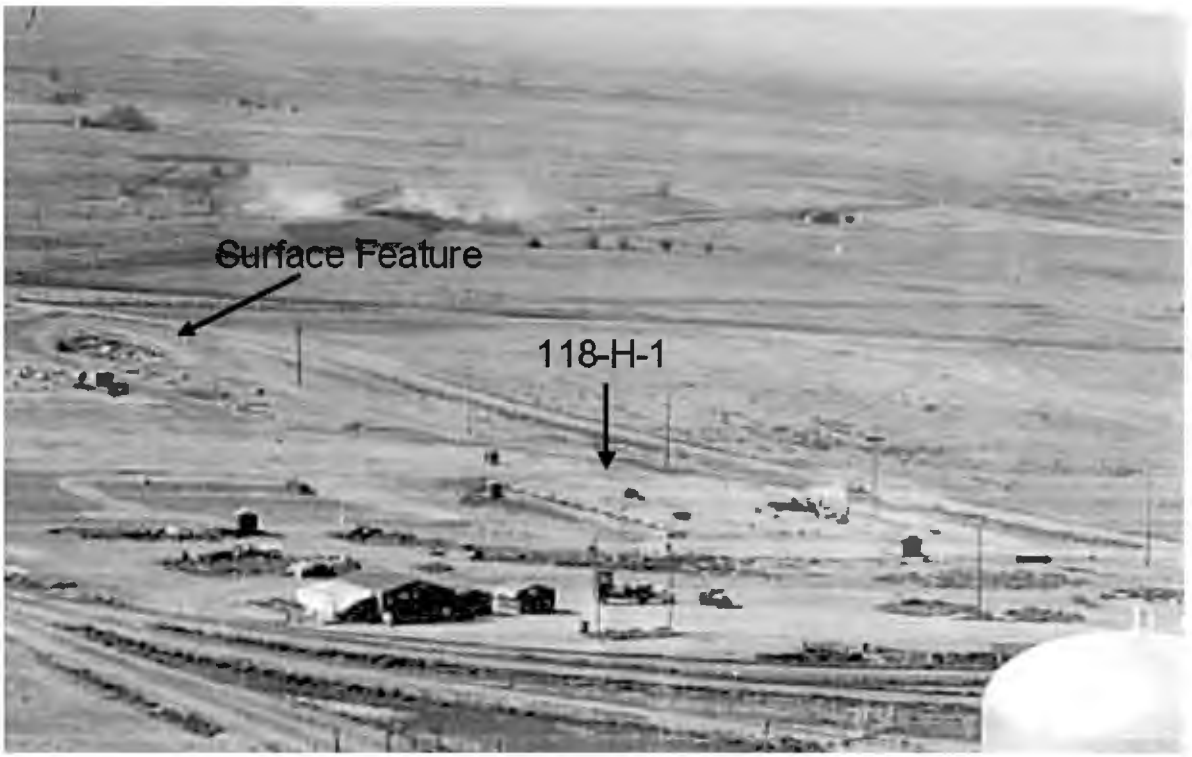


Figure 3. 100-H-40 (April 6, 1949) Prior to Surface Feature Observed in Figure 2.

Figure 4. 100-H-40 Location (October 20, 1949) Without Surface Feature.

CONFIRMATORY SAMPLING

The 100-H-40 waste site was evaluated to determine a No Action or Remedial Action decision in accordance with the RDR/RAWP (DOE-RL 2009b), the Remaining Sites ROD (EPA 1999), and the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2009a). 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-H-40 waste site were identified based on the assumption that the site contains maintenance shop waste, including paint cans and auto repair waste. These COPCs include the expanded list of inductively coupled plasma metals, mercury, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons. Radiological surveys were performed during sampling activities by a radiological control technician using instruments capable of detecting alpha, beta, and gamma radiation to identify potential radiologically contaminated materials, and no radiation was detected above background levels; therefore, radionuclides were not added to the list of COPCs for the 100-H-40 waste site.

