Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

14-AMRP-0274

SEP 09 2014

Ms. J. A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Dear Ms. Hedges:

TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 100-N-99, 100-N OIL FILTERS #3, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2014-091 and supporting, "Remaining Sites Verification Package for the 100-N-99, 100-N Oil Filters #3," Rev. 0. If you have questions, please contact me or your staff may contact Joanne Chance, of my staff, at (509) 376-0811.

Sincerely,

Mark S. French, Director
River Corridor Division

AMRP:JCC

Attachment

cc w/attach:
N. M. Menard, Ecology
Administrative Record, H6-08

cc w/o attach:
R. D. Cantwell, WCH
S. L. Feaster, WCH
D. L. Plung, WCH
J. P. Shearer, CHPRC

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-NR-1 **Control No.:** 2014-091

Waste Site Code(s)/Subsite Code(s): 100-N-99

Reclassification Category: Interim ☒ Final ☐

Reclassification Status: Closed Out ☒ No Action ☐ Rejected ☐
RCRA Post closure ☐ Consolidated ☐ None ☐

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-N-99, 100-N Oil Filters #3 waste site, part of the 100-NR-1 Operable Unit, was added to the *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington* (100-N Area ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999), as a remove, treat, and dispose (RTD) site by the *Explanation of Significant Differences for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2011).

The 100-N-99 waste site consisted of two areas where oil filters were discarded. Both areas were located west of Route 4N approximately 1,420 m (4,658 ft) south of Route 2N. The first area (OSE-N-196) was located approximately 148 m (485 ft) west of Route 4N. The second area (OSE-N-197) was located approximately 55 m (180 ft) west of Route 4N.

Remedial action at the 100-N-99 waste site was conducted on January 31, 2014. The remediation extended approximately 1 m (3.3 ft) below ground surface resulting in approximately 47 bank cubic meters (61 bank cubic yards) of soil and debris being removed and disposed at the Environmental Restoration Disposal Facility (ERDF). No overburden pile or waste staging pile area was created. No anomalous material was encountered during the waste site remediation. Verification soil sampling was performed on May 1, 2014.

Cleanup verification sampling was conducted to determine if the waste site met the remedial action objectives (RAOs) and remedial action goals (RAGs) established by the *Remedial Design Report/Remedial Action Work Plan for the 100-N Area* (100-N Area RDR/RAWP), DOE/RL-2005-93, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2013), and the 100-N Area ROD (EPA 1999). The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at ERDF, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

The verification sampling results for the 100-N-99 waste site demonstrate that the site meets the RAOs and corresponding RAGs established in the 100-N Area RDR/RAWP (DOE-RL 2013) and the 100-N Area ROD (EPA 1999) and support a reclassification to Interim Closed Out. These sampling results established 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. Residual contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-N-99, 100-N Oil Filters #3* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-NR-1 **Control No.:** 2014-091

Waste Site Code(s)/Subsite Code(s): 100-N-99

Regulator comments:

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:

J. P. Neath		8/14/14
DOE Federal Project Director (printed)	Signature	Date
N. Menard KIM WELSCH FOR	KIM WELSCH FOR	8/20/14
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-N-99, 100-N OIL FILTERS #3

Attachment to Waste Site Reclassification Form 2014-091

August 2014

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-N-99, 100-N OIL FILTERS #3

EXECUTIVE SUMMARY

The 100-N-99, 100-N Oil Filters #3 waste site, part of the 100-NR-1 Operable Unit, consisted of two areas where used oil filters had been discarded, having stained soil, and being devoid of vegetation. The 100-N-99 waste site was added to the *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington* (100-N Area ROD) (EPA 1999) as a remove, treat, and dispose site by the *Explanation of Significant Differences for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2011).

Remedial action at the 100-N-99 waste site was conducted on January 31, 2014. The excavation extended to approximately 1 m (3.3 ft) below ground surface resulting in approximately 47 bank cubic meters (61 bank cubic yards) of soil and debris being removed for disposal at the Environmental Restoration Disposal Facility. The debris consisted of oil filters. All material was direct loaded from the waste site; therefore, no waste staging pile area was created. Additionally, there is no overburden soil pile associated with the waste site. No anomalous material was observed during remediation, and all visibly stained soil was removed.

Following remediation, verification soil sampling was conducted on May 1, 2014. A summary of the cleanup evaluation for the soil sampling results against the applicable remedial action goals (RAGs) is presented in Table ES-1. The results of the verification sampling were used to make reclassification decisions for the 100-N-99 waste site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011).

In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding RAGs established in the *Remedial Design Report/Remedial Action Work Plan for the 100-N Area* (DOE-RL 2013) and the 100-N Area 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 sampling results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft] deep), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Residual contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required.

Table ES-1. Summary of Remedial Action Goals for the 100-N-99 Waste Site.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain a dose rate of <15 mrem/yr above background over 1,000 years.	Radionuclides were not COPCs for the 100-N-99 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual direct exposure COPC RAGs.	All individual COPC concentrations are below the direct exposure RAGs.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	A direct contact hazard quotient calculation was not needed because there were not any constituents with direct exposure cleanup levels detected above background. Therefore, the individual and cumulative hazard quotients for the 100-N-99 waste site are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.		
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	A direct contact excess cancer risk calculation was not needed because there were not any constituents with direct exposure cleanup levels detected above background. Therefore, the individual excess cancer risk for the100-N-99 waste site is $<1 \times 10^{-6}$ and the cumulative excess cancer risk evaluation is $<1 \times 10^{-5}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.		
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 100-N-99 waste site.	NA
	Attain National Primary Drinking Water Regulations[a]: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ.		
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5[b].		
	Meet total uranium standard of 30 µg/L (21.2 pCi/L)[c].		
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	All individual COPC concentrations are below the groundwater and Columbia River cleanup requirements.	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).

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
NA = not applicable
RAG = remedial action goal

Soil cleanup levels were established in the 100-N Area ROD (EPA 1999) based in part on a limited ecological risk assessment. There were no ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," or the U.S. Environmental Protection Agency that were exceeded at the 100-N-99 waste site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-N-99, 100-N OIL FILTERS #3

STATEMENT OF PROTECTIVENESS

The 100-N-99 waste site cleanup verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100-N Area* (100-N Area RDR/RAWP) (DOE-RL 2013) and the *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington* (100-N Area ROD) (EPA 1999). The results of verification sampling show that residual soil 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. Residual contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required.

Soil cleanup levels were established in the 100-N Area ROD (EPA 1999) based in part on a limited ecological risk assessment. There were no ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," or the U.S. Environmental Protection Agency (EPA) that were exceeded at the 100-N-99 waste site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-N-99 waste site, part of the 100-NR-1 Operable Unit, consisted of two areas where oil filters were discarded. Both areas were located west of Route 4N approximately 1,420 m (4,658 ft) south of Route 2N. The first area (OSE-N-196) is located approximately 148 m (485 ft) west of Route 4N. The second area (OSE-N-197) is located approximately 55 m (180 ft) west of Route 4N. The location of the two areas is shown in Figure 1.

CONFIRMATORY SAMPLING

Based on the area devoid of vegetation and the presence of stained soil, the site was believed to contain hazardous constituents at levels exceeding the remedial action goals (RAGs). Therefore, the 100-N-99 waste site was recommended for remedial action without confirmatory sampling (WCH 2010). Figures 2 and 3 show the waste site before remediation.

Figure 1. 100-N-99 Waste Site Location Map.