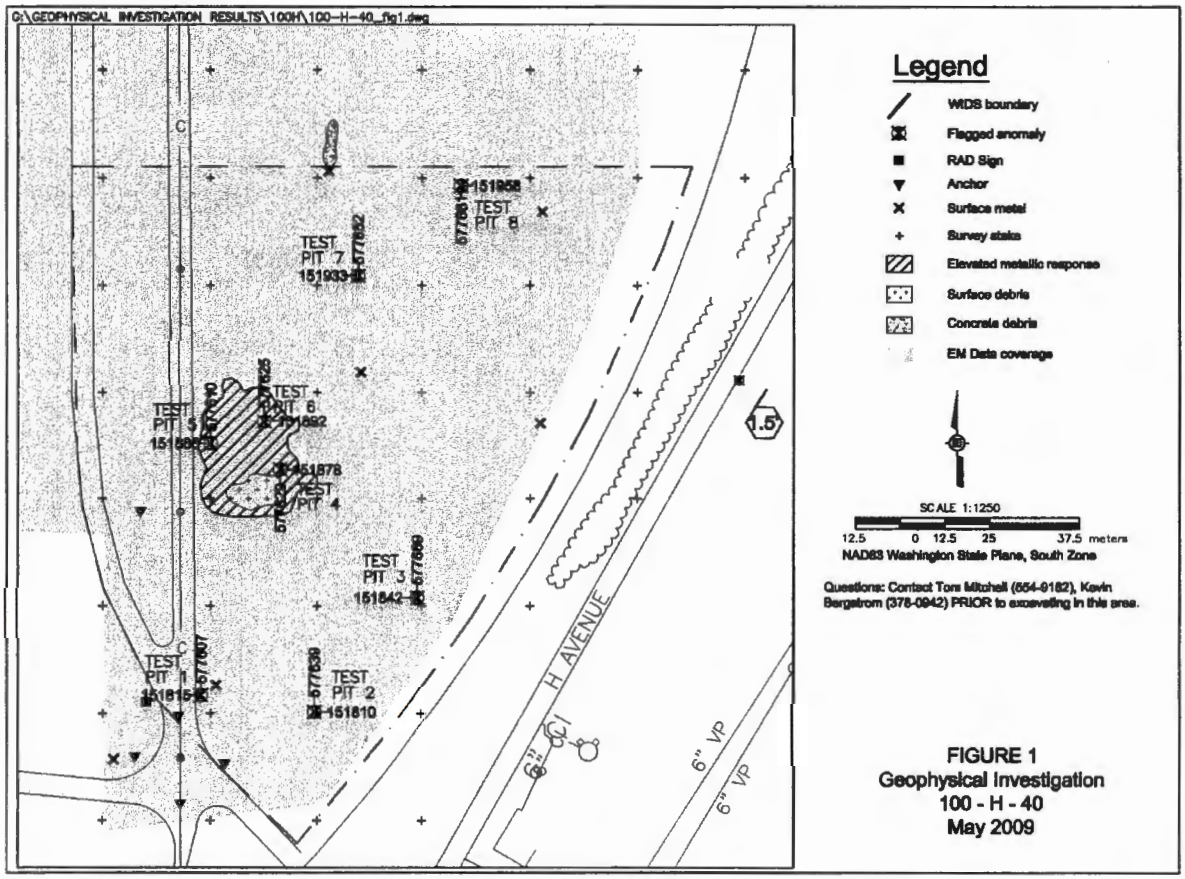
Confirmatory Sample Design

Historical information provided by an interview with a former employee, historical photographs, and geophysical survey results were used to develop a site-specific sample design for the 100-H-40 site. The geophysical survey (WCH 2009a) revealed several areas of surface debris and subsurface anomalies. A 20 m by 30 m disturbed area centered at Washington State Plane coordinates N 151880, E 577620 displayed an elevated metallic response typical of a disposal pit containing metallic debris. The coordinates of the three subsurface electromagnetic point anomalies within this disturbed area were selected as test pit locations. The remainder of the 20 m by 30 m disturbed area showed an elevated metallic response due to surface debris, but not subsurface anomalies. Five electromagnetic point anomalies that did not correlate to metallic surface debris and were consistent with an individual target (i.e., not a disposal pit) were also mapped within the survey area. The locations of subsurface geophysical anomalies identified by the survey are shown in Figure 5 as "flagged anomalies". This sample design included focused sampling of anomalous debris/media and subsurface soil at the suspected disposal pit location(s).

Confirmatory Sampling Activities

Confirmatory sampling activities at the 100-H-40 site were performed from October 27 to 29, 2009, in accordance with the *Work Instruction for Confirmatory Sampling of the 100-H-40, 100-H Disposal Pit* (WCH 2009c). The eight locations with indications of geophysical anomalies were excavated to investigate for potential buried maintenance shop debris. Excavations at the locations shown in Figure 5 unearthed small pieces of metallic surface debris and transite siding, then native soil, or small volumes of debris at shallow depths, with the exception of test pit 7.

Figure 5. Coordinates of the 100-H-40 Test Pit Locations.



At test pit 7, materials observed within the excavation were consistent with the burial of a demolished building. Debris included concrete sections ranging in size from 3 to 4 m (10 to 12 ft), wood, nails, and wire. Vitrified clay pipe, transite siding, and roofing materials were also identified within the excavation. The pit extended to a depth of approximately 2.7 m (9 ft), at which point no further material was observed. A sample of the soil in contact with the debris was collected (J19C63). The excavation continued to a depth of approximately 3 m (10 ft) to access native soil below the debris to collect sample J19C64. Table 1 provides a summary of the media identified within test pit 7 and the remaining 100-H-40 confirmatory sampling test pits. Table 2 provides the summary of the confirmatory samples collected at the 100-H-40 site. Figures 6 through 9 are photographs of examples of the media found within the test pits.

It was noted upon completion of the confirmatory sampling activities at each test pit location that the direction to collect a field duplicate sample (WCH 2009c) had not been accomplished; therefore, the excavation equipment was remobilized to the test pit 1 location, and primary and duplicate samples (J19C70/J19C71) were collected. The sample results from the original sample (J19C69) as well and the primary and duplicate samples were evaluated against cleanup criteria.

Table 1. 100-H-40 Test Pit Shallow Debris Summary.

Test Pit	Media	Depth (m bgs)
1	8 x 46 cm (3 x 18 in.) steel strap	0 - 0.15
2	Sheet metal, transite siding pieces	Surface
3	Heavy metal drum ring	0 - 0.15
4	Piece of pipe, sheet metal	Surface
5	30 to 36 cm (12 to 14 in.) diameter metal valve lid	0.6
6	Hydrant wrench, piece of wire	0.3
7	Concrete, wood, nails, wire, vitrified clay pipe, transite siding, roofing materials	2.7
8	No debris	1.1

bgs = below ground surface

Table 2. 100-H-40 Confirmatory Soil Sampling Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Northing (m)	Easting (m)	Depth (m bgs)	Sample Analysis
Test pit 1	J19C69	151815	577607	0.9	ICP metals,[a] mercury, PCB, TPH, PAH
Test pit 1	J19C70	151815	577607	1.2	
Test pit 2	J19C68	151810	577639	0.9	
Test pit 3	J19C67	151842	577669	0.9	
Test pit 4	J19C74	151878	577629	1.8	
Test pit 5	J19C73	151886	577610	1.2	
Test pit 6	J19C72	151892	577625	1.8	
Test pit 7	J19C63	151933	577652	2.7	
Test pit 7	J19C64	151933	577652	3	
Test pit 8	J19C62	151958	577681	1.1	
Duplicate of J19C70 (Test pit 1)	J19C71	151815	577607	1.2	

Table 2. 100-H-40 Confirmatory Soil Sampling Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Northing (m)	Easting (m)	Depth (m bgs)	Sample Analysis
Equipment blank	J19C77	NA	NA	NA	ICP metals,[a] mercury, TPH, PAH

[a] The expanded list of ICP metals included antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc in the analytical results package.

bgs = below ground surface
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbons

Figure 6. Building Debris at Test Pit 7.

Figure 7. Sheet Metal at Test Pit 2.

Figure 8. Metal Drum Ring at Test Pit 3.

Figure 9. Metal Valve Lid at Test Pit 5.

Confirmatory Sample Results

All confirmatory samples were analyzed using analytical methods approved by the U.S. Environmental Protection Agency (DOE-RL 2009b). Evaluation of the confirmatory data from the test pits was performed by direct comparison of the maximum sample results for each COPC against cleanup criteria.

Comparisons of the results for each COPC against site remedial action goals (RAGs) are summarized in Table 3. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2009) under *Washington Administrative Code* 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 these tables. The complete laboratory results are stored in the Environmental Restoration (ENRE) project-specific database prior to submitting to the Hanford Environmental Information System (HEIS) for archiving and are provided in Appendix B.