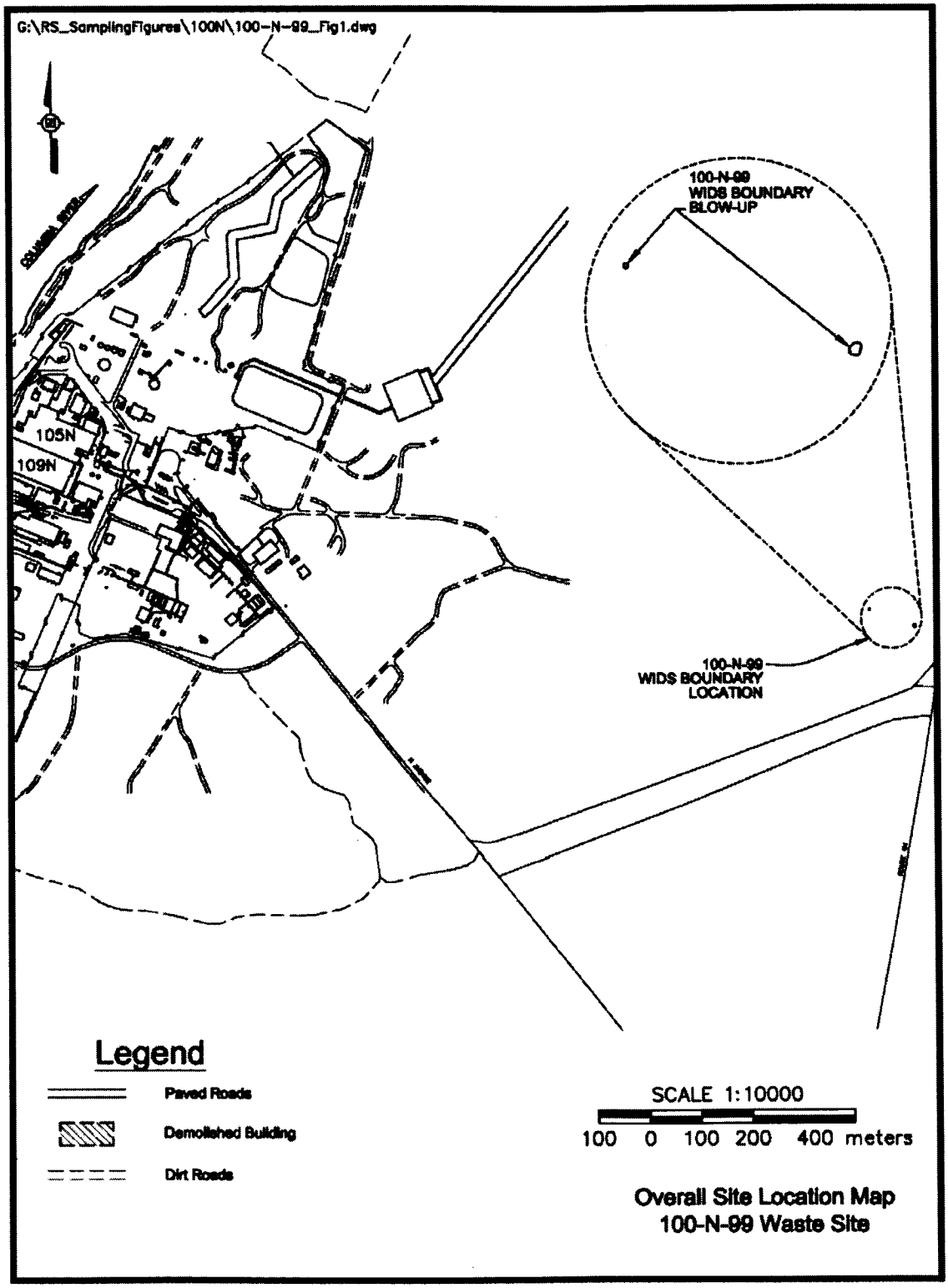


Figure 2. Pre-Remediation Photograph of the 100-N-99 Waste Site (May 15, 2008).

Figure 3. Pre-Remediation Photograph of the 100-N-99 Waste Site (May 19, 2008).

REMEDIAL ACTION SUMMARY

A waste characterization sample was collected on April 22, 2013, prior to the start of remediation. The sample summary and data are presented in Appendix A.

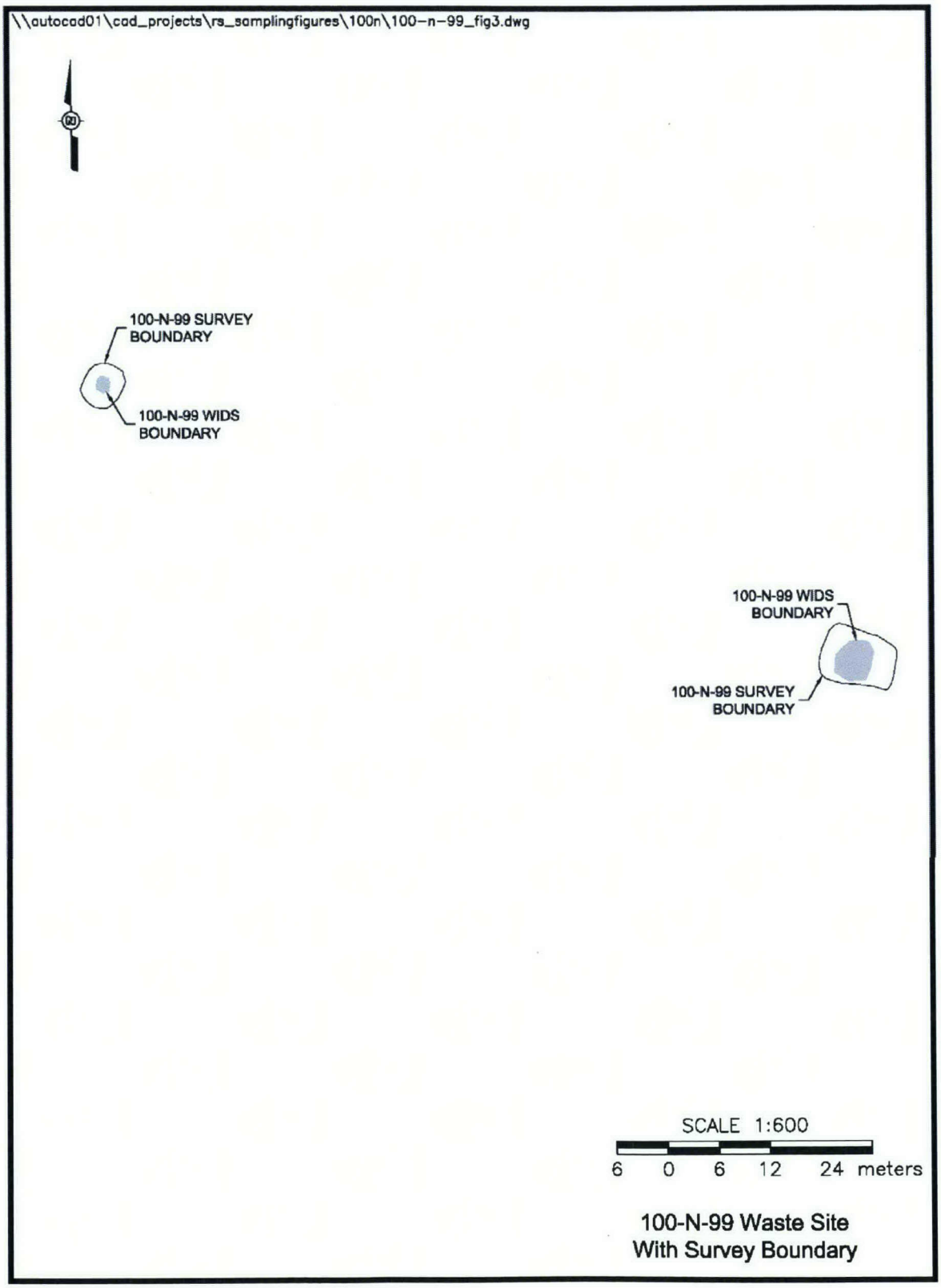
Waste site remediation was conducted on January 31, 2014. The remediation extended to approximately 1 m (3.3 ft) below ground surface resulting in approximately 47 bank cubic meters (61 bank cubic yards) of soil and debris removed for disposal at the Environmental Restoration Disposal Facility (ERDF). The debris consisted of oil filters. All material was loaded directly into the ERDF containers; therefore, no waste staging pile areas were created. Additionally, there was no overburden soil pile associated with the waste site. No anomalous material was encountered during the remediation. All visibly stained soil was removed.