Table 3. Comparison of the Maximum Contaminant Concentrations to the Remedial Action Goals for the 100-H-40 Confirmatory Sampling Data. (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		
Antimony	2.16 (<BG)	32	5[b]	5[b]	No	--
Arsenic	7.83	20[b]	20[b]	20[b]	No	--
Barium	68.6 (<BG)	5,600	200	400	No	--
Beryllium	0.225 (<BG)	10.4[c]	1.51[b]	1.51[b]	No	--
Boron[d]	2.84	7,200	320	--[e]	No	--
Cadmium	0.469 (<BG)	13.9[c]	0.81[b]	0.81[b]	No	--
Chromium (total)	11.9 (<BG)	80,000	18.5[b]	18.5[b]	No	--
Cobalt	6.59 (<BG)	24	15.7[b]	--[e]	No	--
Copper	25.7	2,960	59.2	22.0[b]	Yes	Yes[f]
Lead	24.4	353	10.2[b]	10.2[b]	Yes	Yes[f]
Manganese	325 (<BG)	3,760	512[b]	512[b]	No	--
Mercury	0.08 (<BG)	24	0.33[b]	0.33[b]	No	--
Molybdenum[d]	0.961	400	8	--[e]	No	--
Nickel	13.4 (<BG)	1,600	19.1[b]	27.4	No	--
Vanadium	45.3 (<BG)	560	85.1[b]	--[e]	No	--
Zinc	83.4	24,000	480	67.8[b]	Yes	Yes[f]
TPH-motor oil	170	200[g]	200[g]	200[g]	No	--
Benzo(a)anthracene	0.0191	1.37	0.015[h]	0.015[h]	Yes	Yes[f]
Benzo(a)pyrene	0.0285	0.137	0.015[h]	0.015[h]	Yes	Yes[f]
Benzo(b)fluoranthene	0.133	1.37	0.015[h]	0.015[h]	Yes	Yes[f]
Benzo(ghi)perylene[i]	0.188	2,400	48	192	No	--
Benzo(k)fluoranthene	0.00182	1.37	0.015[h]	0.015[h]	No	--
Chrysene	0.0444	13.7	0.12	0.1[g]	No	--
Dibenz(a,h)anthracene	0.00406	1.37	0.03[h]	0.03[h]	No	--
Fluoranthene	0.0131	3,200	64	18	No	--
Fluorene	0.854	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.0311	1.37	0.33[h]	0.33[h]	No	--
Phenanthrene[i]	0.00516	24,000	240	1,920	No	--

Table 3. Comparison of the Maximum Contaminant Concentrations to the Remedial Action Goals for the 100-H-40 Confirmatory Sampling Data. (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		
Pyrene	0.0244	2,400	48	192	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b) or calculated per WAC 173-340-720, 730, and 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). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Sect. 2.1.2.1 of the RDR/RAWP (DOE-RL 2009b).
[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3], 1996 (Method B for air quality) 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 parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).
[f] Based on the RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), copper, lead, zinc, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are not predicted to migrate through the 10 m (33 ft) thick vadose zone to the groundwater in 1,000 years (based on the copper soil-partitioning distribution coefficient of 22 mL/g, the lead and zinc copper soil-partitioning distribution coefficient of 30 mL/g, the benzo(a)anthracene soil-partitioning distribution coefficient of 360 mL/g, the benzo(a)pyrene soil-partitioning distribution coefficient of 5,500 mL/g, and the benzo[b]fluoranthene soil-partitioning distribution coefficient of 803 mL/g).
[g] The soil cleanup value for TPH is from WAC 173-340-740(2), Table 2, "Method A Cleanup Levels – Soil," Ecology 1996, for diesel and other.
[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[i] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals:
Contaminant: benzo(g,h,i)perylene; surrogate: pyrene
Contaminant: phenathrene; surrogate: anthracene

-- = not applicable
BG = background (obtained from DOE [2001], unless otherwise stated)
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection level
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

DATA EVALUATION

Evaluation of the results listed in Table 3 from confirmatory sampling at the 100-H-40 waste site indicates that residual concentrations of all site COPCs are below soil RAGs, except for copper, lead, zinc, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene.
Residual concentrations of these contaminants exceed the soil RAGs for the protection of groundwater and/or the Columbia River. Data were not collected on the vertical extent of residual contamination, but RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) predicts that compounds with a soil-partitioning coefficient (K_d) greater than 7.2 mL/g will not migrate through the 10-m (33-ft) thick vadose zone between the shallow zone and groundwater at this site. The K_d for copper is 22 mL/g and for lead and zinc is 30 mL/g. The K_d for benzo(a)anthracene is 360 mL/g, the K_d

for benzo(a)pyrene is 5,500 mL/g, and the K_d for benzo(b)fluoranthene is 803 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.

Assessment of the risk requirements for the 100-H-40 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 1.5×10^{-2}. All individual carcinogen risk values for carcinogenic constituents are less than 1×10^{-6}. The cumulative carcinogenic risk is 3.8×10^{-7}. Therefore, the individual and total excess cancer risk limits of 1×10^{-6} and 1×10^{-5}, respectively, are met.

An additional calculation of the hazard quotient and carcinogenic (excess cancer) risk values for the potential impact to groundwater was performed for nonradionuclides. The comparisons for the groundwater pathway 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}. Risk values were not calculated for constituents that were not detected, were detected at concentrations below Hanford Site background values, or were not predicted to reach groundwater in 1,000 years according to fate and transport modeling. One individual constituent (boron) met the criteria for calculation of a protection of groundwater hazard quotient for noncarcinogenic constituents. The maximum value of 2.84 mg/kg for boron was divided by the noncarcinogenic RAG value of 320 mg/kg to obtain the result of 8.9×10^{-3}. Therefore, the cumulative hazard quotient for the 100-H-40 waste site is less than 1.0. No carcinogenic constituents from groundwater met the criteria for evaluation at the 100-H-40 waste site; therefore, no calculations of excess carcinogenic risk were performed. Nonradionuclide risk requirements related to groundwater are met.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the confirmatory sampling approach (WCH 2009c), the field logbook (WCH 2009b), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 100-H-40 site established that the data are of the right type, quality, and quantity to support site confirmatory decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site confirmation. The cleanup confirmatory sample analytical data are stored in the ENRE project-specific database for data evaluation prior to its archival in the HEIS and are summarized in Appendix B. The detailed DQA is presented in Appendix D.

SUMMARY FOR NO ACTION

The 100-H-40 waste site has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2009b). 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-H-40 waste site to No Action. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

REFERENCES

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

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

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

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

DOE-RL, 1995, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

DOE-RL, 2009a, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area,* DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 2009, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc.CLARCHome.aspx>.