Two in-process soil samples were collected on February 3, 2014, and analyzed for the site contaminants of potential concern (COPCs) to determine if remedial action activities were complete and if the site was ready for verification sampling.

A photograph of the waste site during remediation is provided in Figure 4. A post-remediation walkaround boundary survey was conducted following remedial action activities. The post-remediation survey is provided in Figure 5.

Figure 4. Photograph of the 100-N-99 Site During Remediation (January 31, 2014).

Figure 5. 100-N-99 Post-Remediation Walkaround Boundary Survey.



VERIFICATION SAMPLING ACTIVITIES

Verification soil sampling was conducted on May 1, 2014, per the *Work Instruction for Verification Sampling of the 100-N-99, 100-N Oil Filters #3* (WCH 2014b). Sampling was conducted to support a determination that residual contaminant concentrations in the soil meet cleanup criteria specified in the 100-N Area RDR/RAWP (DOE-RL 2013) and 100-N Area ROD (EPA 1999).

The verification sample results are provided in Appendix B and indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) and RAGs for the 100-N-99 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. The results of verification sampling are also summarized to support interim closure of the site.

Contaminants of Potential Concern

The 100-N-99 waste site is not listed in the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* (DOE-RL 2006); therefore, the COPCs were identified based on the visual observations of debris at the waste site, waste characterization sampling, and in-process sampling taken after remediation.

Polycyclic aromatic hydrocarbons and total petroleum hydrocarbons were identified as site COPCs (WCH 2014b).

The analytical methods that were performed to evaluate the site COPCs are provided in Table 1.

Table 1. Laboratory Analytical Methods for the 100-N-99 Waste Site.

Analytical Method	Contaminants of Potential Concern
PAH – EPA Method 8310	Polycyclic aromatic hydrocarbons
TPH – NWTPH-Dx	Total petroleum hydrocarbons

EPA = U.S. Environmental Protection Agency
NWTPH-Dx = Northwest total petroleum hydrocarbons-diesel range organics
PAH = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons

Verification Sample Design

A focused sample design was used for verification sampling at the 100-N-99 waste site. The two areas at the waste site were divided in quadrants, making eight areas, and one discrete grab soil sample was collected from the approximate center of each quadrant. Additionally, one duplicate sample was collected.

All sampling was performed in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* (DOE-RL 2006). Additional information related to verification sampling can be found in the field sampling logbook (WCH 2014a). The verification sample summary is provided in Table 2. Figures 6 through 8 shows the overall waste site footprint and the sampling locations.

Table 2. 100-N-99 Waste Site Verification Sample Summary Table.

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing (m)	Easting (m)	
Quad-1	J1TL55	149171.5	572808.2	PAH and TPH
Quad-2	J1TL56	149171.2	572806.2	
Quad-3	J1TL57	149169.2	572806.3	
Quad-4	J1TL58	149169.4	572808.3	
Quad-5	J1TL59	149138.8	572898.6	
Quad-6	J1TL60	149140.2	572894.6	
Quad-7	J1TL61	149137.3	572893.6	
Quad-8	J1TL62	149136.3	572897.9	
Duplicate of Quad-6	J1TL63	149140.2	572894.6	
Split of Quad-6	J1TL65	149140.2	572894.6	PAH and TPH
Equipment blank	J1TL64	NA	NA	PAH

HEIS = Hanford Environmental Information System
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons

Figure 6. 100-N-99 Waste Site Verification Sample Locations.

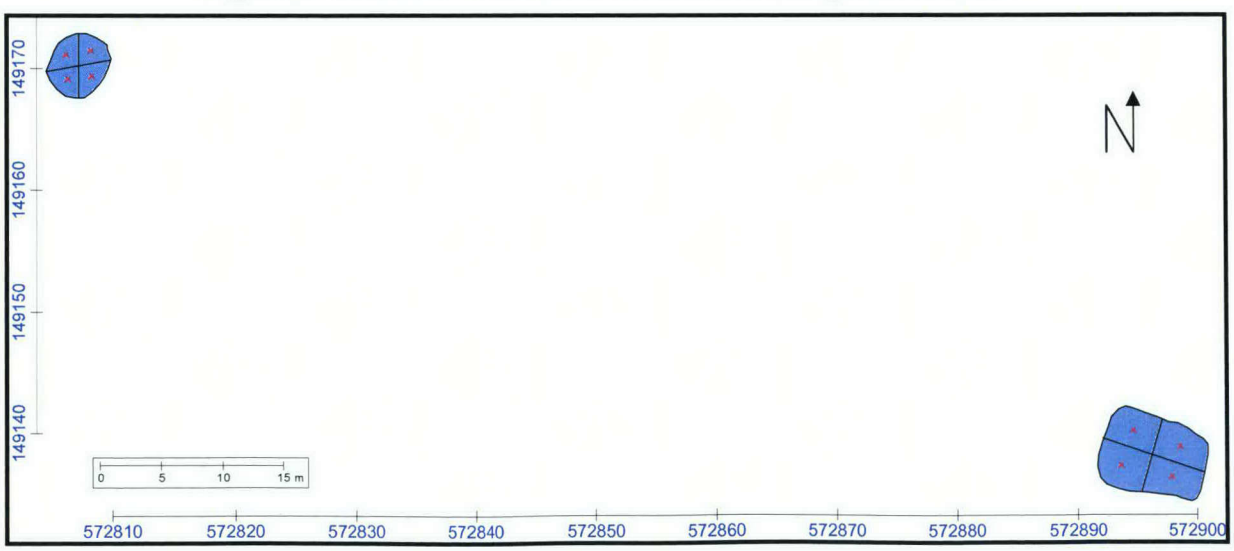


Figure 7. 100-N-99 Waste Site West Segment Verification Sample Locations.