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

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

WCH, 2008, *Orphan Sites,* Logbook EL-1616-1, pp. 33, Washington Closure Hanford, Richland, Washington.

WCH, 2009a, *Geophysical Site Investigation Summary, 100-H-40 Disposal Pit,* GI #0596719, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2009b, *Miscellaneous Sampling,* Logbook EL-1601-3, pp. 53-59, Washington Closure Hanford, Richland, Washington.

WCH, 2009c, *Work Instruction for Confirmatory Sampling of the 100-H-40, 100-H Disposal Pit,* 0100H-WI-G0028, Rev. 0, Washington Closure Hanford, Richland, Washington.

WDOH, 1997, *Hanford Guidance for Radiological Cleanup*, WDOH/320-015, Rev. 1, Washington State Department of Health, Olympia, Washington.

WHC, 1994, *Summary Report: Source Data Compilation for 100-HR-1 Operable Unit*, Rev. 0, Westinghouse Hanford Company, Richland Washington.

APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Maximum Contaminant Concentrations that Exceed Ecological Screening Level for the 100-H-40 Site.[a]

Hazardous Substance		2007 WAC 173-340 Table 749-3			EPA Ecological Soil Screening Levels[b]				Maximum Determined Confirmatory Result[d]
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian[c]	Mammalian[c]	
Metals	Background	(mg/kg)							
Antimony	5	5			NA	78	NA	0.27	2.16 (<BG)
Arsenic III	6.5[e]			7	18	NA	43	46	7.83
Boron	NA	0.5	NA	NA	NA	NA	NA	NA	2.84
Cadmium	0.81	4	20	14	32	140	0.77	0.36	0.469 (<BG)
Lead	10.2	50	500	118	120	1700	11	56	24.4
Manganese	512	1,100[f]	NA	1,500	220	450	4,300	4,000	325 (<BG)
Vanadium	85.1	2	NA	NA	NA	NA	7.8	280	45.3 (<BG)
Zinc	67.8	86[g]	200	360	160	120	46	79	83.4

[a] Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. All exceedances must be evaluated in the context of additional lines of evidence for ecological effects following a baseline risk assessment for the river corridor portion of the Hanford Site which will include a more complete quantitative ecological risk assessment.

[b] Available on the internet at (www.epa.gov/ecotox/ecossl).

[c] Wildlife.

[d] Based on consideration of all statistical values (95% upper confidence level or maximum value, depending on data censorship, as described in Appendix D) and maximum values for all focused samples.

[e] The Hanford Site background for arsenic is 6.5 mg/kg. An arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP, DOE/RL-96-17, Rev. 6.

[f] Benchmark replaced by Washington State natural background concentration.

BG = background
EPA = U.S. Environmental Protection Agency
NA = not available
WAC = *Washington Administrative Code*

APPENDIX B

CONFIRMATORY SAMPLING DATA

Table B-1. 100-H-40 Confirmatory Data Inorganic Results (Page 1 of 2)

			Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
sample location	HEIS Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 8	J19C62	10/27/2009	5110		3.21	0.387	J	0.39	1.79		0.64	40.1		0.32	0.149		0.13	0.534	B	1.29
Test Pit 7	J19C63	10/27/2009	6960		4.97	2.16	J	0.6	7.83		0.99	68.6		0.5	0.225		0.2	2.84		1.99
Test Pit 7	J19C64	10/27/2009	5240		4.37	0.543	J	0.52	2.5		0.87	39.8		0.44	0.156	B	0.18	0.858	B	1.75
Test Pit 3	J19C67	10/29/2009	5240		3.76	0.432	BJ	0.45	2.15		0.75	38.6		0.38	0.172		0.15	0.784	B	1.5
Test Pit 2	J19C68	10/29/2009	6060		3.91	0.586	J	0.47	2.97		0.78	46.3		0.39	0.194		0.16	0.885	B	1.57
Test Pit 1	J19C69	10/29/2009	5990		3.3	0.543	J	0.4	2.47		0.66	48.7		0.33	0.198		0.13	0.627	B	1.32
Test Pit 1	J19C70	10/29/2009	6520		3.55	0.51	J	0.43	2.78		0.71	58		0.36	0.206		0.14	0.838	B	1.42
Dup of J19C70	J19C71	10/29/2009	6260		4.11	0.467	BJ	0.49	2.68		0.82	53.3		0.41	0.206		0.16	0.813	B	1.64
Test Pit 6	J19C72	10/28/2009	3850		3.7	0.451	J	0.44	2.25		0.74	27.2		0.37	0.124	B	0.15	0.445	B	1.48
Test Pit 5	J19C73	10/28/2009	4720		3.24	0.557	J	0.39	1.96		0.65	32.7		0.32	0.141		0.13	0.615	B	1.29
Test Pit 4	J19C74	10/28/2009	4250		3.23	0.461	J	0.39	1.51		0.65	38.8		0.32	0.118	B	0.13	0.479	B	1.29
Equipment Blank	J19C77	10/29/2009	71.8		3.44	0.412	UJ	0.41	0.687	U	0.69	1.37		0.34	0.137	U	0.14	1.37	U	1.37

			Cadmium			Calcium			Chromium			Cobalt			Copper			Iron		
sample location	HEIS Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 8	J19C62	10/27/2009	0.045	B	0.13	3560	J	64.3	8.32		0.13	4.38		1.29	12.8		0.64	12800		12.9
Test Pit 7	J19C63	10/27/2009	0.469		0.2	15100	J	99.3	11.2		0.2	6.59		1.99	25.7		0.99	19500		19.9
Test Pit 7	J19C64	10/27/2009	0.077	B	0.18	5380	J	87.4	11.4		0.18	4.84		1.75	13.9		0.87	13600		17.5
Test Pit 3	J19C67	10/29/2009	0.058	B	0.15	5080	J	75.2	9.07		0.15	5.79		1.5	14.5		0.75	15300		15
Test Pit 2	J19C68	10/29/2009	0.053	B	0.16	7060	J	78.3	11.9		0.16	5.26		1.57	14.1		0.78	14700		15.7
Test Pit 1	J19C69	10/29/2009	0.063	B	0.13	3200	J	66	11.3		0.13	5.35		1.32	16.5		0.66	15000		13.2
Test Pit 1	J19C70	10/29/2009	0.05	B	0.14	3610	J	71	10.4		0.14	5.69		1.42	15.8		0.71	15800		14.2
Dup of J19C70	J19C71	10/29/2009	0.051	B	0.16	3400	J	82.2	10.9		0.16	5.47		1.64	15.5		0.82	15700		16.4
Test Pit 6	J19C72	10/28/2009	0.055	B	0.15	3390	J	74	7.11		0.15	4.75		1.48	11.2		0.74	12900		14.8
Test Pit 5	J19C73	10/28/2009	0.037	B	0.13	4170	J	64.7	9.93		0.13	5.53		1.29	14.8		0.65	16700		12.9
Test Pit 4	J19C74	10/28/2009	0.051	B	0.13	6070	J	64.7	7.26		0.13	4.89		1.29	11.9		0.65	13100		12.9
Equipment Blank	J19C77	10/29/2009	0.137	U	0.14	46.7	BJ	68.7	0.137	U	0.14	1.37	U	1.37	0.687	U	0.69	129		13.7