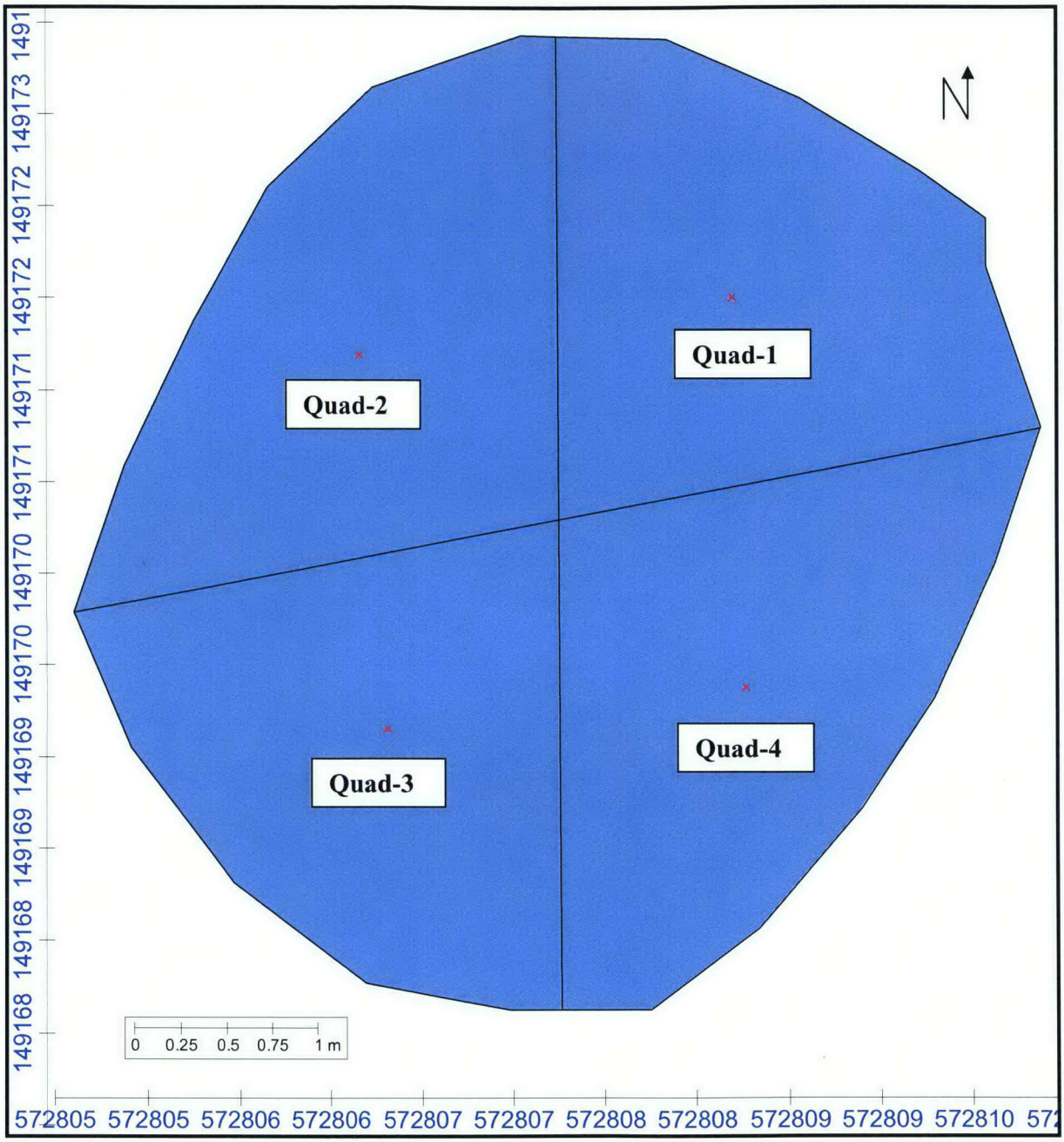
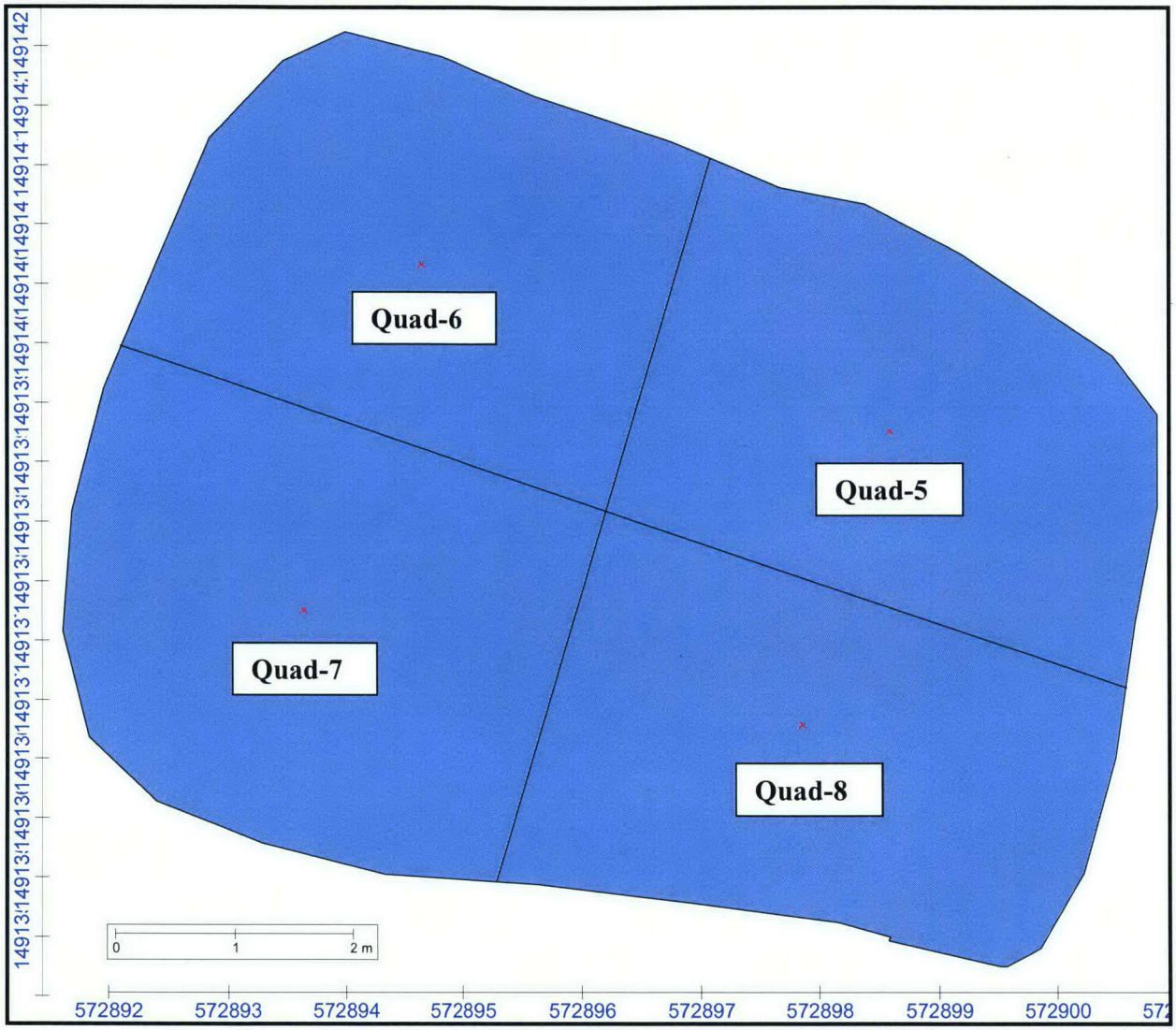


Figure 8. 100-N-99 Waste Site East Segment Verification Sample Locations.



Verification Sample Results

All verification samples were analyzed using EPA-approved analytical methods. Evaluation of the verification data from the 100-N-99 waste site was performed by direct comparison of the maximum sample results for each COPC against the cleanup criteria.

Comparisons of the results for each COPC from the 100-N-99 waste site against the RAGs are summarized in Table 3. Contaminants that were not detected by laboratory analysis are excluded from the table. The complete laboratory results for all constituents are stored in a Washington Closure Hanford (WCH) project-specific database prior to archival in the Hanford Environmental Information System (HEIS) and are presented in Attachment 1 of the *100-N-99 Waste Site Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation* (Appendix B).

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 100-N-99 Verification Samples.

COPC	Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
TPH – diesel	12	--	200	200	No	--
TPH – diesel extended	22	--	200	200	No	--

[a] RAGs obtained from the 100-N Area RDR/RAWP (DOE-RL 2013).
[b] Maximum results as described in the *100-N-99 Waste Site Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation* (Appendix B).

-- = not applicable
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP= remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 100-N-99 waste site achieve the applicable RAGs developed to support unrestricted land use at the 100-N Area as established in the 100-N Area ROD (EPA 1999) and documented in the 100-N Area RDR/RAWP (DOE-RL 2013).

Attainment of Nonradionuclide RAGS

Table 3 compares the cleanup verification sample values for the 100-N-99 waste site excavation to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. All COPCs were quantified below direct exposure, groundwater, and river protection soil RAGs.

Three-Part Test for Nonradionuclides

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test. Because there were no statistical verification samples for the 100-N-99 waste site, this test is not applicable.

Nonradionuclide Direct Contact Hazard Quotient and Carcinogenic Risk RAGs Attained

Nonradionuclide risk 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}. For the 100-N-99 waste site, direct contact hazard quotient and carcinogenic risk calculations were not necessary because there were not any constituents with a direct exposure cleanup level detected above background. Therefore, the 100-N-99 waste site meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the 100-N Area RDR/RAWP (DOE-RL 2013).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 100-N-99 waste site did not include a calculation of the hazard quotient and carcinogenic (excess cancer) risk values for groundwater protection for nonradionuclides. The requirements include an individual and cumulative hazard quotient of less than 1.0, an individual excess carcinogenic risk of less than 1×10^{-6}, and a cumulative excess carcinogenic risk of less than 1×10^{-5}. Because concentrations of all detected constituents with a direct exposure cleanup level were below background it was not necessary to determine hazard quotient and carcinogenic risk values for groundwater protection.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2014b), the field logbook (WCH 2014a), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 100-N-99 waste site established that the data are of the right type, quality, and quantity to support site closeout decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in a WCH project-specific database for data evaluation prior to archival in the HEIS and are summarized in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 100-N-99 waste site has been evaluated in accordance with the 100-N Area ROD (EPA 1999) and the 100-N Area RDR/RAWP (DOE-RL 2013). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at the site meet the RAOs for direct exposure, groundwater protection, and river protection.

In accordance with this evaluation, the verification sampling results support a reclassification of the 100-N-99 waste site to Interim Closed Out. Residual contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site 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.

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

DOE-RL, 2006, *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites,* DOE/RL-2005-92, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2011, *Tri-Party Agreement Handbook Management Procedures,* RL-TPA-90-0001, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2013, *Remedial Design Report/Remedial Action Work Plan for the 100-N Area,* DOE/RL-2005-93, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

ENV-1, *Environmental Monitoring & Management*, Washington Closure Hanford, Richland, Washington.

EPA, 1999, *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2011, *Explanation of Significant Differences for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, 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, 2010, "100-N Remaining Site for Remedial Action," CCN 151502, to S. W. Callison from M. L. Proctor, Washington Closure Hanford, Richland, Washington, June 10.

WCH, 2014a, *100N Field Remediation Sampling*, Logbook EL-1652-11, pp. 93-94, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 100-N-99, 100-N Oil Filters #3,* 0100N-WI-G0086, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX A

WASTE CHARACTERIZATION AND IN-PROCESS SAMPLING RESULTS

APPENDIX A

WASTE CHARACTERIZATION AND IN-PROCESS SAMPLING RESULTS

A waste characterization sample was collected on April 22, 2013, prior to the start of remediation. Additionally, two in-process soil samples were collected after the oil filters and underlying soil were removed. The waste characterization and in-process soil samples are summarized in Table A-1. The data are provided in Tables A-2 through A-5.

Table A-1. Waste Characterization and In-Process Sampling Summary for the 100-N-99 Waste Site.

HEIS Sample Number	Sample Description	Washington State Plane Coordinates		Sample Analysis
		Northing (m)	Easting (m)	
J1RKR8	Waste characterization	149154.6	572850.8	ICP metals [a], mercury, SVOA
J1T929	In-process soil sample	149137.6	572895.9	ICP metals [a], mercury, PCB, TPH
J1T930	In-process soil sample	149170.2	572807.4	ICP metals [a], mercury, PCB, TPH

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

HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons

Table A-2. 100-N-99 Waste Characterization and In-Process Sample Data.

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
Waste Characterization	J1RKR8	4/22/13	6590		1.5	0.38	U	0.38	2.3		0.66	138		0.076
#1 - In Process	J1T929	2/3/14	6280		1.5	0.37	U	0.37	2.5		0.65	55.9		0.075
#2 - In Process	J1T930	2/3/14	3120		1.4	0.35	U	0.35	0.88	B	0.61	18.3		0.070

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
Waste Characterization	J1RKR8	4/22/13	0.31		0.033	1.3	B	0.98	1.2		0.041	2850		14.1
#1 - In Process	J1T929	2/3/14	0.033	U	0.033	0.97	UN	0.97	0.084	B	0.040	4610	X	13.9
#2 - In Process	J1T930	2/3/14	0.030	U	0.030	0.90	U	0.90	0.040	B	0.038	2980	X	12.9

Sample Location	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Waste Characterization	J1RKR8	4/22/13	12		0.058	6.0	X	0.10	42.2		0.22	19600	X	3.8
#1 - In Process	J1T929	2/3/14	6.3		0.057	7.4	X	0.099	16.1	X	0.21	21500	X	3.7
#2 - In Process	J1T930	2/3/14	1.7		0.053	4.4	X	0.092	10.1	X	0.20	11800	X	3.5

Sample Location	HEIS Number	Sample Date	Lead			Magnesium			Manganese			Mercury		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Waste Characterization	J1RKR8	4/22/13	164	X	0.27	3610		3.7	257		0.10	0.042		0.0056
#1 - In Process	J1T929	2/3/14	3.4		0.27	3940		3.6	273	X	0.099	0.0057	U	0.0057
#2 - In Process	J1T930	2/3/14	1.3		0.25	2430		3.4	113	X	0.092	0.0055	U	0.0055

Sample Location	HEIS Number	Sample Date	Molybdenum			Nickel			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Waste Characterization	J1RKR8	4/22/13	1.3	B	0.26	12.5	X	0.12	1270		41.0	0.86	U	0.86
#1 - In Process	J1T929	2/3/14	0.26	U	0.26	9.2	X	0.12	1070		40.4	0.85	U	0.85
#2 - In Process	J1T930	2/3/14	0.24	U	0.24	3.8	X	0.11	417		37.6	0.79	U	0.79

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Waste Characterization	J1RKR8	4/22/13	177		5.7	0.16	U	0.16	198		59.0	41.8		0.094
#1 - In Process	J1T929	2/3/14	248	N	5.6	0.16	U	0.16	263		58.1	41.1		0.093
#2 - In Process	J1T930	2/3/14	60.7	N	5.2	0.15	U	0.15	227		54.2	19.7		0.086

Sample Location	HEIS Number	Sample Date	Zinc			TPH - Diesel Range EXT			TPH - Diesel Range		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Waste Characterization	J1RKR8	4/22/13	117		0.40						
#1 - In Process	J1T929	2/3/14	34.8	X	0.39	1700	J	1000	990	J	680
#2 - In Process	J1T930	2/3/14	18.2	X	0.37	2700	J	940	1800	J	640

Sample Location	HEIS Number	Sample Date	Arsenic			Barium			Cadmium			Chromium		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
Waste Characterization	J1RKR8	4/22/13	0.022	U	0.022	0.42	B	0.002	0.016	B	0.002	0.003	U	0.003

Sample Location	HEIS Number	Sample Date	Lead			Mercury			Selenium			Silver		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
Waste Characterization	J1RKR8	4/22/13	0.14	B	0.013	0	U	3E-05	0.024	U	0.024	0.004	U	0.004

Table A-3. 100-N-99 Waste Characterization and In-Process Sample Data.