			Lead			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
sample location	HEIS Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 8	J19C62	10/27/2009	2.52		0.32	3870		48.2	211		3.21	0.03	U	0.03	0.234	B	1.29	11		2.57
Test Pit 7	J19C63	10/27/2009	24.4		0.5	3530		74.5	325		4.97	0.02	B	0.03	0.961	B	1.99	13.4		3.97
Test Pit 7	J19C64	10/27/2009	4.1		0.44	3930		65.5	222		4.37	0.03	U	0.03	0.22	B	1.75	11.6		3.5
Test Pit 3	J19C67	10/29/2009	2.84		0.38	4010		56.4	225		3.76	0.03	U	0.03	0.264	B	1.5	11.9		3.01
Test Pit 2	J19C68	10/29/2009	3.21		0.39	4490		58.7	234		3.91	0.08		0.03	0.227	B	1.57	13		3.13
Test Pit 1	J19C69	10/29/2009	3.19		0.33	3910		49.5	225		3.3	0.02	U	0.02	0.233	B	1.32	11.8		2.64
Test Pit 1	J19C70	10/29/2009	3.53		0.36	4000		53.3	265		3.55	0.03	U	0.03	0.249	B	1.42	11.8		2.84
Dup of J19C70	J19C71	10/29/2009	3.87		0.41	3850		61.7	247		4.11	0.03	U	0.03	0.253	B	1.64	11.2		3.29
Test Pit 6	J19C72	10/28/2009	2.36		0.37	2870		55.5	192		3.7	0.03	U	0.03	0.226	B	1.48	6.66		2.96
Test Pit 5	J19C73	10/28/2009	2.89		0.32	3650		48.5	213		3.24	0.03	U	0.03	0.254	B	1.29	10		2.59
Test Pit 4	J19C74	10/28/2009	2.14		0.32	3560		48.5	221		3.23	0.02	U	0.02	0.191	B	1.29	9.49		2.59
Equipment Blank	J19C77	10/29/2009	0.27	B	0.34	7.52	B	51.5	2.85	B	3.44	0.02	U	0.02	1.37	U	1.37	2.75	U	2.75

Notes:

B = method blank contamination J = estimate U = undetected

PQL = practical quantitation limit Q = qualifier

Table B-1. 100-H-40 Confirmatory Data Inorganic Results (Page 2 of 2)

			Potassium			Selenium			Silicon			Silver			Sodium			Vanadium		
sample location	HEIS Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 8	J19C62	10/27/2009	698		257	0.193	U	0.19	333	J	1.29	0.129	U	0.13	129		32.1	32.1		1.61
Test Pit 7	J19C63	10/27/2009	1510		397	0.298	U	0.3	820	J	1.99	0.199	U	0.2	353		49.7	34		2.48
Test Pit 7	J19C64	10/27/2009	727		350	0.262	U	0.26	334	J	1.75	0.175	U	0.18	179		43.7	35.3		2.18
Test Pit 3	J19C67	10/29/2009	967		301	0.226	U	0.23	365	J	1.5	0.15	U	0.15	173		37.6	39.5		1.88
Test Pit 2	J19C68	10/29/2009	863		313	0.235	U	0.24	493	J	1.57	0.157	U	0.16	379		39.1	34.8		1.96
Test Pit 1	J19C69	10/29/2009	791		264	0.198	U	0.2	384	J	1.32	0.132	U	0.13	280		33	38.1		1.65
Test Pit 1	J19C70	10/29/2009	990		284	0.213	U	0.21	531	J	1.42	0.142	U	0.14	261		35.5	39.4		1.78
Dup of J19C70	J19C71	10/29/2009	906		329	0.247	U	0.25	505	J	1.64	0.164	U	0.16	267		41.1	40		2.06
Test Pit 6	J19C72	10/28/2009	580		296	0.222	U	0.22	395	J	1.48	0.148	U	0.15	199		37	33.3		1.85
Test Pit 5	J19C73	10/28/2009	607		259	0.194	U	0.19	244	J	1.29	0.129	U	0.13	341		32.4	45.3		1.62
Test Pit 4	J19C74	10/28/2009	519		259	0.194	U	0.19	212	J	1.29	0.129	U	0.13	160		32.3	35.4		1.62
Equipment Blank	J19C77	10/29/2009	48.2	BUJ	275	0.206	U	0.21	79.5	J	1.37	0.137	U	0.14	7.04	B	34.4	1.72	U	1.72

			Zinc			TPH - diesel range			TPH - motor oil (high boiling)		
sample location	HEIS Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 8	J19C62	10/27/2009	29		6.43	3.35	U	3.35	10.2	UJ	10.2
Test Pit 7	J19C63	10/27/2009	83.4		9.93	3.41	U	3.41	170	J	10.3
Test Pit 7	J19C64	10/27/2009	34.6		8.74	3.34	U	3.34	10.1	UJ	10.1
Test Pit 3	J19C67	10/29/2009	34.5		7.52	3.38	U	3.38	10.2	UJ	10.2
Test Pit 2	J19C68	10/29/2009	34.5		7.83	3.36	U	3.36	10.2	UJ	10.2
Test Pit 1	J19C69	10/29/2009	35.6		6.6	3.35	U	3.35	10.2	UJ	10.2
Test Pit 1	J19C70	10/29/2009	35.2		7.1	3.37	U	3.37	10.2	UJ	10.2
Dup of J19C70	J19C71	10/29/2009	37.8		8.22	3.36	U	3.36	10.2	UJ	10.2
Test Pit 6	J19C72	10/28/2009	30.2		7.4	3.47	U	3.47	10.5	UJ	10.5
Test Pit 5	J19C73	10/28/2009	31.1		6.47	3.33	U	3.33	10.1	UJ	10.1
Test Pit 4	J19C74	10/28/2009	27.6		6.47	3.33	U	3.33	10.1	UJ	10.1
Equipment Blank	J19C77	10/29/2009	4.58	B	6.87	3.31	U	3.31	10	UJ	10

Table B-2. 100-H-40 Confirmatory Data Organic Results. (Page 1 of 2)

	J19C62			J19C63			J19C64			J19C67			J19C68			J19C69			J19C70		
	Test Pit 8			Test Pit 7			Test Pit 7			Test Pit 3			Test Pit 2			Test Pit 1			Test Pit 1		
	10/27/2009			10/27/2009			10/27/2009			10/29/2009			10/29/2009			10/29/2009			10/29/2009		
CONSTITUENTS	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbon																					
Acenaphthene	33.9	U	33.9	138	UD	138	33.9	U	33.9	34.2	U	34.2	34	U	34	33.9	U	33.9	34.2	U	34.2
Acenaphthylene	33.9	U	33.9	138	UD	138	33.9	U	33.9	34.2	U	34.2	34	U	34	33.9	U	33.9	34.2	U	34.2
Anthracene	3.39	U	3.39	13.8	UD	3.39	3.39	U	3.39	3.42	U	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Benzo(a)anthracene	3.39	U	3.39	19.1	D	3.39	4.21		3.39	3.42	U	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Benzo(a)pyrene	3.39	U	3.39	28.5	D	3.39	3.29	J	3.39	0.903	J	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Benzo(b)fluoranthene	3.39	U	3.39	133	D	3.39	6.59		3.39	0.886	J	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Benzo(ghi)perylene	3.39	U	3.39	188	D	3.39	3.63		3.39	3.42	U	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Benzo(k)fluoranthene	3.39	U	3.39	13.8	UD	3.39	1.82	J	3.39	3.42	U	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Chrysene	3.39	U	3.39	44.4	D	3.39	1.23	J	3.39	3.42	U	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Dibenz[a,h]anthracene	3.39	U	3.39	4.06	DJ	3.39	3.39	U	3.39	3.42	U	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Fluoranthene	3.39	U	3.39	13.1	DJ	3.39	7.86		3.39	3.84		3.42	1.65	J	3.4	1.44	J	3.39	3.42	U	3.42
Fluorene	3.39	U	3.39	13.8	UD	3.39	3.39	U	3.39	1.06	J	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Indeno(1,2,3-cd)pyrene	3.39	U	3.39	31.3	D	3.39	3.39	U	3.39	3.42	U	3.42	3.4	U	3.4	3.39	U	3.39	3.42	U	3.42
Naphthalene	33.9	U	33.9	138	UD	138	33.9	U	33.9	34.2	U	34.2	34	U	34	33.9	U	33.9	34.2	U	34.2
Phenanthrene	3.39	U	3.39	5.16	DJ	3.39	2.21	J	3.39	1.59	J	3.42	1.48	J	3.4	3.39	U	3.39	3.42	U	3.42
Pyrene	3.39	U	3.39	24.4	D	3.39	1.55	J	3.39	1.6	J	3.42	0.95	J	3.4	3.39	U	3.39	3.42	U	3.42
Polychlorinated Eyphenyl																					
Aroclor-1016	13.5	U	13.5	13.7	U	13.7	13.5	U	13.5	13.6	U	13.6	13.5	U	13.5	13.5	U	13.5	13.6	U	13.6
Aroclor-1221	13.5	U	13.5	13.7	U	13.7	13.5	U	13.5	13.6	U	13.6	13.5	U	13.5	13.5	U	13.5	13.6	U	13.6
Aroclor-1232	13.5	U	13.5	13.7	U	13.7	13.5	U	13.5	13.6	U	13.6	13.5	U	13.5	13.5	U	13.5	13.6	U	13.6
Aroclor-1242	13.5	U	13.5	13.7	U	13.7	13.5	U	13.5	13.6	U	13.6	13.5	U	13.5	13.5	U	13.5	13.6	U	13.6
Aroclor-1248	13.5	U	13.5	13.7	U	13.7	13.5	U	13.5	13.6	U	13.6	13.5	U	13.5	13.5	U	13.5	13.6	U	13.6
Aroclor-1254	13.5	U	13.5	13.7	U	13.7	13.5	U	13.5	13.6	U	13.6	13.5	U	13.5	13.5	U	13.5	13.6	U	13.6
Aroclor-1260	13.5	U	13.5	13.7	U	13.7	13.5	U	13.5	3.6	U	13.6	13.5	U	13.5	13.5	U	13.5	13.6	U	13.6

Table B-2. 100-H-40 Cinfirmatory Data Organic Results. (Page 2 of 2)

	J19C71			J19C72			J19C73			J19C74			J19C77		
	Duplicate of J19C70			Test Pit 6			Test Pit 5			Test Pit 4			Equipment Blank		
	10/29/2009			10/28/2009			10/28/2009			10/28/2009			10/29/2009		
CONSTITUENTS	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbon															
Acenaphthene	68.1	UD	68.1	35.1	U	35.1	33.7	U	33.7	33.7	U	33.7	33.5	U	33.5
Acenaphthylene	68.1	UD	68.1	35.1	U	35.1	33.7	U	33.7	33.7	U	33.7	33.5	U	33.5
Anthracene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Benzo(a)anthracene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Benzo(a)pyrene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Benzo(b)fluoranthene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Benzo(ghi)perylene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Benzo(k)fluoranthene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Chrysene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Dibenz[a,h]anthracene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Fluoranthene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	1.61	J	1.61
Fluorene	854	D	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Indeno(1,2,3-cd)pyrene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Naphthalene	68.1	UD	68.1	35.1	U	35.1	33.7	U	33.7	33.7	U	33.7	33.5	U	33.5
Phenanthrene	1.75	J D	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Pyrene	6.81	UD	6.81	3.51	U	3.51	3.37	U	3.37	3.37	U	3.37	3.35	U	3.35
Polychlorinated Byphenyl															
Aroclor-1016	13.6	U	13.6	14	U	14	13.4	U	13.4	13.4	U	13.4			
Aroclor-1221	13.6	U	13.6	14	U	14	13.4	U	13.4	13.4	U	13.4			
Aroclor-1232	13.6	U	13.6	14	U	14	13.4	U	13.4	13.4	U	13.4			
Aroclor-1242	13.6	U	13.6	14	U	14	13.4	U	13.4	13.4	U	13.4			
Aroclor-1248	13.6	U	13.6	14	U	14	13.4	U	13.4	13.4	U	13.4			
Aroclor-1254	13.6	U	13.6	14	U	14	13.4	U	13.4	13.4	U	13.4			
Aroclor-1260	13.6	U	13.6	14	U	14	13.4	U	13.4	13.4	U	13.4			