CONSTITUENT	CLASS	Waste Characterization			#1 - In Process			#2 - In Process		
		J1RKR8			J1T929			J1T930		
		4/22/13			2/3/14			2/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH				10	U	10	10	U	10
Acenaphthylene	PAH				9.2	U	9.2	9.1	U	9.1
Anthracene	PAH				3.1	U	3.1	3.1	U	3.1
Benzo(a)anthracene	PAH				3.2	U	3.2	3.2	U	3.2
Benzo(a)pyrene	PAH				6.5	U	6.5	6.5	U	6.5
Benzo(b)fluoranthene	PAH				4.3	U	4.3	4.3	U	4.3
Benzo(ghi)perylene	PAH				7.3	U	7.3	7.3	U	7.3
Benzo(k)fluoranthene	PAH				4	U	4	4	U	4
Chrysene	PAH				4.9	U	4.9	4.9	U	4.9
Dibenz[a,h]anthracene	PAH				11	U	11	11	U	11
Fluoranthene	PAH				13	U	13	13	U	13
Fluorene	PAH				5.4	U	5.4	5.4	U	5.4
Indeno(1,2,3-cd)pyrene	PAH				12	U	12	12	U	12
Naphthalene	PAH				12	U	12	12	U	12
Phenanthrene	PAH				12	U	12	12	U	12
Pyrene	PAH				12	U	12	12	U	12
Aroclor-1016	PCB				2.8	U	2.8	2.8	U	2.8
Aroclor-1221	PCB				8.2	U	8.2	8.1	U	8.1
Aroclor-1232	PCB				2	U	2	2	U	2
Aroclor-1242	PCB				4.7	U	4.7	4.7	U	4.7
Aroclor-1248	PCB				4.7	U	4.7	4.7	U	4.7
Aroclor-1254	PCB				2.6	U	2.6	2.6	U	2.6
Aroclor-1260	PCB				2.6	U	2.6	2.6	U	2.6
1,2,4-Trichlorobenzene	SVOA	270	UD	270						
1,2-Dichlorobenzene	SVOA	220	UD	220						
1,3-Dichlorobenzene	SVOA	120	UD	120						
1,4-Dichlorobenzene	SVOA	130	UD	130						
2,4,5-Trichlorophenol	SVOA	98	UD	98						
2,4,6-Trichlorophenol	SVOA	98	UD	98						
2,4-Dichlorophenol	SVOA	98	UD	98						
2,4-Dimethylphenol	SVOA	650	UD	650						
2,4-Dinitrophenol	SVOA	3300	UD	3300						
2,4-Dinitrotoluene	SVOA	650	UD	650						
2,6-Dinitrotoluene	SVOA	270	UD	270						
2-Chloronaphthalene	SVOA	98	UD	98						
2-Chlorophenol	SVOA	210	UD	210						
2-Methylnaphthalene	SVOA	190	UD	190						
2-Methylphenol (cresol, o-)	SVOA	130	UD	130						
2-Nitroaniline	SVOA	490	UD	490						
2-Nitrophenol	SVOA	98	UD	98						
3,3'-Dichlorobenzidine	SVOA	880	UD	880						
3+4 Methylphenol (cresol, m+p)	SVOA	320	UD	320						
3-Nitroaniline	SVOA	720	UD	720						
4,6-Dinitro-2-methylphenol	SVOA	3200	UD	3200						
4-Bromophenylphenyl ether	SVOA	190	UD	190						
4-Chloro-3-methylphenol	SVOA	650	UD	650						
4-Chloroaniline	SVOA	800	UD	800						
4-Chlorophenylphenyl ether	SVOA	210	UD	210						

Table A-4. 100-N-99 Waste Characterization and In-Process Sample Data.

CONSTITUENT	CLASS	Waste Characterization		
		J1RKR8		
		4/22/13		
		ug/kg	Q	PQL
4-Nitroaniline	SVOA	710	UD	710
4-Nitrophenol	SVOA	950	UD	950
Acenaphthene	SVOA	100	UD	100
Acenaphthylene	SVOA	170	UD	170
Anthracene	SVOA	170	UD	170
Benzo(a)anthracene	SVOA	200	UD	200
Benzo(a)pyrene	SVOA	200	UD	200
Benzo(b)fluoranthene	SVOA	260	UD	260
Benzo(ghi)perylene	SVOA	160	UD	160
Benzo(k)fluoranthene	SVOA	390	UD	390
Bis(2-chloro-1-methylethyl)ether	SVOA	230	UD	230
Bis(2-Chloroethoxy)methane	SVOA	230	UD	230
Bis(2-chloroethyl) ether	SVOA	160	UD	160
Bis(2-ethylhexyl) phthalate	SVOA	450	UD	450
Butylbenzylphthalate	SVOA	420	UD	420
Carbazole	SVOA	350	UD	350
Chrysene	SVOA	260	UD	260
Dibenz[a,h]anthracene	SVOA	190	UD	190
Dibenzofuran	SVOA	200	UD	200
Diethyl phthalate	SVOA	250	UD	250
Dimethyl phthalate	SVOA	230	UD	230
Di-n-butylphthalate	SVOA	280	UD	280
Di-n-octylphthalate	SVOA	140	UD	140
Fluoranthene	SVOA	350	UD	350
Fluorene	SVOA	180	UD	180
Hexachlorobenzene	SVOA	280	UD	280
Hexachlorobutadiene	SVOA	98	UD	98
Hexachlorocyclopentadiene	SVOA	490	UD	490
Hexachloroethane	SVOA	210	UD	210
Indeno(1,2,3-cd)pyrene	SVOA	220	UD	220
Isophorone	SVOA	170	UD	170
Naphthalene	SVOA	300	UD	300
Nitrobenzene	SVOA	220	UD	220
N-Nitroso-di-n-dipropylamine	SVOA	300	UD	300
N-Nitrosodiphenylamine	SVOA	210	UD	210
Pentachlorophenol	SVOA	3200	UD	3200
Phenanthrene	SVOA	170	JD	170
Phenol	SVOA	180	UD	180
Pyrene	SVOA	120	UD	120

APPENDIX B

CALCULATIONS

APPENDIX B

CALCULATIONS

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

100-N-99 Waste Site Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100N-CA-V0280, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

The calculations that are provided in this appendix 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.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-N

Discipline: Environmental *Calculation No: 0100N-CA-V0280

Subject: 100-N-99 Waste Site Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations

Computer Program: Excel Program No: Excel 2010

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 = 3 Attachment = 2 Total = 6	J. D. Skoglie	I. B. Berezovskiy	H. M. Sulloway	D. F. Obenauer	4/17/14

SUMMARY OF REVISION

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	6/17/2014	Calc. No.:	0100N-CA-V0280	Rev.:	0
Project:	100-N Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	6/17/2014
Subject:	100-N-99 Waste Site Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 3	

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 100-N-99 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2013), 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 the primary-duplicate and split sample pairs from the 100-N-99 waste site verification sampling, as necessary.