D = dilution
J = estimated result
PQL = practical quantitation limit
Q = qualifier
U = undetected

APPENDIX C

CALCULATIONS

APPENDIX C

CALCULATIONS

The calculation in this appendix is kept in the active Washington Closure Hanford project files and is available upon request. When the project is completed, the file will be stored in a U.S. Department of Energy, Richland Operations Office, repository. The calculation has been prepared in accordance with ENG-1, *Engineering Services*, ENG-1-4.5, "Project Calculation," Washington Closure Hanford, Richland, Washington. The following calculation is provided in this appendix:

100-H-40 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100H-CA-V0121, Rev. 0.

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.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-H

Discipline: Environmental *Calculation No: 0100H-CA-V0121

Subject: 100-H-40 Relative Percent Difference (RPD) and Direct Contact HQ and Carcinogenic 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	E. J. Farris	H. M. Sulloway	B. L. Vedder	M. L. Proctor	signed 1/11/2010
1	Cover = 1 Summary = 6	E. J. Farris	H. M. Sulloway	NA	M. L. Proctor	3/30/10

SUMMARY OF REVISION

1	Entire calculation revised for convenience. "Direct Contact" is added to the subject title on the cover sheet, the header of each sheet, and the title of Table 1.

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:	3/24/10	Calc. No.:	0100H-CA-V0121	Rev.:	1
Project:	100-H Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	3/24/10
Subject:	100-H-40 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 6	

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and carcinogenic (excess cancer) risk for the 100-H-40 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009b), 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-H-40 confirmatory sampling, as necessary.

GIVEN/REFERENCES:

1) DOE-RL, 2009a, *100 Area Remedial Action Sampling and Analysis Plan (SAP)*, DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Areas*, DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

4) WCH, 2009, *Remaining Sites Verification Package for the 100-H-40 100-H Disposal Pit*, Attachment to Waste Site Reclassification Form 2009-065, 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 2009b).

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 2009b).

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJF	Date:	3/24/10	Calc. No.:	0100H-CA-V0121	Rev.:	1
Project:	100-H Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	7/24/10
Subject:	100-H-40 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 6	

5) Use data from WCH (2009) to perform the RPD calculations for primary-duplicate sample pairs, as required.

METHODOLOGY:

Hazard quotient and carcinogenic risk calculations for the 100-H-40 waste site were conservatively calculated for the entire waste site using the highest of the focused results for each analyte (WCH 2009). Copper and zinc require the HQ and risk calculations because these analytes were detected above Washington State or Hanford Site background values. Boron and molybdenum require the HQ and risk calculations because these analytes were 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, with the exceptions of arsenic, total petroleum hydrocarbon (TPH)-motor oil, and lead. Arsenic and TPH-motor oil were detected above the Hanford Site background value but below the *Washington Administrative Code* (WAC) 173-340 Method A cleanup level. Due to the intent of Method A cleanup values and the allowance to use such values for arsenic and TPH (DOE-RL 2009), arsenic and TPH-motor oil have been excluded from the Method B individual analyte and cumulative risk requirements. Lead does not have a reference dose for calculation of a hazard quotient because toxic effects of lead are correlated with blood-lead levels rather than exposure levels or daily intake. As a result, the maximum lead concentration is reported but not included in the hazard quotient calculation. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 2.84 mg/kg, divided by the noncarcinogenic RAG value of 7,200 mg/kg (calculated in accordance with the noncarcinogenic toxic effects WAC 173-340-740[3]), is 3.9×10^{-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 1.5×10^{-2}. 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 benzo(a)anthracene is 0.0191 mg/kg; divided by 1.37 mg/kg, and multiplied as indicated, is 1.4×10^{-8}. 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 3.8×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJF	Date:	3/24/10	Calc. No.:	0100H-CA-V0121	Rev.:	1
Project:	100-H Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	3/24/10
Subject:	100-H-40 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 6	

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 2009a). 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 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. If the RPD is greater than 30%, further investigation regarding the usability of the data is performed. Additional discussion is provided in the data quality assessment section of the applicable RSVP (WCH 2009), 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.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJF	Date:	3/24/10	Calc. No.:	0100H-CA-V0121	Rev.:	1
Project:	100-H Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	3/24/10
Subject:	100-H-40 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 6	

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

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-H-40 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 and TPH					
Boron	2.84	7,200	3.9E-04	--	--
Copper	25.7	2,960	8.7E-03	--	--
Lead	24.4	--	--	--	--
Molybdenum	0.961	400	2.4E-03	--	--
Zinc	83.4	24,000	3.5E-03	--	--
Semivolatiles					
Benzo(a)anthracene	0.0191	--	--	1.37	1.4E-08
Benzo(a)pyrene	0.0285	--	--	0.137	2.1E-07
Benzo(b)fluoranthene	0.133	--	--	1.37	9.7E-08
Benzo(k)fluoranthene	0.00182	--	--	1.37	1.3E-09
Benzo(ghi)perylene[c]	0.188	2,400	7.8E-05	--	--
Chrysene	0.0444	--	--	13.7	3.2E-09
Dibenzo(a,h)anthracene	0.00406	--	--	1.37	1.2E-08
Fluoranthene	0.0131	3,200	4.1E-06	--	--
Fluorene	0.854	3,200	2.7E-04	--	--
Indeno(1,2,3-cd) pyrene	0.0313	--	--	1.37	2.3E-08
Phenanthrene[c]	0.00516	24,000	2.2E-07	--	--
Pyrene	0.0244	2,400	1.0E-05	--	--
Totals					
Cumulative Hazard Quotient:			**1.5E-02**		
Cumulative Excess Cancer Risk:					**3.8E-07**

Notes:

[a] = From WCH (2009).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2009b) or *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

[c] = Toxicity data for these chemicals are not available. RAGs for benzo(g,h,i)perylene and phenanthrene are based on the surrogate chemicals pyrene and anthracene, respectively.

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJF	Date:	3/24/10	Calc. No.:	0100H-CA-V0121	Rev.:	1
Project:	100-H Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	3/24/10
Subject:	100-H-40 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 5 of 6	

Table 2 shows the results of the RPD calculations.

Table 2. Relative Percent Difference Calculations for the 100-H-40 Waste Site. (2 Pages)

Sampling Area	Sample Number	Sample Date	Aluminum			Antimony			Arsenic			Barium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 1	J19C70	10/29/09	6520		3.55	0.51		0.43	2.78		0.71	58		0.36
Duplicate of J19C70	J19C71	10/29/09	6260		4.11	0.467	B	0.49	2.68		0.82	53.3		0.41

Analysis:

TDL		5	0.6	1	0.5
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)		No-Stop (acceptable)	Yes (calc RPD)
	RPD	4.1%			8.4%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable

Sampling Area	Sample Number	Sample Date	Beryllium			Boron			Cadmium			Calcium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 1	J19C70	10/29/09	0.206		0.14	0.838	B	1.42	0.05	B	0.14	3610		71
Duplicate of J19C70	J19C71	10/29/09	0.206		0.16	0.813	B	1.64	0.051	B	0.16	3400		82.2

Analysis:

TDL		0.2	2	0.2	100
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)			Yes (calc RPD)
	RPD				6.0%
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	Not applicable

Sampling Area	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 1	J19C70	10/29/09	10.4		0.14	5.69		1.42	15.8		0.71	15800		14.2
Duplicate of J19C70	J19C71	10/29/09	10.9		0.16	5.47		1.64	15.5		0.82	15700		16.4

Analysis:

TDL		0.2	2	1	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD	4.7%		1.9%	0.6%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable

Sampling Area	Sample Number	Sample Date	Lead			Magnesium			Manganese			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 1	J19C70	10/29/09	3.53		0.36	4000		53.3	265		3.55	0.249	B	1.42
Duplicate of J19C70	J19C71	10/29/09	3.87		0.41	3850		61.7	247		4.11	0.253	B	1.64

Analysis:

TDL		0.5	75	5	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	
	RPD	9.2%	3.8%	7.0%	
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	No - acceptable

Sampling Area	Sample Number	Sample Date	Nickel			Potassium			Silicon			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 1	J19C70	10/29/09	11.8		2.84	990		284	531		1.42	261		35.5
Duplicate of J19C70	J19C71	10/29/09	11.2		3.29	906		329	505		1.64	267		41.1

Analysis:

TDL		4	400	2	50
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD			5.0%	2.3%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris	Date:	3/24/10	Calc. No.:	0100H-CA-V0121	Rev.:	1
Project:	100-H Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	3/24/10
Subject:	100-H-40 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 6 of 6	

Table 2. Relative Percent Difference Calculations for the 100-H-40 Waste Site. (2 Pages)

Sampling Area	Sample Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
Test Pit 1	J19C70	10/29/09	39.4		1.78	35.2		7.1
Duplicate of J19C70	J19C71	10/29/09	40		2.06	37.8		8.22

Analysis:

TDL		2.5	1
Duplicate Analysis	Both > PQL/MDA?	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)
	RPD	1.5%	7.1%
	Difference > 2 TDL?	Not applicable	Not applicable

B = method blank contamination J = estimate RPD = relative percent difference

PQL = practical quantitation limit Q = qualifier

CONCLUSION:

The calculations in Table 1 demonstrate that the 100-H-40 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2009b). 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

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CONFIRMATORY SAMPLING

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 2009b). This DQA was performed in accordance with site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009).

To ensure quality data, the SAP data assurance requirements and the data validation procedures for chemical analysis (BHI 2000) are used as appropriate. This review involves an 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 2006).

A review of the sample design (WCH 2009b), the field logbook (WCH 2009a), and the applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design.

Confirmatory sample data collected at the 100-H-40, 100-H Disposal Pit waste site were provided by the laboratory in sample delivery group (SDG) K1822. SDG K1822 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

SDG K1822

This SDG comprises 11 focused soil samples (J19C62 through J19C64 and J19C67 through J19C74) collected from eight test pits. A field duplicate pair (J19C70/J19C71) is included in this SDG. These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), and polycyclic aromatic hydrocarbons (PAH). In addition, one equipment blank (J19C77) was collected and analyzed for ICP metals, mercury, TPH, and PAH. SDG K1822 was submitted for third-party validation. No major deficiencies were found in SDG K1822. Minor deficiencies found in SDG K1822 are as follows.

In the TPH analysis, all of the motor oil results in SDG K1822 were qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS), matrix spike duplicate, or lab control sample analysis for the analyte. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the ICP metals analysis, the potassium result for sample J19C77 (the equipment blank) is of similar magnitude as the method blank result. The potassium result for sample J19C77 was qualified as an undetected estimate and flagged "UJ" by third-party validation. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for six ICP metals (aluminum, antimony, calcium, iron, magnesium, and silicon) are out of acceptance criteria. For aluminum, iron, and magnesium, 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 and serial dilutions were prepared for all six analytes with acceptable results. The original MS recoveries for antimony, calcium, and silicon were 66%, 144%, and 347%, respectively. All sample results for antimony, calcium, and silicon are qualified by third-party validation as estimated and flagged "J". Estimated data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

Relative percent difference (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 2009a), are the 100-H-40 primary and duplicate samples (J19C70/J19C71) collected from test pit 1. The main and QA/QC sample results are presented in Appendix B.

RPDs are calculated for analytes detected in both the main and duplicate sample at more than five times the target detection limit. RPDs for the remaining analytes are not calculated because 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. No calculated RPDs exceeded the acceptance criteria of 30%. The data are usable 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 target detection limit (TDL), including undetected analytes. In these cases, a control limit of ±2 times the TDL is used to indicate that a visual check of the data is required by the reviewer. No result required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are usable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch quality control (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-H-40 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-H-40 waste site concludes that the data are of the right type, quality, and quantity to support the intended use. The analytical data were found acceptable for decision-making purposes. 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.

REFERENCES

BHI, 2000, *Data Validation Procedure for Chemical Analysis*, BHI-01435, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

DOE-RL, 2009, *100 Area Remedial Action Sampling and Analysis Plan,* DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 2006, *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

WCH, 2009a, *Miscellaneous Sampling,* Logbook EL-1601-03, pp. 53-59, Washington Closure Hanford, Richland, Washington.

WCH, 2009b, *Work Instruction for Confirmatory Sampling of the 100-H-40, 100-H Disposal Pit*, 0100H-WI-G0028, Rev. 0, Washington Closure Hanford, Richland, Washington.

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