GIVEN/REFERENCES:

1) DOE-RL, 2006, *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites*, DOE/RL-2005-92, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) DOE-RL, 2013, *Remedial Design Report/Remedial Action Work Plan for the 100-N Area*, DOE/RL-2005-93, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

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 2013).

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 2013).

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:	J. D. Skoglie	Date:	6/17/2014	Calc. No.:	0100N-CA-V0280	Rev.:	0
Project:	100-N Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	6/17/2014
Subject:	100-N-99 Waste Site Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 3	

METHODOLOGY:

The 100-N-99 waste site underwent verification focused sampling at eight quadrants consisting of one decision unit; the excavation area. In addition, one duplicate and one split sample were collected.

Of the contaminants of potential concern (COPCs) for this waste site they all were either not detected or below the Washington State or Hanford Site background value. Therefore, a direct contact hazard quotient calculation is not necessary and all criterions are met for that calculation.

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 for certain analytes in Table II-1 of the SAP (DOE-RL 2006). Other analytes will have their own pre-determined constituents and will have their own TDLs based on the laboratory and method used. 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. For regulatory splits, a threshold of 35% is used. If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. Additional discussion is provided in the data quality assessment section of the applicable RSVP, as necessary.

RESULTS:

Direct Contact Hazard Quotient 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:	J. D. Skoglie	Date:	6/17/2014	Calc. No.:	0100N-CA-V0280	Rev.:	0
Project:	100-N Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	6/17/2014
Subject:	100-N-99 Waste Site Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 3	

Relative Percent Difference Results

5) The evaluation of the QA/QC duplicate and/or split RPD calculations are performed within the data quality assessment section of the RSVP.

Table 1 shows the results of the RPD calculations for the 100-N-99 waste site.

Table 1. Relative Percent Difference Calculations for the 100-N-99 Waste Site.

Sampling Location	HEIS Number	Sample Date	TPH - Diesel Range EXT			TPH - Diesel Range		
			ug/kg	Q	PQL	ug/kg	Q	PQL
Quad-1	J1THD3	3/27/2014	2200	J	990	1300	J	670
Duplicate of J1THD3	J1THD7	3/27/2014	1600	J	1000	1000	J	680
Split of J1THD3	J1THD9	3/27/2014				2190	U	6730

Analysis:

TDL		5000	5000
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		
	Difference > 2 TDL?	No - acceptable	No - acceptable
Split Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?		
	RPD		
	Difference > 2 TDL?	No - acceptable	No - acceptable

CONCLUSION:

The calculations in Table 1 demonstrate that the 100-N-99 waste site meets the requirements for the RPD, as identified in the RDR/RAWP (DOE-RL 2013) and SAP (DOE-RL-2006). The RPD calculations are for use in the RSVP for this waste site.

Attachment 1. 100-N-99 Waste Site Verification Sample Results (TPH and Physical).

Sample Location	HEIS Number	Sample Date	TPH - Diesel Range EXT			TPH - Diesel Range			TPH - motor oil (high boiling)			Percent moisture (wet sample)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	%	Q	PQL
Quad-6	J1TL60	5/1/14	2200	J	990	1300	J	670				1.0		0.10
Duplicate of J1TL60	J1TL63	5/1/14	1600	J	1000	1000	J	680				0.92		0.10
Quad-1	J1TL55	5/1/14	2000	J	970	1100	J	660				0.65		0.10
Quad-2	J1TL56	5/1/14	22000		1000	12000		690				1.6		0.10
Quad-3	J1TL57	5/1/14	3600	J	980	1800	J	670				3.2		0.10
Quad-4	J1TL58	5/1/14	2100	J	1000	1300	J	680				1.2		0.10
Quad-5	J1TL59	5/1/14	1900	J	980	1200	J	670				1.0		0.10
Quad-7	J1TL61	5/1/14	1500	J	940	950	J	640				0.95		0.10
Quad-8	J1TL62	5/1/14	1800	J	990	1100	J	670				1.1		0.10
Split of J1TL60	J1TL65	5/1/14				2190	U	6730	3750	BJ	6730			
Equipment Blank	J1TL64	5/1/14										0.10	U	0.10

Note: Data qualified with B, J, M, and X are acceptable values.
B = analyte was found in associated method blank as well as the sample.
EXT = extended
HEIS = Hanford Environmental Information system
J = Results less than RL but greater than or equal to the MDL and the concentration is an approximate value.
N = spike sample recovery is outside control limits.
PAH = polycyclic aromatic hydrocarbons
PQL = practical quantitation limit

Attachment	1	Sheet No.	1 of 2
Originator	J. D. Skoglie	Date	6/12/2014
Checked	I. B. Berezovskiy	Date	6/12/2014
Calc. No.	0100N-CA-V0280	Rev. No.	0

Q = qualifier
Quad = quadrant
TPH = total petroleum hydrocarbons
U = undetected

Attachment 1. 100-N-99 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	Quad-6 - J1TL60			Duplicate of J1TL60 - J1TL63			Quad-1 - J1TL55			Quad-2 - J1TL56			Quad-3 - J1TL57			Quad-4 - J1TL58		
		5/1/14			5/1/14			5/1/14			5/1/14			5/1/14			5/1/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.8	UJ	9.8	10	U	10	10	UJN	10	10	UJ	10	9.8	UJ	9.8	9.8	UJ	9.8
Acenaphthylene	PAH	8.8	UJ	8.8	9.0	U	9.0	9.0	UJN	9.0	9.1	UJ	9.1	8.8	UJ	8.8	8.8	UJ	8.8
Anthracene	PAH	3.0	UJ	3.0	3.1	UN	3.1	3.0	UJN	3.0	3.1	UJ	3.1	3.0	UJ	3.0	3.0	UJ	3.0
Benzo(a)anthracene	PAH	3.1	UJ	3.1	3.2	U	3.2	3.2	UJN	3.2	3.2	UJ	3.2	3.1	UJ	3.1	3.1	UJ	3.1
Benzo(a)pyrene	PAH	6.3	U	6.3	6.4	U	6.4	6.4	UN	6.4	6.5	U	6.5	6.3	U	6.3	6.3	U	6.3
Benzo(b)fluoranthene	PAH	4.1	UJ	4.1	4.2	UN	4.2	4.2	UJN	4.2	4.3	UJ	4.3	4.1	UJ	4.1	4.1	UJ	4.1
Benzo(ghi)perylene	PAH	7.0	UJ	7.0	7.2	U	7.2	7.2	UJN	7.2	7.3	UJ	7.3	7.1	UJ	7.1	7.0	UJ	7.0
Benzo(k)fluoranthene	PAH	3.9	UJ	3.9	4.0	UN	4.0	3.9	UJN	3.9	4.0	UJ	4.0	3.9	UJ	3.9	3.8	UJ	3.8
Chrysene	PAH	4.7	UJ	4.7	4.9	U	4.9	4.8	UJN	4.8	4.9	UJ	4.9	4.7	UJ	4.7	4.7	UJ	4.7
Dibenz[a,h]anthracene	PAH	11	UJ	11	11	UN	11	11	UJN	11	11	UJ	11	11	UJ	11	11	UJ	11
Fluoranthene	PAH	13	UJ	13	13	UN	13	13	UJN	13	13	UJ	13	13	UJ	13	13	UJ	13
Fluorene	PAH	5.2	UJ	5.2	5.3	U	5.3	5.3	UJN	5.3	5.4	UJ	5.4	5.2	UJ	5.2	5.2	UJ	5.2
Indeno(1,2,3-cd)pyrene	PAH	12	UJ	12	12	UN	12	12	UJN	12	12	UJ	12	12	UJ	12	12	UJ	12
Naphthalene	PAH	12	UJ	12	12	U	12	12	UJN	12	12	UJ	12	12	UJ	12	12	UJ	12
Phenanthrene	PAH	12	UJ	12	12	U	12	12	UJN	12	12	UJ	12	12	UJ	12	12	UJ	12
Pyrene	PAH	12	UJ	12	12	U	12	12	UJN	12	12	UJ	12	12	UJ	12	12	UJ	12

CONSTITUENT	CLASS	Quad-5 - J1TL59			Quad-7 - J1TL61			Quad-8 - J1TL62			Split of J1TL60 - J1TL65			Equipment Blank - J1TL64		
		5/1/14			5/1/14			5/1/14			5/1/14			5/1/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.9	UJ	9.9	9.8	UJ	9.8	10	UJ	10	5.06	U	16.9	9.2	UJ	9.2
Acenaphthylene	PAH	8.9	UJ	8.9	8.9	UJ	8.9	9.0	UJ	9.0	5.06	U	16.9	8.3	UJ	8.3
Anthracene	PAH	3.0	UJ	3.0	3.0	UJ	3.0	3.1	UJ	3.1	1.69	U	16.9	2.8	UJ	2.8
Benzo(a)anthracene	PAH	3.1	UJ	3.1	3.1	UJ	3.1	3.2	UJ	3.2	0.539	U	1.69	2.9	UJ	2.9
Benzo(a)pyrene	PAH	6.3	U	6.3	6.3	U	6.3	6.4	U	6.4	0.539	U	1.69	5.9	U	5.9
Benzo(b)fluoranthene	PAH	4.1	UJ	4.1	4.1	UJ	4.1	4.2	UJ	4.2	0.539	U	1.69	3.9	UJ	3.9
Benzo(ghi)perylene	PAH	7.1	UJ	7.1	7.1	UJ	7.1	7.2	UJ	7.2	0.539	U	1.69	6.6	UJ	6.6
Benzo(k)fluoranthene	PAH	3.9	UJ	3.9	3.9	UJ	3.9	4.0	UJ	4.0	0.27	U	0.843	3.6	UJ	3.6
Chrysene	PAH	4.8	UJ	4.8	4.8	UJ	4.8	4.9	UJ	4.9	0.539	U	1.69	4.4	UJ	4.4
Dibenz[a,h]anthracene	PAH	11	UJ	11	11	UJ	11	11	UJ	11	0.539	U	1.69	10	UJ	10
Fluoranthene	PAH	13	UJ	13	13	UJ	13	13	UJ	13	0.539	U	1.69	12	UJ	12
Fluorene	PAH	5.2	UJ	5.2	5.2	UJ	5.2	5.3	UJ	5.3	5.06	U	16.9	4.8	UJ	4.8
Indeno(1,2,3-cd)pyrene	PAH	12	UJ	12	12	UJ	12	12	UJ	12	0.539	U	1.69	11	UJ	11
Naphthalene	PAH	12	UJ	12	12	UJ	12	12	UJ	12	5.06	U	16.9	11	UJ	11
Phenanthrene	PAH	12	UJ	12	12	UJ	12	12	UJ	12	5.06	U	16.9	11	UJ	11
Pyrene	PAH	12	UJ	12	12	UJ	12	12	UJ	12	0.539	U	1.69	11	UJ	11

Attachment	1	Sheet No.	2 of 2
Originator	J. D. Skoglie	Date	6/12/2014
Checked	I. B. Berezovskiy	Date	6/12/2014
Calc. No.	0100N-CA-V0280	Rev. No.	0

APPENDIX C

DATA QUALITY ASSESSMENT

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DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2014b). This DQA was performed in accordance with data quality objectives found in the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* (100-N Area SAP) (DOE-RL 2006).

A review of the sample design (WCH 2014b), the field logbook (WCH 2014a), and the applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design.

To ensure quality data, the 100-N Area SAP (DOE-RL 2006) data assurance requirements and the data validation procedure for chemical analysis (BHI 2000) is 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., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Verification data from samples collected at the 100-N-99 waste site were provided by the laboratories in two sample delivery groups (SDGs): SDG JP0785 and SDG XP0086. SDG JP0785 was submitted for third-party validation. No major deficiencies were noted in the data results. Minor deficiencies are discussed for 100-N-99 data set, as follows 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.

MINOR DEFICIENCIES

SDG JP0785

This SDG comprises eight focused soil samples (J1TL55 through J1TL62) collected from the 100-N-99 waste site excavation area. This SDG includes one field duplicate pair (J1TL60/J1TL63). These samples were analyzed for polycyclic aromatic hydrocarbons (PAH) and total petroleum hydrocarbons. In addition, one equipment blank (J1TL64) was collected and analyzed for PAH. The SDG JP0785 was submitted for third-party validation. Minor deficiencies are as follows.

In the PAH analysis, the matrix spike/matrix spike duplicate relative percent differences (RPDs) for all PAH results (except benzo(a)pyrene) encompassing all samples (except sample J1TL63) were outside the quality control limits. Elevated RPDs in environmental samples are generally

attributed to natural heterogeneities in the sample matrix. Third party validation qualified all PAH results in SDG JP0785 as estimates with "J" flags, with the exception of PAH results in sample J1TL63 and benzo(a)pyrene data in all of the samples. Estimated data are usable for decision-making purposes.

SDG XP0086

This SDG comprises one focused soil sample (J1TL65) collected from the 100-N-99 waste site, sample location Quad-6. Field sample J1TL65 is a split sample associated with sample J1TL60. This sample was analyzed for PAH. No major or minor deficiencies were noted.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

Relative percent difference evaluations of main sample(s) versus the laboratory duplicate sample(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 (QA) measurements are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/quality control (QC) samples, listed in the field logbook (WCH 2014a), are shown in Table C-1. The main and QA/QC sample results are presented in Appendix B.

Table C-1. Field Quality Assurance/Quality Control Samples.

Sample Area	Main Sample	Duplicate Sample	Split Sample
Excavation	J1TL60	J1TL63	J1TL65

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 computing the RPD of the sample/duplicate pair(s) for each contaminant of potential concern. Relative percent differences are not calculated for analytes that are not detected in both the main and duplicate sample at more than five times the target detection limit (TDL). Relative percent differences of analytes detected at low concentrations (less than five times the detection limit) are not considered to be indicative of the analytical system performance. The calculation brief in Appendix B provides details on duplicate pair evaluation and RPD calculation.

Field split samples are used to determine systematic differences (bias) between laboratories. A statistical determination of systematic differences would require larger data sets than are presented here. Such a determination is complicated by variability introduced by the natural heterogeneities inherent in field soil samples, and the analytical variability that each individual laboratory experiences. Therefore, when evaluating limited field split data relatively large RPDs are expected. No major or minor deficiencies in the RPD calculations were found for the field duplicate and split samples.

None of the RPDs calculated for the field duplicate sample are above the acceptance criteria of 30%. None of the RPDs calculated for the field split sample are above the acceptance criteria of 35%. 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, or main and split) is less than five times the TDL, including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. No sample 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 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-N-99 waste site verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for the 100-N-99 data set concludes that the reviewed 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 verification sample analytical data are stored in the Washington Closure Hanford project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System database. The verification sample analytical data are also summarized in Appendix B.

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

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